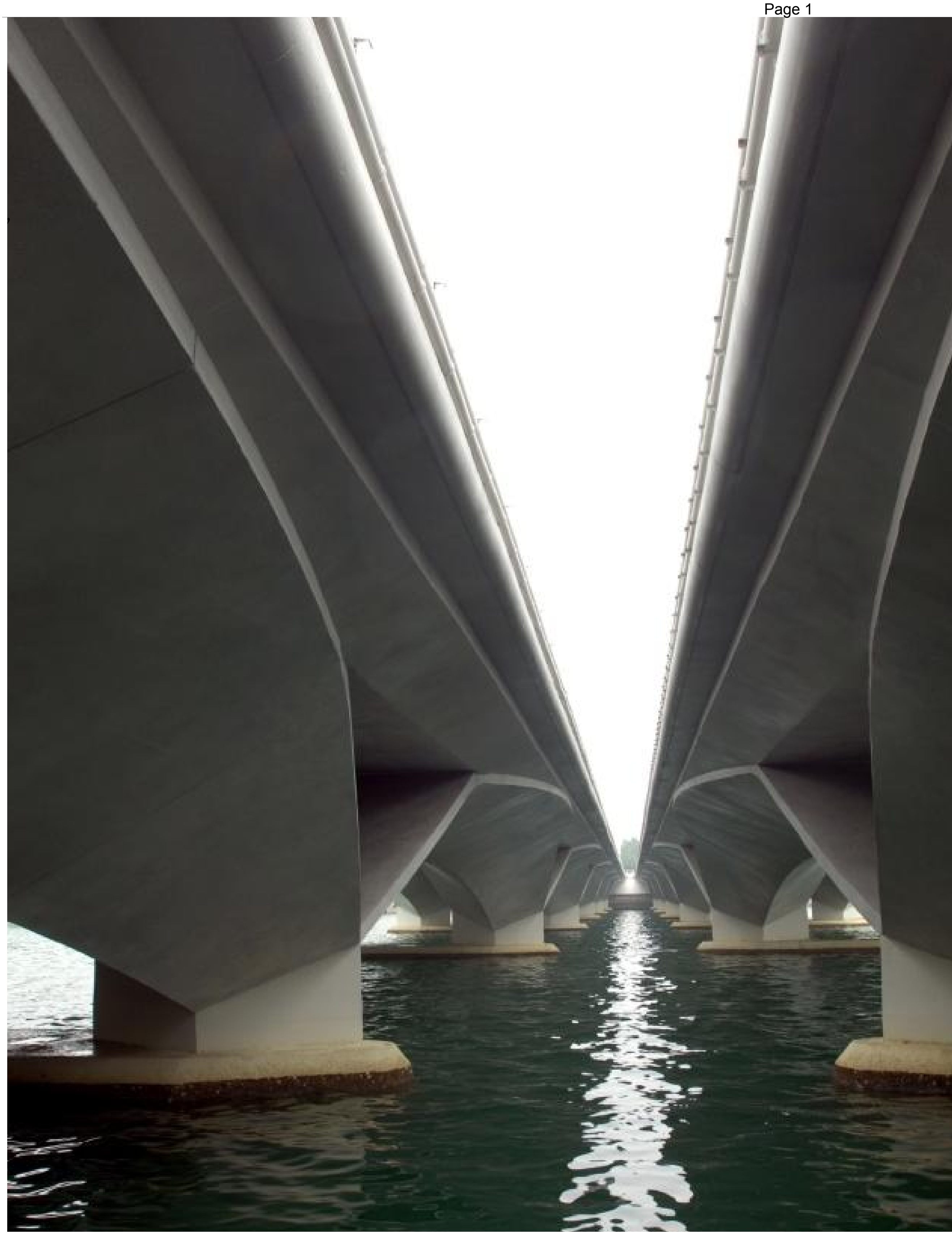

Broward County

Investment Grade Audit Report
May 10, 2019

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A. Executive Summary

A. Executive Summary

This report summarizes the results of the detailed energy analysis performed by Siemens Industry, Inc., Building Technologies Division (Siemens) for Broward County. The analysis included an in depth study of the existing facilities (mechanical replacements, water, lighting, solar, building envelope improvements, automation opportunities, and miscellaneous electrical equipment). Improvement opportunities for each facility and system were assessed for its potential to produce utility savings, operational and maintenance savings, revenues, and overall improvement in the system performance and reliability.

A.1. Project Objective

The primary objective of this analysis is to develop an implementation plan for reducing the City's utility (energy and water) consumption while simultaneously improving operation and maintenance costs. The objective is achieved in two phases as described below:

1. Examine existing energy and non-energy using systems, and current utility data.
2. Identify facility improvement measures (FIMs) and calculate savings and costs.

Facility upgrades recommended in this report comply with the required payback terms and/or the specific upgrades (capital budget projects) requested by the County.

A.2. Facilities included in this Project

BROWARD COUNTY FACILITY SITE LIST

Facility Name	Address	Bldg (ft^2)	Parking (ft^2); Site (ft^2) for Parks
BG Agricultural Extension	3245 College Avenue	16,193	43,547
BCJC N Wing	201 SE 6th Street	245,745	
BCJC States Attorney Office (LTS)	16 SE 6th Street	8,000	
Emergency Operations Center	201 NW 84th Avenue	42,000	
HIGH & BRDG Administration	1600 NW 30th Avenue	11,423	
South Regional Courthouse	3600 Hollywood Blvd.	72,656	128,429
West Regional Courthouse	100 N. Pine Island Road	65,000	
Fleet Services #2, SR 84	2515 SW 4th Avenue	13,280	10,000
FLET SERV, #3, Pompano Beach	1600 NW 30th Avenue	32,057	
MASS TRAN, Downtown Terminal	101 NW 1st Avenue	26,553	10,000
Mid-Rise / East Parking	540 SE 3 AVE	67,152	636,924
State Attorney & Clerks Warehouse	515 SW 2nd Avenue	30,264	2,985

BROWARD COUNTY FACILITY SITE LIST CONTINUED

Facility Name	Address	Bldg (ft²)	Parking (ft²); Site (ft²) for Parks
West Regional Maintenance Center	300 North Pine Island Road	2,500	
Edgar Mills Center	900 NW 31st Avenue	58,275	98,150
Family Success Center, NW	10077 NW 29th St	14,269	65,428
Hunter & Hughes Bldg	601 W Atlantic & 205 NW 6th Ave	44,434	92,838
Northwest Health Center	324 NW 15th Way	4,920	40,000
South Regional Health Center	4105 Pembroke Rd	38,237	104,559
LIBRARY, Collier City	2800 NW 9th Court	10,000	40,000
LIBRARY, Deerfield Beach	837 East Hillsboro Boulevard	15,120	16,562
LIBRARY, East Regional	1300 E. Sunrise Blvd.	33,297	44,284
LIBRARY, Galt Ocean	3403 Galt Ocean Drive	2,450	1,000
LIBRARY, Hollywood Beach	1301 South Ocean Drive	2,500	2,000
LIBRARY, Hollywood	2600 Hollywood Boulevard	46,200	10,000
LIBRARY, Imperial Point	5985 Federal Highway	14,500	20,000
LIBRARY, Lauderhill	6399 Oakland Park Boulevard	10,000	10,000
LIBRARY, Main	100 S. Andrew Avenue	281,000	
LIBRARY, Miramar	2302 Civic Center Place	70,000	10,000
LIBRARY, Beach Branch			
LIBRARY, Riverland Branch	2710 West Davie Boulevard	10,000	10,000
LIBRARY, Tamarac	8701 West Commercial Blvd	30,000	40,000
LIBRARY, Tyrone Bryant	2230 NW 21st Avenue	10,250	25,377
LIBRARY, Young at Art	751 SW 121 Avenue	62,916	50,000
PARK, CB SMITH	900 N FLAMINGO RD	65,195	12,839,400
PARK, DELEVOE	2520 NW SIXTH ST	9,593	1,340,848
PARK, EVERGLADES HOLIDAY	21940 GRIFFIN ROAD	17,000	1,683,000
PARK, FRANKLIN	2501 FRANKLIN DR	16,525	111,270
PARK, LAFAYETTE HART	2851 NW 8th RD	408	89,229
PARK, MARKHAM	16001 W. STATE RD. 84	47,097	26,947,034
PARK, QUIET WATERS	401 S POWERLINE ROAD	28,618	8,418,406
PARK, ROOSEVELT GARDENS	ROOSEVELT GDN	5,594	233,627
PARK, SUNVIEW	1500 S.W. 42ND AVE	3,984	901,193
PARK, TRADEWINDS	3600 W SAMPLE RD	42,694	5,902,679
PARK, VISTA VIEW	4001 SW 142 AVENUE	6,249	10,364,951

A.3. Summary of Facility Improvement Measures (FIM)

Projects are recommended based on cost savings, energy reduction, project cost, simple payback period, age of existing equipment, environmental impact, and the needs of the County. The following provides a brief description of the FIMs recommended for implementation throughout various facilities. All savings calculations are provided in Section H, Appendices.

NOTE: All new work directly associated with the recommended FIMs will be in accordance with applicable codes, specifications, and standards. However, the intent is not to correct or address code, specification, or standard deficiencies inherent in existing equipment, fixtures, or installations, which are considered outside the scope of the measures.

The following are the established FIM Identification codes created for each FIM type.

LTG-I	Interior Lighting	Conversion of T5, T8 & T12 fluorescent straight lamp and U-Bend lamps to LED technology. Where applicable compact fluorescent fixture retrofit and relamps, as well as high intensity discharge (HID) fixtures, are also included as part of the conversion to LED technology. Work is specific to interior of buildings and facilities.
LTG-E	Exterior Lighting	Conversion of compact fluorescent, incandescent, and high intensity discharge (HID) fixtures to LED technology. Work is specific to the exterior of buildings and facilities, including parking lots where specified in the line-by-lines
WTR	Water	Designates the conversion of existing water consuming fixtures (primarily in restrooms) to newer technology, lower consumption fixtures; including faucets, aerators, shower heads, flush valves, urinals, and water closets
DX	Full DX Replacement	Replacement of split DX systems. Scope includes the full replacement of the condensing units and their corresponding air handlers
RTU	Full RTU Replacement	Replacement of roof-top units. Scope includes the full replacement of the unit and curb adapter
COIL-DX	DX Condenser & Coil Only Replacement	Replacement of split DX systems. Scope includes the full replacement of the condensing units and the replacement/upgrade of the coils within their corresponding air handlers. This scope applied to units over 15 tons only.
AHU	Chilled-water air handler replacement	Scope includes the replacement of chilled-water air handlers. This is specific to the capital project at East Regional Library.
CH	Chiller replacements	Scope includes the replacement of water-cooled chillers including pump motors. This scope is specific to South Regional Courthouse
TOD	HVAC Scheduling	Scope includes the introduction of time-of-day operating schedules
COMP	HVAC Compliance	Designates work to be performed to address and/or correct existing code compliance issues inherent to the scope of work being performed
BAU	Automation	Designates building automation strategies of specified equipment for improved individual operation.
OPT	Optimization	Designates building automation strategies of entire systems in order to optimize cohesive operation
SOLAR	Solar	Refers to only CB Smith Park and includes the installation of solar canopies at the water park

The following table identifies the FIMs, by ID code, currently in the scope.

Building	FIM	FIM Description
CB Smith Park	DX	Split System Replacement
CB Smith Park	COMP	Split System Code Compliance
Markham Park	LTG-I	Lighting - Interior
Markham Park	TOD	Split System Scheduling
Quietwaters Park	LTG-I	Lighting - Interior
Everglades Holiday Park	LTG-I	Lighting - Interior
Everglades Holiday Park	WTR	Water - Retrofits
Everglades Holiday Park	TOD	Split System Scheduling
Franklin Park	LTG-E	Lighting - Exterior
Franklin Park	WTR	Water - Retrofits
Franklin Park	TOD	Split System Scheduling
Delevoe Park	WTR	Water - Retrofits
Delevoe Park	DX & TOD	Split Systems (Replacement and Scheduling)
Delevoe Park	COMP	Split System Code Compliance
Roosevelt Gardens Park	WTR	Water - Retrofits
Roosevelt Gardens Park	DX & TOD	Split Systems (Replacement and Scheduling)
Sunview Park	LTG-I	Lighting - Interior
Sunview Park	LTG-E	Lighting - Exterior
Sunview Park	WTR	Water - COMBINED
Lafayette Hart Park	LTG-E	Lighting - Exterior
Main Library	LTG-I	Lighting - Interior
Main Library	OPT	Optimal chiller start
East Regional Library	LTG-I	Lighting - Interior
East Regional Library	BAU	Controls for (CO2, OA, SAT)
East Regional Library	AHU	AHU Replacement - CAPITAL PROJ
Tamarac Library	LTG-E	Lighting - Exterior
Deerfield Beach Library	LTG-I	Lighting - Interior
Deerfield Beach Library	DX & COIL-DX	Split System Replacement
Deerfield Beach Library	COMP	Split System Code Compliance

Building	FIM	FIM Description
Imperial Point Library	LTG-I	Lighting - Interior
Imperial Point Library	LTG-E	Lighting - Exterior
Imperial Point Library	RTU & TOD	RTU (Replacement and Scheduling)
Imperial Point Library	COMP	RTU Code Compliance
Tyrone Bryant Library	WTR	Water - Retrofits
Collier City Library	RTU & TOD	RTU (Replacement and Scheduling)
Lauderhill Library	LTG-E	Lighting - Exterior
Lauderhill Library	DX & COIL-DX	Split System Upgrades
Riverland Branch Library	LTG-I	Lighting - Interior
Riverland Branch Library	LTG-E	Lighting - Exterior
Riverland Branch Library	RTU & TOD	RTU (Replacement and Scheduling)
Hollywood Beach Library	LTG-I	Lighting - Interior
Pompano Beach Branch Library	LTG-I	Lighting - Interior
Pompano Beach Branch Library	LTG-E	Lighting - Exterior
BC Agricultural Extension	LTG-I	Lighting - Interior
BC Agricultural Extension	BAU	Split System OA Control / DCV
BCJC N Wing	LTG-I	Lighting - Interior
South Regional Courthouse	WTR	Water - Retrofits
South Regional Courthouse	CH & OPT	Chiller Replacement & Optimization
South Regional Courthouse	OPT	Chiller Lead/Lag Optimization
Emergency Operations Center	LTG-I	Lighting - Interior
West Regional Courthouse	OPT	Chiller Plant Optimization
BCJC State Attorney's Office (LTS)	LTG-I	Lighting - Interior
BCJC State Attorney's Office (LTS)	DX & TOD	Split Systems (Replacement and
BCJC State Attorney's Office (LTS)	COMP	Split System Code Compliance

Building	FIM	FIM Description
Edgar Mills Center	WTR	Water - Retrofits
Hunter & Hughes	LTG-I	Lighting - Interior
Hunter & Hughes	COMP	Hunter Code Compliance
Hunter & Hughes	COMP	Hughes Code Compliance
Hunter & Hughes	DX & TOD	Hunter and Hughes (Replacement and Scheduling)
NW Family Success Center	LTG-I	Lighting - Interior
NW Family Success Center	DX & RTU & TOD	HVAC work - (Replacement and Scheduling)
Northwest Health Center	LTG-I	Lighting - Interior
Northwest Health Center	LTG-E	Lighting - Exterior
Northwest Health Center	TOD	Split System Scheduling
Mid-Rise / East Parking	LTG-I	Lighting - Interior
Fleet Services #3	LTG-I	Lighting - Interior
Fleet Services #3	LTG-E	Lighting - Exterior
Fleet Services #3	DX & RTU & TOD	HVAC work - (Replacement and Scheduling)
Fleet Services #3	COMP	HVAC Code Compliance
Fleet Services #2	DX & TOD	Split System (Replacement and Scheduling)
West Regional Maintenance	LTG-I	Lighting - Interior
CB Smith Water Park	SOLAR	Solar - Canopy

The following table identifies which of the aforementioned scope resides within each facility along with the utility savings associated with each.

Building or Facility	Description	SAVINGS Electric KWh	SAVINGS Electric KW	SAVINGS Water	Total Savings
CB Smith Park	Split System Replacement	17,280	51.30	0	$ 1,592
Markham Park	Lighting - Interior	75,421	192.66	0	$ 7,532
Markham Park	Split System Scheduling	93,974	0.00	0	$ 6,579
Quietwaters Park	Lighting - Interior	14,300	51.30	0	$ 1,564
Everglades Holiday Park	Lighting - Interior	19,496	39.90	0	$ 1,730
Everglades Holiday Park	Water - Retrofits	1,934	0.00	120,888	$ 1,128
Everglades Holiday Park	Split System Scheduling	13,531	0.00	0	$ 771
Franklin Park	Lighting - Exterior	41,247	88.92	0	$ 3,704
Franklin Park	Water - Retorfits	1,752	0.00	83,311	$ 1,104
Franklin Park	Split System Scheduling	25,067	0.00	0	$ 1,429
Delevoe Park	Water - Retrofits	876	0.00	90,769	$ 1,164
Delevoe Park	Split Systems COMBINED	67,685	79.80	0	$ 4,760
Roosevelt Gardens Park	Water - Retrofits	1,499	0.00	67,135	$ 894
Roosevelt Gardens Park	Split Systems COMBINED	61,204	175.75	0	$ 5,878
Sunview Park	Lighting - Interior	15,319	55.86	0	$ 1,739
Sunview Park	Lighting - Exterior	21,826	60.42	0	$ 2,338
Sunview Park	Water - COMBINED	339	0.00	1,906,707	$ 10,209
Lafayette Hart Park	Lighting - Exterior	1,683	5.70	0	$ 195
Main Library	Lighting - Interior	498,835	1,340.64	0	$ 53,744
East Regional Library	Lighting - Interior	42,192	142.50	0	$ 4,765
East Regional Library	Controls for (CO2, OA, SAT)	56,817	0.00	0	$ 4,429
East Regional Library	AHU Replacement - CAPITAL PROJ	0	0.00	0	$ -
Tamarac Library	Lighting - Exterior	29,357	82.08	0	$ 2,990
Deerfield Beach Library	Lighting - Interior	27,940	136.80	0	$ 3,586
Deerfield Beach Library	Split System Replacement	20,150	80.75	0	$ 2,097
Imperial Point Library	Lighting - Interior	28,584	120.84	0	$ 3,482
Imperial Point Library	Lighting - Exterior	5,000	13.68	0	$ 509
Imperial Point Library	RTU COMBINED	117,163	240.35	0	$ 9,557
Tyrone Bryant Library	Water - Retrofits	1,109	0.00	75,625	$ 1,009
Collier City Library	RTU COMBINED	139,571	171.95	0	$ 10,064
Lauderhill Library	Lighting - Exterior	23,268	64.98	0	$ 2,338
Lauderhill Library	Split System Updrages	32,814	539.00	0	$ 8,072
Riverland Branch Library	Lighting - Interior	15,800	52.44	0	$ 1,763
Riverland Branch Library	Lighting - Exterior	163	0.00	0	$ 26
Riverland Branch Library	RTU COMBINED	89,500	62.70	0	$ 5,919
Hollywood Beach Library	Lighting - Interior	4,475	19.38	0	$ 501
Pompano Beach Branch Library	Lighting - Interior	4,837	18.24	0	$ 530
Pompano Beach Branch Library	Lighting - Exterior	776	2.28	0	$ 101
BC Agricultural Extension	Lighting - Interior	19,088	92.34	0	$ 2,041
BC Agricultural Extension	Split System OA Control / DCV	0	0.00	0	$ -
BCJC N Wing	Lighting - Interior	590,593	1,607.40	0	$ 61,366

Building or Facility	Description	SAVINGS Electric KWh	SAVINGS Electric KW	SAVINGS Water	Total Savings
South Regional Courthouse	Water - Retrofits	7,223	0.00	510,857	$ 6,800
South Regional Courthouse	Chiller Replacement & Optimization	141,495	0.00	0	$ 11,666
South Regional Courthouse	Chiller Lead/Lag Optimization	0	11.05	0	$ 1,742
Emergency Operations Center	Lighting - Interior	136,887	337.44	0	$ 13,845
West Regional Courthouse	Chiller Plant Optimization	93,525	0.00	0	$ 7,697
BCJC State Attourney's Office (LTS)	Lighting - Interior	22,061	63.84	0	$ 2,285
BCJC State Attourney's Office (LTS)	Split Systems COMBINED	51,784	86.45	0	$ 4,058
Edgar Mills Center	Water - Retrofits	2,649	0.00	45,087	$ 696
Hunter & Hughes	Lighting - Interior	206,316	440.04	0	$ 18,562
Hunter & Hughes	Hunter and Hughes COMBINED	427,631	748.60	0	$ 32,337
NW Family Success Center	Lighting - Interior	23,910	96.90	0	$ 2,759
NW Family Success Center	HVAC work - COMBINE	153,098	75.33	0	$ 9,370
Northwest Health Center	Lighting - Interior	7,030	61.56	0	$ 1,153
Northwest Health Center	Lighting - Exterior	1,986	5.70	0	$ 206
Northwest Health Center	Split System Scheduling	14,827	0.00	0	$ 826
Mid-Rise / East Parking	Lighting - Interior	396,933	567.72	0	$ 31,904
Fleet Services #3	Lighting - Interior	54,590	229.14	0	$ 6,435
Fleet Services #3	Lighting - Exterior	31,009	86.64	0	$ 2,947
Fleet Services #3	HVAC work - COMBINED	55,423	30.40	0	$ 3,558
Fleet Services #2	Split System COMBINED	83,347	128.48	0	$ 6,833
West Regional Maintenance	Lighting - Interior	1,845	7.98	0	$ 208
TOTALS		**4,136,030**	**8,567.23**	**2,900,378**	**$399,084**

A.4. Project Savings

The following table summarizes the total savings, costs, and project paybacks associated with the implementation of the recommended FIMs, on a per building basis. As requested, the costs associated with development fees, performance assurance services, and any costs associated with correcting code compliance issues directly impacted by a given FIM, are shown separately below the table. This includes how each of these costs affects the overall project.

BROWARD COUNTY PROJECT SUMMARY BY FACILITY

Building or Facility	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
CB Smith Park Total	$ 1,013	$ 580	$ -	$ -	$ 1,592	$ 35,208	22.1
Markham Park Total	$ 12,949	$ -	$ -	$ 1,162	$ 14,111	$ 107,755	7.6
Quietwaters Park Total	$ 1,348	$ -	$ -	$ 216	$ 1,564	$ 13,996	8.9
Everglades Holiday Park Total	$ 2,461	$ -	$ 923.58	$ 245	$ 3,630	$ 32,638	9.0
Franklin Park Total	$ 3,880	$ 1,006	$ 949.75	$ 402	$ 6,237	$ 86,279	13.8
Delevoe Park Total	$ 3,927	$ 899	$1,034.77	$ 62	$ 5,923	$ 114,732	19.4
Roosevelt Gardens Park Total	$ 4,076	$ 1,886	$ 765.33	$ 45	$ 6,771	$ 78,935	11.7
Sunview Park Total	$ 3,748	$ -	$9,442.08	$ 1,096	$ 14,287	$ 109,072	7.6
Lafayette Hart Park Total	$ 166	$ -	$ -	$ 29	$ 195	$ 4,949	25.3
Main Library Total	$ 45,730	$ -	$ -	$ 8,014	$ 53,744	$ 527,342	9.8
East Regional Library Total	$ 6,880	$ 1,631	$ -	$ 682	$ 9,193	$ 276,077	30.0
Tamarac Library Total	$ 1,705	$ 939	$ -	$ 346	$ 2,990	$ 35,482	11.9
Deerfield Beach Library Total	$ 2,791	$ 2,488	$ -	$ 404	$ 5,682	$ 180,803	31.8
Imperial Point Library Total	$ 8,757	$ 4,295	$ -	$ 497	$ 13,549	$ 233,185	17.2
Tyrone Bryant Library Total	$ 64	$ -	$ 862.12	$ 83	$ 1,009	$ 10,783	10.7
Collier City Library Total	$ 8,097	$ 1,967	$ -	$ -	$ 10,064	$ 102,720	10.2
Lauderhill Library Total	$ 3,253	$ 6,912	$ -	$ 245	$ 10,410	$ 138,144	13.3
Riverland Branch Library Total	$ 6,127	$ 1,330	$ -	$ 250	$ 7,707	$ 104,255	13.5
Hollywood Beach Library Total	$ 451	$ -	$ -	$ 50	$ 501	$ 4,841	9.7
Pompano Beach Branch Library Total	$ 548	$ -	$ -	$ 83	$ 631	$ 6,369	10.1
BC Agricultural Extension Total	$ 1,824	$ -	$ -	$ 217	$ 2,041	$ 24,527	12.0
BCJC N Wing Total	$ 47,553	$ -	$ -	$ 13,813	$ 61,366	$ 685,400	11.2
South Regional Courthouse Total	$ 12,234	$ 1,742	$5,823.77	$ 408	$ 20,208	$ 503,192	24.9
Emergency Operations Center Total	$ 11,923	$ -	$ -	$ 1,922	$ 13,845	$ 143,958	10.4
West Regional Courthouse Total	$ 7,697	$ -	$ -	$ -	$ 7,697	$ 23,592	3.1
BCJC State Attourney's Office (LTS) Total	$ 4,403	$ 1,691	$ -	$ 250	$ 6,343	$ 127,211	20.1
Edgar Mills Center Total	$ 151	$ -	$ 513.99	$ 31	$ 696	$ 5,690	8.2
Hunter & Hughes Total	$ 35,238	$ 13,612	$ -	$ 2,049	$ 50,899	$ 553,750	10.9
NW Family Success Center Total	$ 9,839	$ 1,970	$ -	$ 319	$ 12,129	$ 212,920	17.6
Northwest Health Center Total	$ 1,327	$ 763	$ -	$ 94	$ 2,184	$ 18,868	8.6
Mid-Rise / East Parking Total	$ 23,464	$ -	$ -	$ 8,440	$ 31,904	$ 197,693	6.2
Fleet Services #3 Total	$ 8,180	$ 3,952	$ -	$ 807	$ 12,939	$ 159,512	12.3
Fleet Services #2 Total	$ 5,422	$ 1,412	$ -	$ -	$ 6,833	$ 57,644	8.4
West Regional Maintenance Total	$ 186	$ -	$ -	$ 22	$ 208	$ 1,947	9.4
TOTALS	**$ 287,412**	**$ 49,073**	**$ 20,315**	**$ 42,283**	**$399,084**	**$ 4,919,472**	**12.3**

BROWARD COUNTY PROJECT – WITH DEVELOPMENT COSTS

Building or Facility	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
CB Smith Park						$ 7,823	
Markham Park						$ 5,652	
Quietwaters Park						$ 1,152	
Everglades Holiday Park						$ 1,152	
Franklin Park						$ 1,983	
Delevoe Park						$ 1,152	
Roosevelt Gardens Park						$ 671	
Sunview Park						$ 478	
Lafayette Hart Park						$ 49	
Main Library						$ 18,936	
East Regional Library						$ 5,660	
Tamarac Library						$ 5,100	
Deerfield Beach Library						$ 2,570	
Imperial Point Library						$ 2,465	
Tyrone Bryant Library						$ 1,743	
Collier City Library						$ 1,700	
Lauderhill Library						$ 1,700	
Riverland Branch Library						$ 1,700	
Hollywood Beach Library						$ 425	
Pompano Beach Branch Library						$ 340	
BC Agricultural Extension						$ 2,753	
BCJC N Wing						$ 41,777	
South Regional Courthouse						$ 12,352	
Emergency Operations Center						$ 7,140	
West Regional Courthouse						$ 11,050	
BCJC State Attourney's Office (LTS)						$ 1,360	
Edgar Mills Center						$ 9,907	
Hunter & Hughes						$ 7,554	
NW Family Success Center						$ 2,426	
Northwest Health Center						$ 836	
Mid-Rise / East Parking						$ 10,073	
Fleet Services #3						$ 5,450	
Fleet Services #2						$ 2,258	
West Regional Maintenance						$ 425	
Tradewinds Park						$ 5,123	
Vista View Park						$ 750	
Miramar Library						$ 11,900	
Hollywood Library						$ 7,854	
Galt Ocean Library						$ 417	
Highway & Bridge						$ 1,942	
South Regional Health Center						$ 6,500	
State Attorney & Clerks Warehouse						$ 4,540	
Mass TRANS						$ 3,983	
BG Governement Center						$ 60,311	
TOTALS						**$ 281,129**	
Total with Breakage Fee Added	**$ 287,412**	**$ 49,073**	**$ 20,315**	**$ 42,283**	**$399,084**	**$ 5,200,600**	**13.0**

BROWARD COUNTY PROJECT – WITH CODE COMPLIANCE/CAPITAL COSTS

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
CB Smith Park	Split System Code Compiance	$ -	$ -	$ -	$ -	$ -	$ 7,874	-
Delevoe Park	Split System Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 12,891	-
Deerfield Beach Library	Split System Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 12,145	-
Imperial Point Library	RTU Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 5,715	-
BCJC State Attourney's Office (LTS)	Split System Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 3,762	-
Hunter & Hughes	Hunter Code Compliace	$ -	$ -	$ -	$ -	$ -	$ 38,853	-
Hunter & Hughes	Hughes Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 14,324	-
Fleet Services #3	HVAC Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 4,734	-
TOTALS							**$ 100,298**	
Total with Code Compliance Added		**$ 287,412**	**$ 49,073**	**$ 20,315**	**$ 42,283**	**$399,084**	**$ 5,300,898**	**13.3**

BROWARD COUNTY PROJECT – WITH MEASURMENT AND VERIFICATION COST

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
CB Smith Park	PA Cost						$ 450	
Markham Park	PA Cost						$ 1,128	
Quietwaters Park	PA Cost						$ 147	
Everglades Holiday Park	PA Cost						$ 342	
Franklin Park	PA Cost						$ 735	
Delevoe Park	PA Cost						$ 1,334	
Roosevelt Gardens Park	PA Cost						$ 825	
Sunview Park	PA Cost						$ 1,064	
Lafayette Hart Park	PA Cost						$ 15	
Main Library	PA Cost						$ 1,147	
East Regional Library	PA Cost						$ 2,890	
Tamarac Library	PA Cost						$ 371	
Deerfield Beach Library	PA Cost						$ 2,016	
Imperial Point Library	PA Cost						$ 2,496	
Tyrone Bryant Library	PA Cost						$ 113	
Collier City Library	PA Cost						$ 1,075	
Lauderhill Library	PA Cost						$ 1,446	
Riverland Branch Library	PA Cost						$ 1,089	
Hollywood Beach Library	PA Cost						$ 51	
Pompano Beach Branch Library	PA Cost						$ 67	
BC Agricultural Extension	PA Cost						$ 257	
BCJC N Wing	PA Cost						$ 817	
South Regional Courthouse	PA Cost						$ 4,908	
Emergency Operations Center	PA Cost						$ 422	
West Regional Courthouse	PA Cost						$ 247	
BCJC State Attourney's Office (LTS)	PA Cost						$ 1,368	
Edgar Mills Center	PA Cost						$ 1,036	
Hunter & Hughes	PA Cost						$ 6,343	
NW Family Success Center	PA Cost						$ 2,225	
Northwest Health Center	PA Cost						$ 197	
Mid-Rise / East Parking	PA Cost						$ 2,070	
Fleet Services #3	PA Cost						$ 1,719	
Fleet Services #2	PA Cost						$ 604	
West Regional Maintenance	PA Cost						$ 20	
TOTALS							**$ 41,034**	
Total with PA Costs Added		**$ 287,412**	**$ 49,073**	**$ 20,315**	**$ 42,283**	**$399,084**	**$ 5,341,931**	**13.4**

BROWARD COUNTY PROJECT – INCLUDING SOLAR OPPORTUNITIES*

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
CB Smith Water Park Solar	Solar - Canopy	$ -	$ -	$ -	$ -	$ 54,045	$ 2,434,346	
CB Smith Water Park Solar PA Cost							$ 9,727	
Total							**$ 2,444,073**	
Total with Solar Added		**$ 287,412**	**$ 49,073**	**$ 20,315**	**$ 42,283**	**$399,084**	**$ 7,786,005**	**19.5**

B. Utility Data Analysis

B. Utility Data Analysis - Methodology

This section explains the methodology used to acquire, organize, and analyze utility data made available for each facility listed within the Siemens scope.

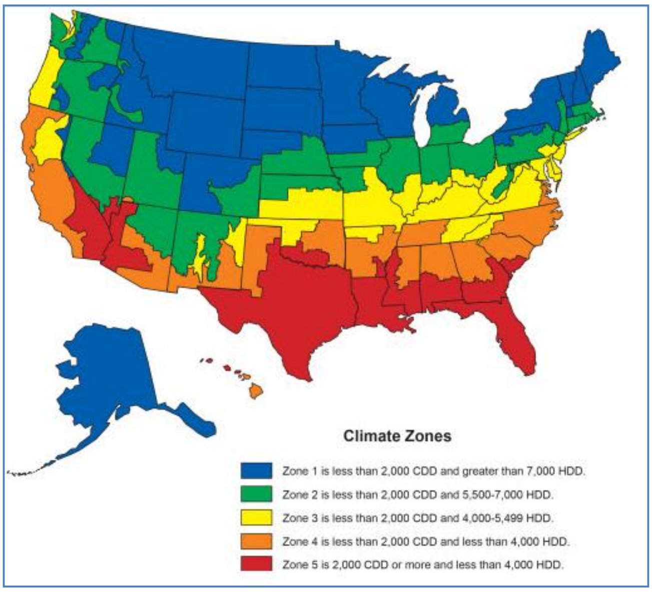
B.1. Electric Utility

Broward County provided Siemens with online access to their Florida Power and Light (FPL) accounts, from which, Siemens was able to download (where available) electrical consumption data, demand data and energy costs for the previous 24 months (July 2015 to June 2017). This data was compiled into spreadsheet tables where each month's bill was recreated using the most recent electric rate structure tariffs. Tariffs were obtained from the available copy of the June 2017 bill, online. Additional tariff information was obtained from FPL's Index of Rate Schedules, updated March 1, 2017.

The data compiled was then used to create baseline profiles from the 24 month billing and usage data. Both the profile graphs and resulting tables are presented later in this report. The baseline values were converted into metric values and analyzed using the Commercial Buildings Energy Consumption Survey (CBECs) data of comparable buildings within the same geographical location.

This summary section presents the results of the above analysis. The in-depth results are provided in the per-building audit section of this report.

BENCHMARKING ANALYSIS:



The energy and water billing data acquired included electrical consumption and demand, and energy costs over 24 months spanning from July 2015 to June 2017. The data was compiled and organized in order to understand the energy, energy costs, and metrics to compare their current performance.

Square footages were provided to Siemens and are understood to be the gross area of each facility, including mechanical, storage, back-of-house and support spaces, but do not include any internal or external parking.

From the electrical energy consumption and the total area, and Electrical Consumption Index (ECI) was created, with the units of kWh/sf/year. This metric can be used to establish an understanding of building performance compared to national databases, such as the Commercial Buildings Energy Consumption Survey (CBECs).

A summary of the electric energy intensity indices relevant to the Broward County is shown in the table below, taken from Table C20 of the May 2012 CBECS data (www.eia.gov); released December 2016. The table shows the Electricity Consumption (kWh) Intensities by End Use for Non-Mall Buildings in Zone 5, also illustrated in red in map above.

CBECS - 2012 kWh/Sq Ft Data			
Faclity Type	25th percentile	Median	75th percentile
Outpatient	6.3	12.8	19
Health care	7	13.1	19.2
Library	10.7	14.3	15.6
Courthouse or probation office	13.2	15.9	19.2
Courthouse	13.2	15.9	19.2
Office - Mixed Use	4.5	8.6	13.4
Office - Government	7.9	11.9	17.1
Warehouse Nonrefrigerated	1.6	3.7	7.3
Vehicle service or repair	4.5	7.5	11.7
Recreation	3.7	7.3	17.6

The following table summarizes the resulting Electrical Consumption Indices.

BENCHMARKING ANALYSIS PER FACILITY

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data 25th percentile	Median	75th percentile
HELATH & LAB					
Edgar Mills	Outpatient	20.06	6.3	12.8	19
Family Success Center	Health care	18.85	7	13.1	19.2
Northwest Health Center	Outpatient	22.52	6.3	12.8	19
hunter & hughes bldg	Health care	-	7	13.1	19.2
south regional health center	Outpatient	-	6.3	12.8	19
LIBRARIES					
Collier City Library	Library	65.98	10.7	14.3	15.6
Deerfield Beach Library	Library	18.64	10.7	14.3	15.6
East Regional Library	Library	19.28	10.7	14.3	15.6
Galt Ocean Library	Library	29.38	10.7	14.3	15.6
Hollywood Beach Library	Library	23.78	10.7	14.3	15.6
Holllywood Library	Library	15.79	10.7	14.3	15.6
Imperial Point Library	Library	21.72	10.7	14.3	15.6
Lauderhill Library	Library	26.02	10.7	14.3	15.6
Miramar Library	Library	12.98	10.7	14.3	15.6
Riverland Branch Library	Library	18.09	10.7	14.3	15.6
Tamarac Library	Library	17.89	10.7	14.3	15.6
Tyrone Bryant Library	Library	20.79	10.7	14.3	15.6
Young at Art Library	Library	17.41	10.7	14.3	15.6
Main Library	Library	15.53	10.7	14.3	15.6
Beach Branch Library	Library	-	10.7	14.3	15.6
OFFICE & COURT HOUSES					
South Regional Courthouse	Courthouse or probation office	16.71	13.2	15.9	19.2
West Regional Courthouse	Courthouse	21.26	13.2	15.9	19.2
BG Agricultural Extension	Office - Mixed Use	7.79	4.5	8.6	13.4
BCJC States Attorney Office (LT	Office - Government	12.78	7.9	11.9	17.1
Emergency Ops Center	Office - Government	43.61	7.9	11.9	17.1
HIGH and BRDG Administration	Office - Government	25.97	7.9	11.9	17.1
BCJC N Wing	Courthouse	52.66	13.2	15.9	19.2
PARKING, WAREHOUSE AND REPAIR					
State Attorney-Clerks Warehouse	Warehouse Nonrefrigerated	9.37	1.6	3.7	7.3
Fleet Services #2 - SR84	Vehicle service or repair	20.33	4.5	7.5	11.7
Fleet Services #3	Vehicle service or repair	6.47	4.5	7.5	11.7
MASS TRAN Downtown Terminal		7.40			
West Regional Maintenance Cente	Vehicle service or repair	26.40	4.5	7.5	11.7
Mid-Rise / East Parking		25.81			

BENCHMARKING ANALYSIS PER FACILITY - CONTINUED

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
PARKS					
CB Smith Park	Recreation	44.36	3.7	7.3	17.6
Delevoe Park	Recreation	25.58	3.7	7.3	17.6
Everglades Holiday Park	Recreation	20.22	3.7	7.3	17.6
Franklin Park	Recreation	8.81	3.7	7.3	17.6
Lafayette Hart Park	Recreation	16.79	3.7	7.3	17.6
Markham	Recreation	20.60	3.7	7.3	17.6
Quiet Waters	Recreation	20.77	3.7	7.3	17.6
Roosevelt Gardens Park	Recreation	28.28	3.7	7.3	17.6
Sunview Park	Recreation	33.84	3.7	7.3	17.6
Trade Winds	Recreation	17.17	3.7	7.3	17.6
Vista View	Recreation	16.09	3.7	7.3	17.6

Buildings with the greatest opportunity for energy savings are identified in the table (operating at or above the 75th percentile of comparable buildings). Each case was assessed considering specific buildings and/or uses within each facility that may skew the results or provide exceptions that do not make it as comparable as CBECs intends. For instance, Markham park has CB Smith park has multiple facilities not normally present in Recreation areas, such as a water park.

ELECTRIC RATE STRUCTURES AND TARIFFS:

The following is a general description of all the FPL electric rates structures currently used by each facility as well as the tariffs used in determining electric utility savings.

GS-1: Is applied to electric services required for commercial or industrial lighting, power and any other purpose with a demand of 20 kW or less. The following facilities are billed under this rate:

- Galt Ocean Library
- Hollywood Beach Library
- South Regional Courthouse Garage
- West Regional Maintenance Center
- CB Smith Park; Meters labeled: Restroom and Tram
- Delevoe Park
- Everglades Holiday Park
- Lafayette Hart Park
- Markham Park; Meters labeled: Corp Pavilion, Restroom, Arena Lights, Shoot House, Dog Park, Maintenance Building, Core IS-RR, Air field, Guard House, Comfort Station, Comfort Station 2, and North Pump Core
- Quiet Waters Park; Meters labeled: Park 3, Park, Pavilion, and #2
- Sunview Park Meters labeled: Restroom, Basketball Lights, F2, F4, and Trail
- Trade Winds Park; Meters labeled: Restroom 2, South Corp Pavilion, Stables, Boat Restroom, Park, Gen Str, Maintenance, Barn, Picnic, Booth 1, Youth Camp, and Restroom ABC
- Vista View Park; Meters labeled: Trailer and Lift

The following are the electric rates based off their June 2017 bill obtained from the FPL website; rates include taxes.

Rate Structure	June - Sept		Year-Round		$ / kWh	$ / kW
	on peak	off peak	on peak	off peak		
GS-1	-	-	-	-	$ 0.09757	-

GSD-1: Is applied to electric service required for commercial or industrial lighting, power and any other purpose with a measured Demand in excess of 20 kW and less than 500 kW. Customers with a Demand of 20 kW or less may enter an agreement for service under this schedule based on a Demand Charge for a minimum of 21 kW. The following facilities are billed under this rate:

- Edgar Mills
- Family Success Center
- Northwest Health Center
- Hunter & Hughes Building
- South Regional Health Center
- Collier City Library
- Deerfield Beach Library
- East Regional Library
- Hollywood Library
- Imperial Point Library
- Lauderhill Library
- Riverland Branch Library
- Tamarac Library
- Tyrone Bryant Library
- BCJC States Attorney Office (LTS)
- State Attorney-Clerks Warehouse
- Fleet Services #3
- CB Smith Park Maintenance Building
- Everglades Holiday Park Trailer
- Franklin Park
- Markham Park; Meters labeled: E, ABC, Admin Office, South Pump Core, and Food Stand
- Quiet Waters Park; Meters labeled: Pool and Campsite
- Trade Winds Park; Meters labeled: North Maintenance, and Lights S2
- Vista View Maintenance Building

The following electric rates are from the June 2017 bill obtained from the FPL website; rates include taxes.

Rate Structure	June - Sept		Year-Round		$ / kWh	$ / kW
	on peak	off peak	on peak	off peak		
GSD-1	-	-	-	-	$ 0.05810	$ 11.47

<u>GSTD-1:</u> Is applied to electric services required for commercial or industrial lighting, power and any other purpose with a measured Demand in excess of 20 kW and less than 500 kW. Customers with Demands of less than 21 kW may enter an agreement for service under this schedule based on a Demand Charge for a minimum of 21 kW. This is an optional rate available to General Service Demand customers upon request subject to availability of meters. The following facilities are billed under this rate:

- Emergency Ops Center
- CB Smith Park Water Slide

The following electric rates are from the June 2017 bill obtained from the FPL website; rates include taxes.

Rate Structure	June - Sept		Year-Round		$ / kWh	$ / kW
	on peak	off peak	on peak	off peak		
GSTD-1	-	-	$0.08275	$0.04458	-	$ 11.25

<u>GSLDT-1:</u> Is applied to electric services required for commercial or industrial lighting, power and any other purpose to any Customer with a measured demand of 500 kW and less than 2,000 kW. Customers with demands of less than 500 kW may enter an agreement for service under this schedule based on a Demand Charge for a minimum of 500 kW. This is an optional rate available to General Service Large Demand customers upon request subject to availability of meters. The following facilities are billed under this rate:

- Main Library

The following electric rates are from the June 2017 bill obtained from the FPL website; rates include taxes.

Rate Structure	June - Sept		Year-Round		$ / kWh	$ / kW
	on peak	off peak	on peak	off peak		
GSLDT-1	-	-	$0.06661	$0.04525	-	$ 13.36

SDTR-1A/B: Is applied to electric services required for commercial or industrial lighting, power and any other purpose with a measured Demand in excess of 20 kW. This is an optional rate available to customers otherwise served under the GSD-1 GSDT-1, GSLD-1, GSLDT-1, GSLD-2 or GSLDT-2 Rate Schedules. The following facilities are billed under this rate:

- Miramar Library
- Young at Art Library
- South Regional Courthouse
- West Regional Courthouse
- BG Agricultural Extension
- HIGH and BRDG Administration
- State Attorney-Clerks Warehouse
- Fleet Services #2 - SR84
- MASS TRAN Downtown Terminal
- CB Smith Park; Meters labeled: New RV, Parking Garage, and Park
- Delevoe Park
- Markham Park
- Quiet Waters Park
- Roosevelt Gardens Park
- Sunview Park Pump
- Trade Winds Park; Meters labeled: Softball, Soccer, Irrigation, and Booth 2

The following electric rates are from the June 2017 bill obtained from the FPL website; rates include taxes.

Rate Structure	June - Sept		Year-Round		$ / kWh	$ / kW
	on peak	off peak	on peak	off peak		
SDTR-1A	$ 0.12898	$ 0.04070	-	-	$ 0.05630	$ 10.95

CILC-1G: Available to any commercial or industrial customer to which the load control provisions of this schedule can feasibly be applied who, as of March 19, 1996, was either taking service pursuant to this schedule or had a fully executed copy of a Commercial/Industrial Load Control Agreement with FPL.

It is applied to electric service provided to any commercial or industrial customer as a part of the Commercial/Industrial Load Control Program Agreement between the Customer and the Company, who agrees to allow the Company to control at least 200 kw of the Customer's load, or agrees to operate Backup Generation Equipment (see Definitions) and designate (if applicable) additional controllable demand to serve at least 200 kw of the Customer's own load during periods when the Company is controlling load. A Customer shall enter into a "Commercial/Industrial Load Control Program Agreement" with the Company for service under this schedule. To establish the initial qualification for service under this schedule, the Customer must have had an On-Peak Demand (as defined below) during the summer rating period (April through October) for at least three of the previous twelve (12) months of at least 200 kw greater than the Firm Demand or Controllable Demand (as applicable) level specified in Section 4 of the Commercial/Industrial Load Control Program Agreement. This controlled load shall not be served on a firm service basis until service has been terminated under this rate schedule. The following facilities are billed under this rate:

- BCJC N Wing
- Mid-Rise / East Parking

The following electric rates are from the June 2017 bill obtained from the FPL website; rates include taxes.

Rate Structure	June - Sept		Year-Round		$ / kWh	$ / kW
	on peak	off peak	on peak	off peak		
CILC-1D	-	-	$0.04809	$0.04224	-	$ 13.04

OS-2: This is a transitional rate available to municipal, county and school board accounts for the operation of a football, baseball or other playground, or civic or community auditorium, when all such service is taken at the available primary distribution voltage at a single point of delivery and measured through one meter, and who were active as of October 4, 1981. Customer may also elect to receive service from other appropriate rate schedules. The following facilities are billed under this rate:

- Sunview Park

The following electric rates are from the June 2017 bill obtained from the FPL website; rates include taxes.

Rate Structure	June - Sept		Year-Round		$ / kWh	$ / kW
	on peak	off peak	on peak	off peak		
OS-2 Sports Field	-	-	-	-	$ 0.13107	-

BASELINE VALUES PER BUILDING SECTION

The following tables summarize the baseline values of demand (kW) and consumption (kWh) for each building.

Facility	# of Meters	Rate Structure	Average Consumption	Average Demand	Max Demand
HELATH & LAB					
Edgar Mills	2	GSD-1	1,168,860	2,959	274
Family Success Center	1	GSD-1	268,980	723	72
Northwest Health Center	1	GSD-1	110,789	260	37
hunter & hughes bldg					
south regional health center					
LIBRARIES					
Collier City Library	1	GSD-1	659,820	1,922	198
Deerfield Beach Library	2	GSD-1	281,778	1,283	113
East Regional Library	1	GSD-1	642,060	1,393	139
Galt Ocean Library	2	GS-1	71,969	-	-
Hollywood Beach Library	1	GS-1	59,458	-	-
Holllywood Library	2	GSD-1	729,334	2,704	263
Imperial Point Library	1	GSD-1	314,940	879	89
Lauderhill Library	1	GSD-1	260,182	13,333	90
Miramar Library	1	SDTR-1A	908,820	2,451	286
Riverland Branch Library	1	GSD-1	180,913	518	59
Tamarac Library	1	GSD-1	536,580	1,702	191
Tyrone Bryant Library	1	GSD-1	213,120	712	78
Young at Art Library	1	SDTR-1A	1,095,660	3,044	289
Main Library	1	GSLDT-1	4,363,400	8,354	843
Beach Branch Library	?				
OFFICE & COURT HOUSES					
South Regional Courthouse	Garage	GS-1	37,210	-	-
	Bldg	SDTR-1A	1,177,020	2,722	276
West Regional Courthouse	1	SDTR-1A	1,381,680	3,179	307
BG Agricultural Extension	1	SDTR-1A	126,180	394	42
BCJC States Attorney Office (LTS)	1	GSD	102,240	313	35
Emergency Ops Center	1	GSTD-1	1,831,740	3,164	317
HIGH and BRDG Administration	1	SDTR-1A	296,700	713	75
BCJC N Wing	1	CILC-1D	12,939,960	27,906	2619
PARKING, WAREHOUSE AND REPAIR					
State Attorney-Clerks Warehouse		GSD-1	156,060	446	44
		SDTR-1A	127,470	377	40
Fleet Services #2 - SR84	1	SDTR-1A	269,940	817	74
Fleet Services #3	1	GSD-1	207,330	810	79
MASS TRAN Downtown Terminal	1	SDTR-1A	196,480	383	42
West Regional Maintenance Cente	1	GS-1	66,000	-	-
Mid-Rise / East Parking	1	CILC-1G	1,733,400	3,440	328

Facility	# of Meters	Rate Structure	Average Consumption	Average Demand	Max Demand
PARKS					
CB Smith Park	Maint Bldg	GSD	214,230	1,159	101
	New RV	SDTR-1A	111,330	409	65
	Parking Garage	SDTR-1A	834,030	1,591	170
	Park	SDTR-1A	562,650	1,437	164
	Water Slide	GSTD-1	1,106,160	3,174	413
	Restroom	GS-1	36,960	-	-
	Tram	GS-1	26,598	-	-
Delevoe Park		GS-1	44,695	-	-
		SDTR-1A	200,666	447	45
Everglades Holiday Park	Trailor	GSD-1	301,507	651	61
		GS-1	9,085	-	-
	Park	GS-1	13,209	-	-
	Park 2	GS-1	19,972	-	-
Franklin Park	1	GSD-1	145,604	444	47
Lafayette Hart Park	1	GS-1	6,850	-	-
Markham	Corp Pavilion	GS-1	4,837	-	-
	E	GSD-1	49,572	210	26
	ABC	GSD-1	192,600	633	71
	Restroom	GS-1	2,362	-	-
	Arena Lights	GS-1	307	-	-
	Shoot House	GS-1	759	-	-
	Dog Park	GS-1	3,502	-	-
	Maint Bldg	GS-1	47,901	-	-
	Admin Office	GSD-1	87,872	233	22
	Core IS-RR	GS-1	2,790	-	-
		GS-1	24,104	-	-
	Air field	GS-1	3,900	-	-
		GS-1	959	-	-
		SDTR-1A	3,762	365	33
		SDTR-1A	118,080	674	78
		GSD-1	71,830	244	30
		GSD-1	59,804	251	29
		GS-1	14,698	-	-
		GSD-1	57,707	225	27
	Guard House	GS-1	5,912	-	-
	Comfort Station	GS-1	19,546	-	-
	Comfort Station 2	GS-1	15,279	-	-
	South Pump Core	GSD-1	33,427	60	28
	Food Stand	GSD-1	140,640	235	26
	North Pump Core	GS-1	7,882	-	-
Quiet Waters	Park 3	GS-1	2,582	-	-
	Park	GS-1	511	-	-
	Pavilion	GS-1	16,262	-	-
	#2	GS-1	3,662	-	-
	Pool	GSD-1	128,202	405	44
	Campsite	GSD-1	26,799	132	57
	Park	SDTR-1A	72,152	269	84
	Park	SDTR-1A	85,140	490	57
	Park	SDTR-1A	259,170	599	58
Roosevelt Gardens Park		SDTR-1A	158,190	400	41

Facility	# of Meters	Rate Structure	Average Consumption	Average Demand	Max Demand
PARKS - Continued					
Sunview Park	Restroom	GS-1	3,093	-	-
	Basketball Lights	GS-1	15,723	-	-
		OS-2 Sports Field	8,680	-	-
	F2	GS-1	2,179	-	-
	F4	GS-1	3,962	-	-
		OS-2 Sports Field	56,324	-	-
	Trail	GS-1	44,499	-	-
	Pump	SDTR-1B	362	32	26
Trade Winds	Restroom 2	GS-1	2,717	-	-
	South Corp Pavilion	GS-1	4,335	-	-
	Stables	GS-1	60,976	-	-
	North Maintenance	GSD-1	95,701	-	-
	Boat Restroom	GS-1	21,429	-	-
	Softball	SDTR-1A	120,794	2,624	351
	Soccer	SDTR-1A	99,789	1,147	156
	Pump	GS-1	7	-	-
	Trail Restrooms	GS-1	14,867	-	-
	North Maintenance	GSD-1	95,701	-	-
	Lights S2	GSD-1	9,058	98	34
	Park	GS-1	4,678	-	-
	Gen Str	GS-1	21,550	-	-
	Maintenance	GS-1	2,569	-	-
		GS-1	19,096	-	-
	Barn	GS-1	25,590	-	-
	Picnic	GS-1	5,534	-	-
	Booth 1	GS-1	14,444	-	-
	Youth Camp	GS-1	12,298	-	-
	Irrigation	SDTR-1A	71,113	491	75
	Restroom ABC	GS-1	5,080	-	-
	Booth 2	SDTR-1A	25,856	209	75
Vista View	Trailor	GS-1	6,146	-	-
	Lift	GS-1	20,261	-	-
	Maintenance	GSD-1	74,136	94	21

B.2. Water Utility

This section will be used to summarize and explain the methodology that was used to collect, organize, and analyze water consumption data that was made available for each of the facilities that has water consumption data.

Consumption data was not available at the start of this investment grade audit therefore Broward County instructed Siemens to use a blanket rate of $5.00 per thousand gallons for domestic water usage and $5.00 per thousand gallons for sewer water. To supplement these rates, the County later provided a spreadsheet that had water billing data for a multitude of accounts throughout the county. The spreadsheet contained data on the facility that the account belongs to, billing address, account numbers, meter numbers, account type, meter size, notes, water consumption data (in thousands of gallons or in cubic feet.), and expense amounts. The spreadsheet contains data from June 2017 back to October of 2012. It is important to note that the spreadsheet did not contain complete data for a facility's billing address, account numbers, meter numbers, account type, meter size, notes, water consumption data, and expense amounts. The missing data had no detectable pattern; some accounts had complete data sets while other accounts were missing data sporadically. The data that was received was for accounts that were in Siemens scope of work and accounts that were not in Siemens scope of work. Not every single facility that was in Siemens scope of work was reflected in the data that was contained in the spreadsheet that was provided by the County.

The consumption data from the County was compiled, organized, analyzed, and summarized in the table below for the facilities that were available. Only the most recent and most complete 24 months of data were used for this analysis. Because of the incomplete data, an average monthly consumption was determined by adding up the available data points and dividing by the number of data points available. The same process was used for determining the average monthly consumption and sewer charge.

This summary section presents the results of the above analysis. The in-depth results are provided in the per-building audit section of this report.

WATER CONSUMPTION AND ANALYSIS SUMMARY TABLE

The following tables contain the summary of the data collected for the facilities within Siemens' scope of work. The facilities are divided up by facility type.

Facility	Account	Rate	Meter Size	Meter #	Meter Type	Average Consumption kgal (Monthly)	Average Consumption CF (Monthly)	Average Cost (Monthly)	$/kgal	$/CF
HELATH & LAB										
Edgar Mills	2065645		1"	200801357-M	W/S			$ 58.39		
	2065646		2"	200803313-M	W/S			$ 529.78		
	2065647				FLS			$ 335.84		
	2026198		2"	200900908	W/S			$ 1,560.66		
Family Success Center	7742-64114			N60080149	W/S			$ 310.79		
Northwest Health Center										
Hunter & Hughes bldg										
South Regional Health Center										

Facility	Account	Rate	Meter Size	Meter #	Meter Type	Average Consumption kgal (Monthly)	Average Consumption CF (Monthly)	Average Cost (Monthly)	$/kgal	$/CF
LIBRARIES										
Collier City Library										
Deerfield Beach Library	30540-54965					9		$ 171.89	$ 19.99	
	30550-54985					18		$ 572.19	$ 31.79	
East Regional Library										
Galt Ocean Library	2002504			200008427				$ 96.46		
	2002505			200213367				$ 99.72		
Hollywood Beach Library										
Holllywood Library	309625-243446						8983	$ 1,162.84		$ 0.13
	110269-210918			WA 60181877			825	$ 182.04		$ 0.22
Imperial Point Library	2053854			200113349				$ 429.21		
Lauderhill Library	5050680-0		2"	60872754		3		$ 645.05	$ 215.02	
Miramar Library	40262001-01							$ 2,928.42		
	40440448-00							$ 497.62		
	40262001							$ 1,535.87		
	40440448							$ 1,006.88		
Riverland Branch Library	2041452			201000204				$ 28.36		
	2041453			200213997				$ 174.47		
Tamarac Library	58199-10009868			WT 60340741 04		25		$ 506.73	$ 19.92	
Tyrone Bryant Library	2028503			200701699				$ 625.21		
Young at Art Library	427311-207648			60723804&90879373			36	$ 2,737.04		$ 76.38
Main Library	2015412		4"	114751700-M	W/S/ST/FL-CT	349		$ 4,675.78	$ 13.39	
	2015157		2"	201001004-M	IRR	119		$ 875.29	$ 7.34	
Beach Branch Library										
Pompano Beach Library	16219-4336		2"							

Facility	Account	Rate	Meter Size	Meter #	Meter Type	Average Consumption kgal (Monthly)	Average Consumption CF (Monthly)	Average Cost (Monthly)	$/kgal	$/CF
OFFICE & COURT HOUSES										
South Regional Courthouse	170467-145110			60691695	IRR			$ 79.69		
	170469-220170			70123919	W/S/ST	15817		$ 2,303.90	$ 6.87	
West Regional Courthouse	23317-06			06552272	W/S			$ 168.52		
	82367-03			08362954	W/S			$ 432.41		
	82367-03			08362954	W/S			$ 432.41		
	36144-09			08364099	W/S			$ 78.57		
	76372-01			08089931	W/S			$ 280.01		
	79308-04			08362961	IRR			$ 539.49		
BG Agricultural Extension										
BCJC States Attorney Office (LTS)	2028876		1"	200202926-M	W/S/ST			$ 114.42		
Emergency Ops Center										
HIGH and BRDG Administration										
BCJC N Wing	2097110		8"	70134765-M	W/S/ST/+F			$ 71,743.21		
Government Center	2015131		6"	071526051-M	W/F			$ 1,889.73		
	2015134		6"	061344071-M	W/S			$ 8,984.90		
	2015288		2"	200228250-M	W/S/ST/F			$ 1,229.94		
	2015289		2"	200208447-M	W/S			$ 229.10		
	2015129		.0625"	201201550-M	W/S			$ 413.06		
	2015241		1.5"	16002006-M	IRR			$ 493.24		
	2015287		2"	200208445-M	IRR			$ 41.85		
	2015290		1	200300966-M	IRR			$ 13.95		
	2015132				FLS			$ 252.33		
	2015133				FLS			$ 132.35		
	2015135				FLS			$ 402.85		

Facility	Account	Rate	Meter Size	Meter #	Meter Type	Average Consumption kgal (Monthly)	Average Consumption CF (Monthly)	Average Cost (Monthly)	$/kgal	$/CF
PARKING, WAREHOUSE AND REPAIR										
State Attorney-Clerks Warehouse	2032476		1.5"	200004312-M	W/S	4		$ 106.73	$ 28.54	
	2032477					10		$ 123.90	$ 12.64	
Fleet Services #2 - SR84										
Fleet Services #3										
MASS TRAN Downtown Terminal										
West Regional Maintenance Cente										
Mid-Rise / East Parking	2028915		2"	200110981-M	W/S/ST			$ 718.20		
	2028916		1.5"	200112090-M	IRR			$ 729.50		

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Facility	Account	Rate	Meter Size	Meter #	Meter Type	Average Consumption kgal (Monthly)	Average Consumption CF (Monthly)	Average Cost (Monthly)	$/kgal	$/CF
PARKS										
CB Smith Park	03-297-51816-0015				Trash			$ 3,810.55		
	03-301-00030-0011			0070222366	W/S	1046		$ 9,719.32	$ 9.30	
Delevoe Park	2041829		1.5"	200701417M	W/S	166		$ 1,052.51	$ 6.36	
Everglades Holiday Park										
Franklin Park				2025883				$ 272.20		
				2025884				$ 157.55		
Lafayette Hart Park	2042245		0.75"	200106823	Irr			$ 242.36		
	2042246		1.5"	200114403	W/S	2		$ 106.25	$ 70.83	
Markham	84339-107458			60378336	W/S//RE/G	268		$ 3,960.39	$ 14.77	
	84341-107460			31826643	W/S/ST	183		$ 7,262.45	$ 39.70	
Quiet Waters				3005518				$ 659.38		
				3005520				$ 818.32		
				3005521				$ 1,631.36		
				3005522				$ 304.45		
				3005523				$ 284.43		
				3005524				$ 282.58		
				3005525				$ 127.61		
				3005526				$ 139.06		
				3005527				$ 111.39		
				3005528				$ 1,678.38		
				3005529				$ 113.97		
				3022890				$ 199.05		
				3022891				$ 440.53		
				3022892				$ 663.89		
				3022893				$ 23.03		
				3084183				$ 63.83		
				3098573				$ 124.53		
				3113809				$ 262.60		
Roosevelt Gardens Park	2027814		2"	200219366	W/S	9		$ 286.86	$ 30.52	
Sunview Park	3062113			1552649	W/S	16		$ 6,807.25	$ 433.19	
Tradewinds	000266-01		3"		W	1		$ 249.08	$ 415.13	
	001700-00		1.5"		W/S	5		$ 105.26	$ 21.57	
	001722-01		1"		W/S	1		$ 45.89	$ 42.50	
	001754-00		1.5"		W/S	1		$ 85.32	$ 64.64	
	013003-01		1.5"		W/S	3		$ 93.04	$ 34.72	
	013004-01		1.5"		W/S/ST	1		$ 81.05	$ 144.73	
	013005-01		1.5"		W/S	6		$ 112.67	$ 18.29	
	013006-01		1.5"		W/S	4		$ 100.02	$ 25.78	
	013007-01		1.5"		W/S	1		$ 140.25	$ 103.34	
	013008-01		1.5"	34309968	W/S	6		$ 110.03	$ 19.37	
	013009-01		1.5"	34309971	W/S			$ 183.68		
	019010-01		2"		W	156		$ 997.42	$ 6.39	
	019013-01		1.5"		W	5		$ 104.48	$ 22.13	
	019014-01		1.5"		IRR	5		$ 104.48	$ 22.13	
Vista View	266317-164646			Mtrs; 77559675,60325956, 86745021,86744980, 70218879duel,70218 880dual	W/S	45		$ 1,582.56	$ 35.43	

The data above is only being used for the purpose of summarizing what the County provided. Because there were no utility bills to analyze along with this data, the data could not be broke down any further. The blended rates that were acquired through this method were not used in the savings calculations as they do not remotely match the rates for water and sewer that the County provided. The reason why the blended rates above vary so widely is because there are unknown charges and fees that are added to the expenses amount in each facility but because there are no utility bills to analyze it was not possible to break down the charges to each account. Furthermore, these facilities have different providers depending on their location and each provider could have a different rate structure than the next. It is not known which provider services which facility.

A further breakdown of each account can be found in the utility data analysis for each facility.

WATER AND SEWER RATES USED FOR SAVINGS CALCULATIONS

Due to the inconsistency of the data that was provided to Siemens, another rate had to be used for calculating waster savings FIMs. The rates that were used for the savings calculations where acquired by three different water providers. The providers that were used were the Broward County domestic water utility provider, the town of Davie domestic water utility provider, and the City of Ft. Lauderdale domestic water utility provider. The rates that were selected were found through each of the providers' website. Facilities were categorized by their location and depending to their location, a provider was assigned to them. Because there was no further detail provided for water consumption, only a base rate was used for each facility. There was no breakdown based on meter type, meter size, consumption tiers, or facility type. The below carts display the utility rates that were used from each provider and the rates that each facility used for domestic water and sewer.

Residential and Commercial Water Rates

Ft. Lauderdale	Davie	Broward County
$ 4.80	$ 5.64	$ 3.78

Commerical and Industrial Sewer Rates

Ft. Lauderdale	Davie	Broward County
$ 6.60	$ 6.60	$ 3.86

WATER UTILITY RATE PER FACILTIY

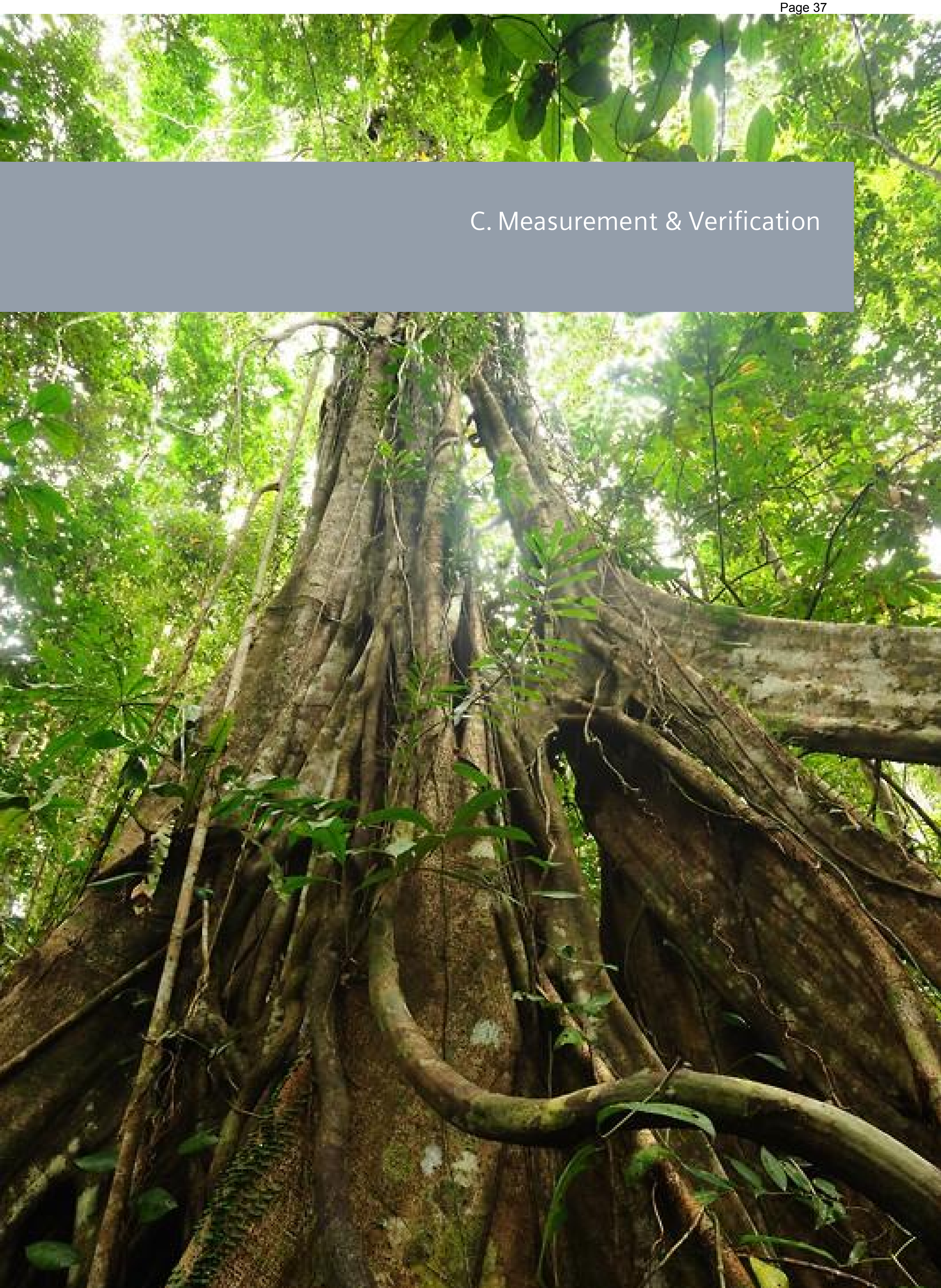
Building Name	Sewer Rate (KGAL)	Water Rate (KGAL)
LIBRARY, DB, Deerfield Beach	$ 3.86	$ 3.78
QUIET WATERS	$ 3.86	$ 3.78
TRADEWINDS	$ 3.86	$ 3.78
FLET SERV, #3, Pompano Beach	$ 3.86	$ 3.78
LIBRARY, CC, Collier City	$ 3.86	$ 3.78
LIBRARY, BE, Pompano Beach Branch	$ 3.86	$ 3.78
LIBRARY, IP, Imperial Point	$ 6.60	$ 4.80
Family Success Center, NW	$ 3.86	$ 3.78
LIBRARY, TA, Tamarac	$ 3.86	$ 3.78
LIBRARY, LC, Lauderhill	$ 3.86	$ 3.78
LIBRARY, BR, Tyrone Bryant	$ 6.60	$ 4.80
LIBRARY, GO, Galt Ocean	$ 6.60	$ 4.80
LIBRARY, FL, East Regional	$ 6.60	$ 4.80
MASS TRAN, Downtown Terminal	$ 6.60	$ 4.80
BC Government Center Complex	$ 6.60	$ 4.80
LIBRARY, MN, Main	$ 6.60	$ 4.80
BCJC States Attorney Office (LTS)	$ 6.60	$ 4.80
State Attorney & Clerks Warehouse	$ 6.60	$ 4.80
DELEVOE	$ 6.60	$ 4.80
FRANKLIN	$ 6.60	$ 4.80
ROOSEVELT GARDENS	$ 6.60	$ 4.80
Edgar Mills Center	$ 6.60	$ 4.80

WATER UTILITY RATE PER FACILTIY - CONTINUED

Building Name	Sewer Rate (KGAL)	Water Rate (KGAL)
Fleet Services #2, SR 84	$ 6.60	$ 4.80
LIBRARY, RV, Riverland Branch	$ 6.60	$ 4.80
SUNVIEW	$ 6.60	$ 4.80
Emergency Operations Center	$ 3.86	$ 3.78
West Regional Courthouse	$ 3.86	$ 3.78
West Regional Maintenance Center	$ 3.86	$ 3.78
MARKHAM	$ 3.86	$ 3.78
BC Agriculture Extension	$ 6.60	$ 5.64
MEDICAL EXAM	$ 6.60	$ 4.80
LIBRARY, HB, Hollywood Beach	$ 3.86	$ 3.78
LIBRARY, HO, Hollywood	$ 3.86	$ 3.78
South Regional Courthouse	$ 6.60	$ 4.80
south regional health center	$ 3.86	$ 3.78
LIBRARY, MI, Miramar	$ 3.86	$ 3.78
CB SMITH	$ 3.86	$ 3.78
VISTA VIEW	$ 6.60	$ 5.64
EVERGLADES HOLIDAY PARK	$ 3.86	$ 3.78
HIGH & BRDG Administration, Pompano	$ 3.86	$ 3.78
hunter & hughes bldg	$ 3.86	$ 3.78
Northwest Health Center	$ 6.60	$ 4.80
BCJC North Wing	$ 6.60	$ 4.80

There are three facilities that are not included in the above list. Those facilities are the Mid-rise/East Parking building, the Young at Art building, and Lafayette Hart Park. These facilities are not included in the water and sewer rate list because no potential water savings FIMs were found at these facilities.

C. Measurement & Verification



C. Measurement and Verification Methodology

This section provides a description of the measurement and verification (M&V) approach selected for each FIM type (HVAC, lighting, etc.). Detailed descriptions of the listed M&V Options, as well as a detailed action plan and responsibilities, is provided in Section V of this report.

Siemens adheres to the guidelines of the International Performance Measurement and Verification Protocol (IPMVP) and Federal Energy Management Program (FEMP) in develop the appropriate M&V plan.

There are four options under the IPMVP to measure and verify energy/utility savings:

- Option A - Retrofit Isolation: Key Parameter Measurement
- Option B - Retrofit Isolation: All Parameter Measurement
- Option C - Whole Facility
- Option D – Calibrated Simulation.

A fifth option, Option E - Stipulated, is an industry-accepted engineering standard and is the option used for Operational Savings or savings associated with FIMs whose impact is not directly measurable outside of lab conditions.

A coefficient of variation (CV) of 0.5 will be considered for all post measurement data when compared to guaranteed values. Siemens will have met agreed upon guaranteed savings if post measurements are within this coefficient of variation

LIGHTING UPGRADES

The Measurement and Verification (M&V) of Lighting Retrofit FIMs will be International Performance Measurement and Verification Protocol (IPMVP) Option A: Retrofit Isolation: Key Parameter Measurement. Savings generated by lighting retrofits will be based upon a one-time, Pre- and Post-Implementation measurement for each major fixture type. The number of fixtures that will be measured (quantity) will be in accordance with IPMVP standards, and consistent with an 80% confidence and 20% precision.

In addition to the savings generated by the more efficient equipment, lighting savings generated by, and associated with, newly installed lighting occupancy sensors (reductions in total operating hours) are also included in the savings calculations. Occupancy sensor lighting savings are determined using post-installation fixture wattages, measured for each major fixture type, and the total reduction in burn hours generated by the occupancy sensors. The baseline operating hours used to calculate occupancy sensor energy were established using County-approved operating hours, and are shown in the "Lighting Occupancy Data Logging Report" presented in the Section H, Appendices.

WATER CONSERVATION

The Measurement and Verification (M&V) of Water Conservation FIMs will be International Performance Measurement and Verification Protocol (IPMVP) Option A: Retrofit Isolation: Key Parameter Measurement. Savings shall be based upon one-time Pre- and Post-installation measurements, and calculated using flow measurements on a sampling of each fixture or retrofit type. The number of fixtures that will be measured (quantity) will be in accordance with IPMVP standards, and consistent with an 80% confidence and 20% precision, as well as a coefficient of variation of 0.5.

RTU AND SPLIT DX UNIT REPLACMENTS

The Measurement and Verification (M&V) of HVAC Replacements will be International Performance Measurement and Verification Protocol (IPMVP) Option A: Retrofit Isolation: Key Parameter Measurement. Savings generated through the installation of new split DX units will be based on the improved efficiency of the new equipment. Siemens will document the energy savings by trending Pre- and Post-installation measurements of total unit KW at similar outdoor air conditions.

VENDING & ICE MACHINE SENSORS – OPTION D

The Measurement and Verification (M&V) of occupancy tied to vending and ice machines sensors will be International Performance Measurement and Verification Protocol (IPMVP) Option D: Calibrated Simulation. The baseline operating hours used to calculate occupancy sensor energy were established using County-approved operating hours, and are shown in the "Lighting Occupancy Data Logging Report" presented in the Section H, Appendices .

CHILLER REPLACMENTS

The Measurement and Verification (M&V) of HVAC Replacements will be International Performance Measurement and Verification Protocol (IPMVP) Option A: Retrofit Isolation: Key Parameter Measurement. Savings generated by installing new, like-for-like chillers will be based on the improved part-load efficiency of the new equipment. Siemens will document the energy savings by trending the Pre- and Post-installation measurements of total unit kW/ton. Where possible, the buildings energy management system (EMS) will be utilized to trend and monitor key parameters.

BUILDING AUTOMATION

Building automation improvements consists of a wide range of solutions. The Measurement and Verification (M&V) of advanced control FIMs will be International Performance Measurement and Verification Protocol (IPMVP) Option B: Retrofit Isolation: All Parameter Measurement. In order to track/determine the proper operation of installed sequences, all necessary points will be measured and trended. The solutions associated with this M&V method include:

- Chiller lead/lead operations
- Chiller plant optimization
- Demand control ventilation
- Outside air control
- Supply air temperature resets and setbacks
- Static pressure resets and setbacks
- Retro-commissioning efforts
- HVAC schedules

Option B ensures continuous monitoring of key parameters to verify the persistence of guaranteed savings. This is a shared responsibility and County personnel are critical to successfully protecting and maintaining implemented control improvements. A Post-retrofit commissioning report will be completed to certify control sequences have been implemented as designed.

PHOTOVOLTAIC RENEWABLE ENERGY SYSTEM

The Measurement and Verification (M&V) of PV Solar Array FIMs will be International Performance Measurement and Verification Protocol (IPMVP) Option B: Retrofit Isolation: All Parameter Measurement. For the purposes of meeting Guaranteed Performance Ratio, the System Performance Ratio shall be calculated from onsite, measured data available via a data acquisition website and then be compared to an Annual Performance Ratio Guarantee Level. The SREC Revenue and O&M Savings will be Option E: accepted spreadsheet modeling calculations. SIEMENS strongly recommends utilizing the solar maintenance services offered by SIEMENS to comply with the maintenance requirements for the M&V savings to be guaranteed for the guarantee period.

HOT WATER & MISC. SAVINGS – OPTION E

The Measurement and Verification (M&V) of the following savings streams will utilize Option E: Stipulated:

- Hot water energy savings resulting from reductions in water consumption
- Ice machine energy savings resulting from reduced run hours

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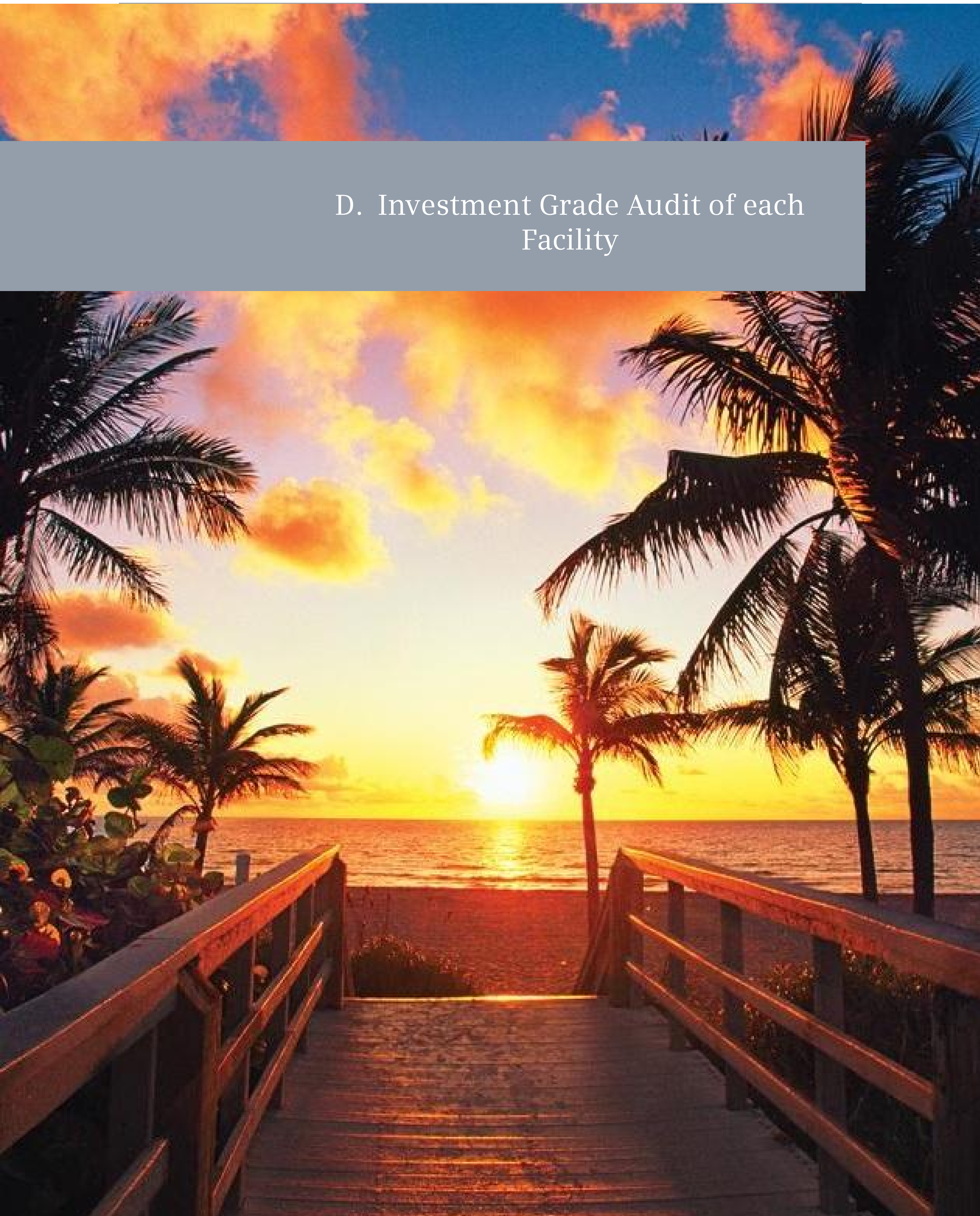

D. Investment Grade Audit of each Facility

D.Investment Grade Audit of Each Facility

This section summarizes the Investment Grade Audit (IGA) for each facility, and is formatted/divided into three distinct sections:

Facility #1 (i.e., BC Agricultural Extension)

- **Facility Description** - Complete summary including existing conditions, equipment inventory, nameplate data, data logging results, and operating hours
- **Utility data analysis (UDA)** – Electric & Water baseline
- **Recommended FIMs** - Description of scope, savings, costs, and paybacks

Facility #2 (i.e., BCJC North Wing)

- **Facility Description** - Complete summary including existing conditions, equipment inventory, nameplate data, data logging results, and operating hours
- **Utility data analysis (UDA)** – Electric & Water baseline
- **Recommended FIMs** - Description of scope, savings, costs, and paybacks

Facility #3.....and so forth

D.1. BC Agricultural Extension

FACILITY DESCRIPTION

The BC Agricultural Extension is a one-story, 16,193 square foot building constructed around 1996 and located at 3245 College Ave. The building consists of offices, an auditorium, a food galley, meeting spaces, and a break room. The facility is used to provide educational programs in urban horticulture, natural resource management, commercial horticulture, family nutrition, and 4-H Youth Development programs, clubs, and camps.

This facility operates as follows:

<u>Office Hours</u>

Monday – Fridays:	8AM – 5PM
Weekends:	closed

<u>Event Hours:</u>

Monday – Fridays:	6:30AM – 10PM
Weekends:	on occasion

Observed Issues:

- Drainage problems on the roof
- Single-pane windows tinted from the inside with tint failing
- Reports of windows experiencing infiltration of both water and air



Examples of Observed Issues Pictured Above

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COOLING SYSTEM:

Cooling is provided by one split DX package configuration located on the roof of the building. The condenser is a 26.7 ton commercial, air-cooled, semi-hermetic Carrier unit that serves a multi-zone air handling unit (AHU) with electric reheat capability at the supply duct of each zone. The AHU is a Trane MCCA model unit equipped with a 7.5 HP fan motor. The following table documents nameplate data acquired both onsite and from online Product Data Sheets.

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
BG Agricultural Extension												
Condenser	Carrier	38AKS034---501	3610Q60480	compressor	R-22		30	208	3	106.5	10.1	33.4
				fan		1		208	1	6.4		1.2
				fan		1		208	1	6.4		1.2
AHU	Trane	MCCA025GAMOAA	K96F46852	multi-zone	Jun-96	7.5		200	3			5.6

Building HVAC

The outside air intake for the AHU was designed to be modulated and controlled, but has fallen in disrepair. The dampers and ductwork are rusted and frozen in the position that was last set.

Outside Air for AHU

All HVAC is equipment is reported to be original to the building (1996 manufacturing dates). The condensing unit appears to be newer.

Observed Issues with the cooling system

- Excess condensation on windows and glass doors
- Reports of humidity and mold
- Occupants report of excessive swings in temperature
- Occupants report that duct heaters are not working
- Offices/spaces report various issues; too much cold air, not enough cold air, poor ventilation, etc.

Examples of Observed Issues

LIGHTING SYSTEM:

Interior lighting primarily consists of 32 Watt, T8 fluorescent lamps in either 2 or 3-lamp 2x4 fixtures. The auditorium also includes halogen lamps in recessed cans.

Interior Lighting Examples Pictured Above

Exterior Lighting consists of HPS wall packs. Facility personnel have retrofitted one of these wall packs to compact fluorescent (CFL) lighting.

Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restrooms. Fixtures and water closets are all operated manually. The following are example of the types of fixture found within the restroom of the facility:

- 0.5 and 2.5 gpm faucets
- 1.6 gpf toilets
- 2.5 gpm shower heads


Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM:

The building is equipped with a Johnson Metasys Building Automation System (BAU). Any changes to the controls operation is handled from the Government Center with the exception of an override button, which is available to staff if the building becomes too warm.


Building Controls Pictured Above

Available trending data was downloaded from the BAU. The following lists the available points being trended:

Air Handling Unit:

- Return air relative humidity

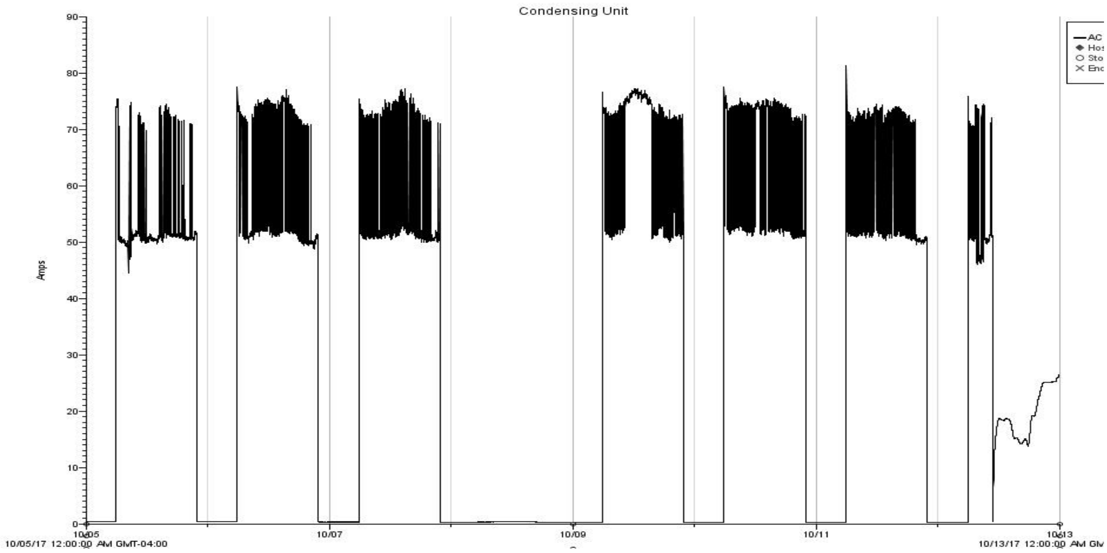
VAV 1- 13

- Box Flow
- Damper Position
- Zone Temperature
- Zone Temperature Setpoint

TRENDING DATA AQUISITION:

In order to determine the runtime (operations) of each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from the logging sessions.

Trending Data – 30 ton condensing unit



This unit registered an average of 60.03 amps and was operated for a total of 96.12 hours during a one week period.

The following table compares the operating hours of each unit with the facility's hours of service.

Day	Hours of Service	Run Hours
Sunday	closed	off
Monday	varies depending on classes	6:00 AM - 10:00 PM
Tuesday	varies depending on classes	6:00 AM - 10:00 PM
Wednesday	varies depending on classes	6:00 AM - 10:00 PM
Thursday	varies depending on classes	6:00 AM - 10:00 PM
Friday	varies depending on classes	6:00 AM - 10:00 PM
Saturday	varies depending on classes	6:00 AM - 10:00 PM

The DX split unit is scheduled to operate during occupied hours. The staff in the office side of the building typically leaves between 5 and 6PM. However, the auditorium may hold night classes that run until 10PM.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the Seasonal Demand Time-of-Day Rider (SDTR-1A) rate structure. The most recent 24-months of electric billing data was utilized to create the baseline (shown below), and obtained directly from the Florida Power and Light (FPL) website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings, as well as the demand and consumption values representing baseline electric usage.

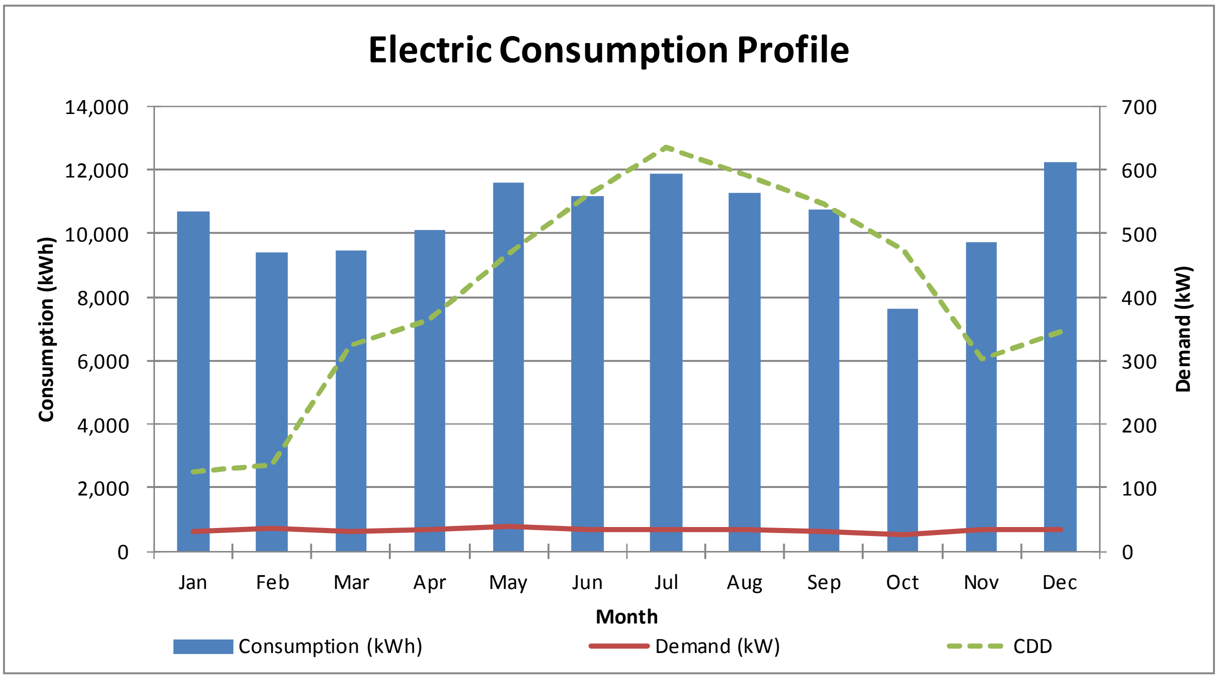
Electric Baseline Summary

Facility	# of Meters	Rate Structure	June - Sept		$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak					
BG Agricultural Extension	1	SDTR-1A	$ 0.12131	$ 0.03828	$ 0.05295	$ 10.30	126,180	394	42

The data in the table above was generated using the following electric billing data.

Meter RU5292H; Account: 140668812; Address: 3245 COLLEGE AVE # A

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Storm Charge	gross receipts tax 2.56%	Franchise Fee	Total Charges
		Total Consumption	On Peak	Off Peak							
Jun-15	$ 26	10,680	955	9,725	$ 454	28	$ 339	$ 6	$ 21	$ 129	$ 975
Jul-15	$ 26	11,520	1,473	10,047	$ 500	29	$ 351	$ 6	$ 23	$ 169	$ 1,076
Aug-15	$ 26	10,080	1,398	8,682	$ 440	27	$ 327	$ 6	$ 20	$ 157	$ 976
Sep-15	$ 26	10,200	1,228	8,972	$ 441	25	$ 303	$ 6	$ 20	$ 141	$ 936
Oct-15	$ 26	6,240	355	5,885	$ 251	17	$ 206	$ 3	$ 12	$ 74	$ 573
Nov-15	$ 26	10,440		10,440	$ 421	37	$ 448	$ 6	$ 23	$ 112	$ 1,035
Dec-15	$ 26	14,640		14,640	$ 590	35	$ 424	$ 8	$ 27	$ 177	$ 1,252
Jan-16	$ 26	12,240		12,240	$ 612	30	$ 293	$ 8	$ 24	$ 58	$ 1,021
Feb-16	$ 26	10,560		10,560	$ 528	40	$ 391	$ 7	$ 24	$ 59	$ 1,035
Mar-16	$ 26	9,960		9,960	$ 498	29	$ 284	$ 6	$ 21	$ 52	$ 887
Apr-16	$ 26	9,480		9,480	$ 474	28	$ 274	$ 6	$ 20	$ 26	$ 826
May-16	$ 26	10,680		10,680	$ 534	37	$ 362	$ 7	$ 24	$ 34	$ 987
Jun-16	$ 27	11,640	1,200	10,440	$ 545	38	$ 447	$ 11	$ 26	$ 63	$ 1,120
Jul-16	$ 27	12,240	1,920	10,320	$ 628	37	$ 435	$ 11	$ 28	$ 68	$ 1,197
Aug-16	$ 27	12,480	2,040	10,440	$ 647	38	$ 447	$ 11	$ 29	$ 70	$ 1,231
Sep-16	$ 27	11,280	1,800	9,480	$ 581	37	$ 435	$ 10	$ 27	$ 63	$ 1,144
Oct-16	$ 27	9,000		9,000	$ 420	36	$ 363	$ 8	$ 21	$ 80	$ 919
Nov-16	$ 27	9,000		9,000	$ 420	31	$ 312	$ 8	$ 20	$ 46	$ 833
Dec-16	$ 27	9,840		9,840	$ 459	32	$ 323	$ 9	$ 21	$ 49	$ 887
Jan-17	$ 25	9,120		9,120	$ 462	31	$ 319	$ 7	$ 21	$ 50	$ 884
Feb-17	$ 25	8,280		8,280	$ 420	31	$ 319	$ 7	$ 20	$ 47	$ 837
Mar-17	$ 25	9,000		9,000	$ 477	32	$ 330	$ 7	$ 21	$ 52	$ 911
Apr-17	$ 25	10,680		10,680	$ 566	41	$ 422	$ 9	$ 26	$ 63	$ 1,110
May-17	$ 25	12,480		12,480	$ 661	42	$ 433	$ 10	$ 29	$ 69	$ 1,227
Yearly Averages		**125,880**	**2,040**	**119,696**	**$ 6,015**	**394**	**$ 4,294**	**$ 92**	**$ 274**	**$ 953**	**$ 11,941**



The energy use profile (shown above) is not influenced by cooling needs throughout the year, as identified by comparing monthly consumption to bin weather data's cooling degree days (CDD). Electric usage, not entirely constant from month to month, appears to be affected by building occupancy and the classes held within the auditorium. The average peak for the 24 month period occurs in December, while the average low occurs in October.

The billing is analyzed as a combination of all facility meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
BG Agricultural Extension	Office - Mixed Use	7.79	4.5	8.6	13.4

Overall, this building is operating **at the median** of comparable facilities. This indicates limited improvement opportunities. HVAC scheduling is currently already being implemented by the County and the condition of onsite equipment is fair.

UTILITY DATA ANALYSIS - WATER

No water consumption data could be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis and payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure.

BUILDIND LEVEL SUMMARY

The following table summarizes the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only recommended for this facility.

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
BC Agricultural Extension	Lighting - Interior	$ 1,824.00	$ -	$ -	$ 217	$ 2,041.00	$ 21,714.68	10.6
BC Agricultural Extension	Split System OA	$ -	$ -	$ -	$ -	$ -	$ 2,812.81	-
Breakage Fee							$ 2,752.81	
PA Cost							$ 256.72	
Total		**$ 1,824.00**	**$ -**	**$ -**	**$ 217**	**$ 2,041.00**	**$ 27,537.02**	**13.5**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided in Section H, Appendices .

LIGHTING RETROFIT

This section describes all lighting scope proposed for this facility.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize the type of linear LED T8 and T5 lamps used throughout the buildings. We recommend a non-proprietary proven LED tube that will provide the greatest performance and energy savings of other lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp recommended for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that does not require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation, as well as to reduce future maintenance. This LED retrofit strategy being recommended will maintain the recommended light levels, reduce energy consumption, and standardize lamp types.

All fixtures retrofitted will be dry wiped to remove dust and particulate matter, and improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we propose installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Pin-Based Compact Fluorescent Fixtures

In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, the design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps, and remove the existing fluorescent ballasts. In some cases, it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

LED Replacement for Screw Based Incandescent and Compact fluorescent fixtures

Our design strategy for the screw-based incandescent and compact fluorescent lamps is to replace them with screw-based LED, where the application permits. LED has become an attractive replacement option when incandescent fixtures are controlled by dimmers due to its excellent dimming capability.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of these various scenarios, existing battery backup ballasts in fluorescent fixtures require the replacement of the battery ballasts as they are not compatible with the UL Type B LED lamps. In these cases, a standalone EM kit, with a dedicated emergency battery, LED driver, and LED board, will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting retrofit scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
BC Agriculture Extension	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	10	10
	Existing T8 Fluorescent - Proposed Retrofit LED	195	195
	Existing Incandescent - Proposed Relamp LED	19	19
	Existing Compact Fluorescent - Proposed Relamp LED	1	1

PROJECT SCOPE – EXTERIOR LIGHTING

LED Replacement for High Intensity Discharge Exterior

The replacement of HID (high intensity discharge) exterior lighting, including metal halide or high-pressure sodium, provides significant energy reduction when converting to LED. For exterior pole mounted applications, the number of fixtures can often be reduce because of the improved photometric and light distribution of new LED fixtures. All proposed LED fixtures are from recognized manufacturers that have met the required standards for light quality, efficiency and longevity.

In our design effort and fixture selection process, consideration was given to the long-term maintenance benefits of the prescribed solution, specifically the reduction in the future costs to maintain exterior fixtures in difficult to reach applications. The proposed LED fixture replacement has been specified to furnish light levels that are complaint and support the existing site condition requirements. Where time clocks or automated lighting controls are not in place, proposed LED building and site lighting will incorporate an integral photocell to maximize energy savings.

In general, the design recommendations are to replace existing HID luminaires with new LED luminaires of similar type, i.e., shoeboxes, wallpacks, floodlights. Some fixture types will be replaced with new LED fixtures of a different type, i.e., recessed canopy lights replaced with low profile LED canopy lights.

Where deemed appropriate, integral occupancy sensors will be used on pole mounted shoebox parking lot luminaires to automatically dim during hours of inactivity.

Decorative post top luminaires, recessed step lights, and bollards typically use low wattage HID lamps in architectural form. Replacement luminaires of this type are relatively high cost, with relatively low energy savings potential. Therefore, the proposed design typically calls for removing the HID lamp and ballast, and installing a new screw based LED lamp.

Exterior Lighting retrofit scope considered

BUILDING	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
BC Agriculture Extension	Existing High Intensity Discharge - Proposed New LED Fixture With Sensor	9	9
	Existing High Intensity Discharge - Proposed New LED Fixture	8	8
	Existing Incandescent - Proposed Relamp LED	11	11

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, and was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are accompanied with recommended lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 19,088 kWh

Annual Electric Demand: 92.34 kW

FIM FINANCIAL SUMMARY

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
BC Agricultural Extension	Lighting - Interior	$ 1,824.00	$ -	$ -	$ 217	$ 2,041.00	$ 21,714.68	10.6

D.2. BC Government Center

FACILITY DESCRIPTION

The BC Government Center and Annex are two buildings linked by a walkway. The BC Government Center is a 5-story building constructed in 1985 that consists of the Broward League of Cities, Property Appraiser, Records, Taxes and Treasury, Supervisor of Elections, and numerous other offices, meeting spaces and cafeteria. The Annex is a 6-story building consisting of Community Partnership, Construction Management, Property Appraiser, Public Works, Purchasing, Revenue Administration, Revenue Collection, Small Business, and various other offices. The combined square footage is estimated at 354,768, and both sides of the building are typically occupied during the hours of 6AM through 6PM, Monday through Friday. The Elections and Appraiser Departments may have Saturday hours during special events throughout the year.

Observed Issues:

- Building experiences power surges
- Building generator does not always automatically switch over during outages
- Annex still equipped with fuses; no breakers

COOLING SYSTEM - ANNEX:

Cooling for the Annex is provided by two (2) condenser water loops feeding multiple heat pumps on floors 3-6 of the building. Floors 1 and 2 are cooled by a combination of air handlers (AHUs) and compressors.

There are two (2) cooling towers on the Annex roof that provide air-cooled condenser water to various heat pumps, a 250 ton tower and another of unknown tonnage. Cooling Tower #1's condenser loop feeds floors 5 and 6 and herby referred to as Loop 1. Cooling Tower #2's condenser loop feeds floors 3 and 4 hereby referred to as Loop 2. Both cooling towers appear to be reaching the end of their useful life. Neither cooling tower seems to be equipped with fan variable frequency drives (VFDs).

Cooling Towers

Loop 1's water is distributed by two (2) condenser water pumps located on the 5th floor, each with 10 HP motors and 360 GPM pumps. Only one pump was running at the time of the site visit. Loop 2's water for this loop is distributed by a separate pair (2) of condenser water pumps located on the 2nd floor; each with 15 HP motors and 750 GPM pumps. Only one pump was running at the time of the site visit.

Condenser Pumps Pictured Above

The first two floors of the building are cooled by two (2) AHUs, each with a dedicated semi-hermetic screw compressor. Compressor #2 was leaking water at time of our site visit. The AHU ductwork is deteriorated with what appears to be water damage.

Compressors Pictured Above



Air Handlers Pictured Above

All mechanical rooms where air distribution equipment is located are used as plenums. Outside air is supplied by a main vent running through each floor.

Mechanical Rooms Pictured Above

The following table breaks down the existing heat pump equipment identified.

Location / Service Area	Unit	Fan HP	# of Compressors
6th Floor	4	3	2
6th Floor / conference room	3B	2	2
6th Floor	3A	2	2
6th Floor	2	3	2
6th Floor	1	2	2
5th Floor	4	5	2
5th Floor	3	2	2
5th Floor	2B	2	2
5th Floor	2A	2	2
5th Floor	1	3	2
4th Floor	4	1.5	2
4th Floor	3	3	2
4th Floor	5	2	2
4th Floor	2	3	2

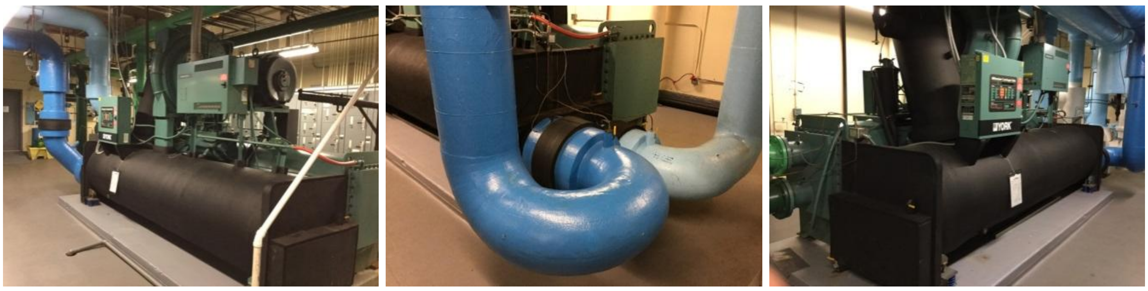
4th Floor	1	5	2
3rd Floor	1A	3	2
3rd Floor / Hallway	2	1.5	2
3rd Floor	3	1.5	2
3rd Floor	4	3	2
3rd Floor	5	3	2
2nd Floor – Cash Room	S	0.75	1
2nd Floor	N	0.75	1
2nd Floor / 2nd Floor	AHU 1	10	
2nd Floor / 1st Floor	AHU 2	10	

Examples of Heat Pump Units

The AHUs and water source heat pump distribute conditioned air using a variable air volume (VAV) system equipped with electric heat. It was reported that Siemens BAS is currently repairing the VAV boxes.

COOLING SYSTEM – GOVERNMENT CENTER:

Cooling for the building is provided by a chiller plant consisting of two (2) water-cooled York chillers. The chillers are two-pass machines of approximately 150 tons. Model YT Style H chillers ceased production in 2001 and tonnages values could not be determined from the nameplate data nor from the as-built drawing provided. The chillers are operated as lead/lag.



Chiller Plant

Two (2) 75 HP pumps are used to circulate chilled-water. However, only chilled-water pump #2 is equipped with a VFD. There are three (3) condenser water pumps (CWP), each with 30

HP motors. CWP #1 has a 7500 GPM pump while the other two have 1300 GPM pumps. None of the CWPs are equipped with VFDs.

Chiller Plant Pumps

Plant Observations during Visit:

- Only one chiller was running
- Chilled-water temperature leaving: 42.9 °F
- Chilled-water temperature returning: 47.5 °F
- Delta T: 4.6 °F
- Condenser water leaving temperature: 93.5 °F
- Condenser water return temperature: 80.6 °F
- Amperage: 255, 244, 244; Average of 247.7 Amps
- BTU/Hr: not avalable

There are four (4) cooling towers for the chiller plant located on the roof. Inspection of the cooling towers revealed excess scaling and damage of the fins. The towers themselves are not in bad condition.

Chiller Plant Cooling Towers

AIR DISTRIBUTION SYSTEM

Chilled water is distributed to approximately 16 air handling units (AHUs) throughout the building. In general, each floor has three (3) to four (4) AHUs located in mechanical rooms, used as plenums, and equipped with VFDs. The units are capable of modulating return and outside air intake via dampers situated within the ductwork, although at this time it could not be confirmed that the dampers are working properly. Outside air for the building is supplied by a common shaft, and distributed throughout the building via a variable air volume (VAV) system. It was reported that Siemens BAS is currently working on the repair VAV controls. The VAV boxes observed during the site visit appear to utilize electric reheating.

Return and Outside Air Damper Control

The following table breaks down the AHU equipment identified.

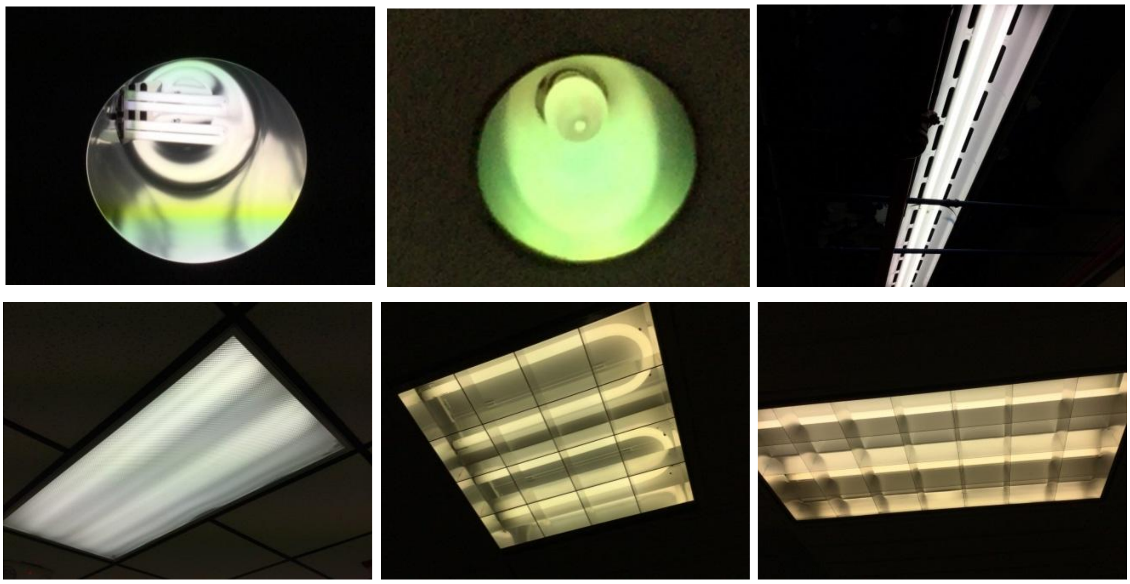
Location / Service Area	AHU	Fan HP	VFD?	Hz
Chiller Plant	AHU	-	-	-
5th Floor	AHU 5A	-	Yes	40.6
5th Floor	AHU 5B	-	Yes	-
4th Floor	4D	-	Yes	12.0
4th Floor	4C	30	Yes	-
4th Floor	4A	20	Yes	36.3
4th Floor	4B	-	Yes	37.8
3rd Floor	3C	-	Yes	30.6
3rd Floor	2C	-	Yes	42.3
3rd Floor	3D	-	Yes	41.4
2nd Floor	-	-	-	-
2nd Floor	-	-	-	-
2nd Floor	-	-	-	-
1st Floor	1A	30	Yes	35.6
1st Floor	1B	30	Yes	36.7
1st Floor	1C	30	Yes	57.0

Air Handing Units

LIGHTING SYSTEM:

Interior lighting consists of the following mixture of lighting:

- 18 Watt, Compact fluorescent (CFL) lamps in recessed cans
- Metal halide lamps in recessed cans (higher ceiling situations)
- 32 Watt, T8 Fluorescent fixtures
- 32 Watt, T8, U-bend Fluorescent fixtures



Interior Lighting Examples Pictured Above

Exterior Lighting consists of HPS decorative lights around the perimeter of the building, and 18-Watt, Compact fluorescent (CFL) lamps in recessed cans.

Exterior Lighting Examples Pictured Above

Although the building utilized occupancy sensors in the past, the equipment was removed due to complaints that the lights would turn off while people were working on their computers.

DOMESTIC WATER SYSTEM:

Domestic water is used in both restroom and for cooling tower makeup water. The following are example of the types of fixture found within the facility:

- 2.2 gpm faucets
- 3,5 and 1.6 gpf toilets
- 1.5 gpm urinals
- 2.5 gpm kitchen sinks

Most faucets, toilets and urinals are operated manually, with some equipped with dual flush capability.



Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM:

The building is equipped with a JCI building automation system. Exterior lights are on timers and/or photocell.



Building Controls Pictured Above

BROWARD COUNTY FLORIDA

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by three (3) electric meters. The Annex and Garage meter is on the Seasonal Demand Time of Use Rider (SDTR-1A) rate structure. The Government Center meter is on the General Service Large Demand Time of Use (GSLDT) rate structure.

The historical data for both the Annex and Government Center was not available on the FPL website (lack of smart meter technology within these buildings). A baseline was created using a June 2017 bill and extrapolating the remaining information. The County provided the most recent 24 months of electric billing data for the garage only.

The following summarizes the rate structure and estimated electrical values for each meter:

Government Annex:	SDTR-1A	$10,593 in June	$127,116 yearly
Government Center:	GSLDT	$35,764 in June	$429,168 yearly
Government Center Garage:	SDTR-1A	$5,980 in June	$63,845 yearly

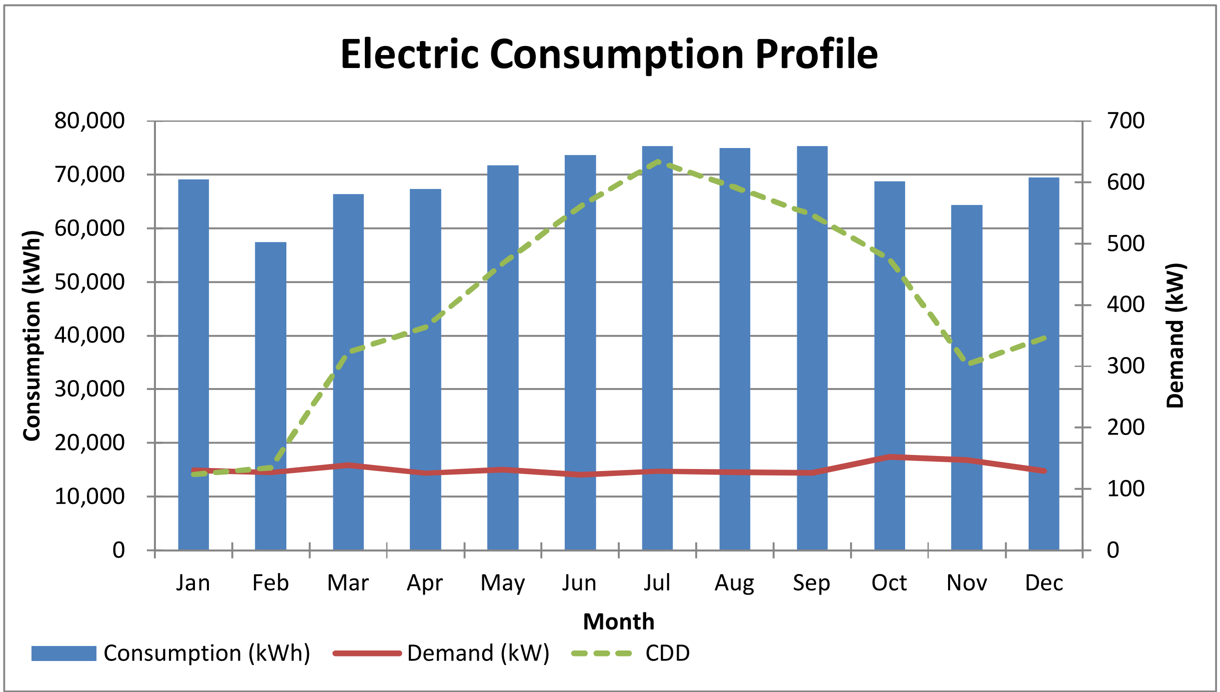
Electric Baseline Summary - Garage

Facility	# of Meters	Rate Structure	June - Sept		$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak					
BC Government Center	1	SDTR-1A	$ 0.12131	$ 0.03828	$ 0.05295	$ 10.30	834,030	1,591	161

The data in the table above was generated using the following electric billing data.

Meter MV3662A; Account: 61024-46389; Address: 151 SW 2ND ST # PKNG GARAGE

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak				Storm Charge	gross receipts tax 2.56%	Franchise Fee	
Jun-15	$ 25.96	71,760	4,620	67,140	$ 3,004	120	$ 1,454	$ 39	$ 116	$ 699	$ 5,339
Jul-15	$ 25.96	69,840	6,420	63,420	$ 2,971	123	$ 1,491	$ 38	$ 116	$ 819	$ 5,461
Aug-15	$ 25.96	71,100	6,900	64,200	$ 3,033	126	$ 1,527	$ 39	$ 118	$ 860	$ 5,604
Sep-15	$ 25.96	76,740	6,840	69,900	$ 3,259	131	$ 1,588	$ 42	$ 126	$ 857	$ 5,898
Oct-15	$ 25.96	68,100	2,220	65,880	$ 2,744	170	$ 2,060	$ 37	$ 125	$ 814	$ 5,807
Nov-15	$ 25.96	66,360	0	66,360	$ 2,674	134	$ 1,624	$ 36	$ 112	$ 830	$ 5,302
Dec-15	$ 25.96	69,240	0	69,240	$ 2,790	131	$ 1,588	$ 38	$ 114	$ 877	$ 5,433
Jan-16	$ 25.96	66,660	0	66,660	$ 3,334	142	$ 1,389	$ 43	$ 123	$ 298	$ 5,212
Feb-16	$ 25.96	55,920	0	55,920	$ 2,797	133	$ 1,301	$ 36	$ 106	$ 258	$ 4,524
Mar-16	$ 25.96	69,120	0	69,120	$ 3,457	146	$ 1,428	$ 45	$ 127	$ 323	$ 5,405
Apr-16	$ 25.96	66,180	0	66,180	$ 3,310	127	$ 1,242	$ 43	$ 118	$ 104	$ 4,843
May-16	$ 25.96	66,480	0	66,480	$ 3,325	135	$ 1,320	$ 43	$ 121	$ 112	$ 4,946
Jun-16	$ 26.97	75,540	4,320	71,220	$ 3,250	127	$ 1,494	$ 69	$ 124	$ 301	$ 5,265
Jul-16	$ 26.97	80,940	7,020	73,920	$ 3,681	135	$ 1,588	$ 74	$ 137	$ 333	$ 5,841
Aug-16	$ 26.97	78,780	6,840	71,940	$ 3,584	129	$ 1,517	$ 72	$ 133	$ 323	$ 5,656
Sep-16	$ 26.97	73,980	6,420	67,560	$ 3,365	122	$ 1,435	$ 68	$ 125	$ 290	$ 5,310
Oct-16	$ 26.97	69,480	2,340	67,140	$ 3,243	135	$ 1,361	$ 64	$ 120	$ 279	$ 5,094
Nov-16	$ 26.97	62,400	0	62,400	$ 2,913	161	$ 1,623	$ 57	$ 118	$ 278	$ 5,016
Dec-16	$ 26.97	69,780	0	69,780	$ 3,257	128	$ 1,290	$ 64	$ 119	$ 278	$ 5,035
Jan-17	$ 25.00	71,520	0	71,520	$ 3,625	119	$ 1,226	$ 57	$ 126	$ 306	$ 5,365
Feb-17	$ 25.00	59,040	0	59,040	$ 2,993	121	$ 1,246	$ 47	$ 110	$ 267	$ 4,689
Mar-17	$ 25.00	63,540	0	63,540	$ 3,364	132	$ 1,360	$ 51	$ 123	$ 302	$ 5,224
Apr-17	$ 25.00	68,520	0	68,520	$ 3,628	125	$ 1,288	$ 55	$ 128	$ 314	$ 5,437
May-17	$ 25.00	77,040	0	77,040	$ 4,079	129	$ 1,329	$ 62	$ 141	$ 345	$ 5,981
AVERAGE TOTALS		**834,030**	**26,970**	**807,060**	**$ 38,840**	**1,591**	**$ 17,383**	**$ 612**	**$ 1,463**	**$ 5,234**	**$ 63,845**



The energy usage profile, illustrated above, is not influenced by cooling needs as this is a garage. Instead, the usage is based on the lighting requirements for the parking structure. The average peak for the 24 month period evaluated occurs in March, while the average low occurs in July.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Government Center East - 1200 Garage, 350 Garage, ERP & Print

Account #	2015288	**Meter #**	200228250-M
Rate		**Address**	
Meter Size	2"	**Meter Type**	W/S/ST/F

Date	Total Charges
Mar-17	$ 1,372.00
Feb-17	$ 1,520.20
Jan-17	$ 1,588.60
Dec-16	$ 1,759.60
Nov-16	$ 1,423.64
Oct-16	$ 1,630.66
Sep-16	$ 1,415.72
Aug-16	$ 1,209.38
Jul-16	$ 1,133.36
Jun-16	$ 1,187.66
May-16	$ 1,187.66
Apr-16	$ 1,165.94
Mar-16	$ 1,176.80
Feb-16	$ 1,144.22
Jan-16	$ 1,079.06
Dec-15	$ 1,144.22
Nov-15	$ 1,133.36
Oct-15	$ 1,132.03
Sep-15	$ 1,004.87
Aug-15	$ 1,025.55
Jul-15	$ 1,066.91
Jun-15	$ 1,077.25
May-15	$ 1,046.23
Apr-15	$ 1,066.91
Mar-15	$ 1,056.57
TOTALS	**$ 30,748.40**

Government Center East - 1200 Garage, 350 Garage

Account #	2015289	**Meter #**	200208447-M
Rate		**Address**	
Meter Size	2"	**Meter Type**	W/S

Date	Total Charges
Mar-17	$ 282.84
Feb-17	$ 260.04
Jan-17	$ 271.44
Dec-16	$ 260.04
Nov-16	$ 217.15
Oct-16	$ 262.19
Sep-16	$ 269.02
Aug-16	$ 247.30
Jul-16	$ 65.16
Jun-16	$ 429.44
May-16	$ 182.14
Apr-16	$ 193.00
Mar-16	$ 203.86
Feb-16	$ 203.86
Jan-16	$ 193.00
Dec-15	$ 214.72
Nov-15	$ 236.44
Oct-15	$ 208.20
Sep-15	$ 206.43
Aug-15	$ 196.09
Jul-15	$ 206.43
Jun-15	$ 227.11
May-15	$ 227.11
Apr-15	$ 227.11
Mar-15	$ 237.45
TOTALS	**$ 5,727.57**

The above account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

Government Center East - Annex

Account # 2015131		**Meter #**	071526051-M
Rate		**Address**	
Meter Size 6"		**Meter Type**	W/F

Date	Total Charges
Mar-17	$ 1,833.59
Feb-17	$ 1,718.39
Jan-17	$ 1,881.59
Dec-16	$ 2,164.79
Nov-16	$ 1,570.55
Oct-16	$ 2,171.46
Sep-16	$ 2,239.41
Aug-16	$ 2,193.71
Jul-16	$ 2,079.46
Jun-16	$ 2,088.60
May-16	$ 1,777.84
Apr-16	$ 1,887.52
Mar-16	$ 1,846.39
Feb-16	$ 1,700.15
Jan-16	$ 1,805.26
Dec-15	$ 2,029.19
Nov-15	$ 1,892.09
Oct-15	$ 2,176.38
Sep-15	$ 1,618.50
Aug-15	$ 1,744.65
Jul-15	$ 2,136.15
Jun-15	$ 2,018.70
May-15	$ 2,149.20
Apr-15	$ 1,392.30
Mar-15	$ 1,127.30
TOTALS	**$ 47,243.17**

Government Center East - Governmental Center

Account # 2015134		**Meter #**	061344071-M
Rate		**Address**	
Meter Size 6"		**Meter Type**	W/S

Date	Total Charges
Mar-17	$ 4,815.90
Feb-17	$ 5,894.70
Jan-17	$ 4,770.30
Dec-16	$ 7,614.30
Nov-16	$ 4,235.75
Oct-16	$ 9,366.66
Sep-16	$ 14,851.83
Aug-16	$ 14,582.59
Jul-16	$ 13,339.34
Jun-16	$ 13,992.66
May-16	$ 12,196.58
Apr-16	$ 12,944.84
Mar-16	$ 14,050.25
Feb-16	$ 12,882.43
Jan-16	$ 12,625.28
Dec-15	$ 6,775.87
Nov-15	$ 6,836.95
Oct-15	$ 7,739.71
Sep-15	$ 7,300.01
Aug-15	$ 5,037.21
Jul-15	$ 8,074.86
Jun-15	$ 5,244.01
May-15	$ 7,327.67
Apr-15	$ 6,636.97
Mar-15	$ 5,485.74
TOTALS	**$224,622.41**

The above account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

Government Center East - Annex

Account #	2015129	Meter #	201201550-M
Rate		Address	
Meter Size	.0625"	Meter Type	W/S

Date	Total Charges
Mar-17	$ 1,930.29
Feb-17	$ 1,645.17
Jan-17	$ 1,728.33
Dec-16	$ 1,942.17
Nov-16	$ 691.83
Oct-16	$ 350.49
Sep-16	$ 378.91
Aug-16	$ 141.25
Jul-16	$ 16.76
Jun-16	$ 265.74
May-16	$ 118.62
Apr-16	$ 16.76
Mar-16	$ 28.08
Feb-16	$ 28.08
Jan-16	$ 73.35
Dec-15	$ 39.40
Nov-15	$ 16.76
Oct-15	$ 16.14
Sep-15	$ 15.96
Aug-15	$ 15.96
Jul-15	$ 156.04
Jun-15	$ 209.91
May-15	$ 199.14
Apr-15	$ 209.91
Mar-15	$ 91.39
TOTALS	**$ 10,326.44**

Government Center East - 1200 Garage, 350 Garage

Account #	2015241	Meter #	16002006-M
Rate		Address	
Meter Size	1.5"	Meter Type	IRR

Date	Total Charges
Mar-17	$ 494.39
Feb-17	$ 392.47
Jan-17	$ 455.19
Dec-16	$ 80.48
Nov-16	$ 318.86
Oct-16	$ 553.69
Sep-16	$ 597.69
Aug-16	$ 522.99
Jul-16	$ 433.35
Jun-16	$ 425.88
May-16	$ 358.65
Apr-16	$ 82.15
Mar-16	$ 71.09
Feb-16	$ 104.27
Jan-16	$ 220.40
Dec-15	$ 575.28
Nov-15	$ 545.40
Oct-15	$ 945.42
Sep-15	$ 427.09
Aug-15	$ 904.54
Jul-15	$ 822.06
Jun-15	$ 780.82
May-15	$ 657.10
Apr-15	$ 832.37
Mar-15	$ 729.27
TOTALS	**$ 12,330.90**

The above account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

Government Center East - Government Center

Account #	2015287	Meter #	200208445-M
Rate		Address	
Meter Size	2"	Meter Type	IRR

Date	Total Charges
Mar-17	$ 44.19
Feb-17	$ 44.19
Jan-17	$ 44.19
Dec-16	$ 44.39
Nov-16	$ 36.83
Oct-16	$ 42.09
Sep-16	$ 48.34
Aug-16	$ 42.09
Jul-16	$ 42.09
Jun-16	$ 42.09
May-16	$ 42.09
Apr-16	$ 42.09
Mar-16	$ 42.09
Feb-16	$ 42.09
Jan-16	$ 42.09
Dec-15	$ 42.09
Nov-15	$ 42.09
Oct-15	$ 40.52
Sep-15	$ 40.09
Aug-15	$ 40.09
Jul-15	$ 40.09
Jun-15	$ 40.09
May-15	$ 40.09
Apr-15	$ 40.09
Mar-15	$ 40.09
TOTALS	**$ 1,046.27**

Government Center East - 1200 Garage, 350 Garage

Account #	2015290	Meter #	200300966-M
Rate		Address	
Meter Size	1	Meter Type	IRR

Date	Total Charges
Mar-17	$ 14.84
Feb-17	$ 14.84
Jan-17	$ 14.84
Dec-16	$ 14.84
Nov-16	$ 11.87
Oct-16	$ 14.35
Sep-16	$ 14.13
Aug-16	$ 14.13
Jul-16	$ 14.13
Jun-16	$ 14.13
May-16	$ 14.13
Apr-16	$ 14.13
Mar-16	$ 14.13
Feb-16	$ 14.13
Jan-16	$ 14.13
Dec-15	$ 14.13
Nov-15	$ 14.13
Oct-15	$ 13.60
Sep-15	$ 13.46
Aug-15	$ 13.46
Jul-15	$ 13.46
Jun-15	$ 13.46
May-15	$ 13.46
Apr-15	$ 13.46
Mar-15	$ 13.46
TOTALS	**$ 348.83**

The above account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

Government Center East - Annex

Account #	2015132	Meter #	
Rate		Address	
Meter Size	NA	Meter Type	FLS

Date	Total Charges
Mar-17	$ 268.29
Feb-17	$ 268.29
Jan-17	$ 268.29
Dec-16	$ 268.29
Nov-16	$ 214.63
Oct-16	$ 259.77
Sep-16	$ 255.51
Aug-16	$ 255.51
Jul-16	$ 255.51
Jun-16	$ 255.51
May-16	$ 255.51
Apr-16	$ 255.51
Mar-16	$ 255.51
Feb-16	$ 255.51
Jan-16	$ 255.51
Dec-15	$ 255.51
Nov-15	$ 255.51
Oct-15	$ 246.59
Sep-15	$ 243.34
Aug-15	$ 243.34
Jul-15	$ 243.34
Jun-15	$ 243.34
May-15	$ 243.34
Apr-15	$ 243.34
Mar-15	$ 243.34
TOTALS	**$ 6,308.14**

Government Center East - ERP & Print

Account #	2015133	Meter #	
Rate		Address	
Meter Size	NA	Meter Type	FLS

Date	Total Charges
Mar-17	$ 134.90
Feb-17	$ 134.90
Jan-17	$ 134.90
Dec-16	$ 134.90
Nov-16	$ 238.54
Oct-16	$ 128.48
Sep-16	$ 128.48
Aug-16	$ 128.48
Jul-16	$ 128.48
Jun-16	$ 128.48
May-16	$ 128.48
Apr-16	$ 128.48
Mar-16	$ 128.48
Feb-16	
Jan-16	$ 128.48
Dec-15	$ 128.48
Nov-15	$ 128.48
Oct-15	$ 128.48
Sep-15	$ 122.36
Aug-15	$ 122.36
Jul-15	$ 122.36
Jun-15	$ 122.36
May-15	$ 122.36
Apr-15	$ 122.36
Mar-15	$ 122.36
TOTALS	**$ 3,176.42**

The above account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

Government Center East - Governmental Center

Account #	2015135	**Meter #**	
Rate		**Address**	
Meter Size	NA	**Meter Type**	FLS

Date	Total Charges
Mar-17	$ 428.34
Feb-17	$ 428.34
Jan-17	$ 428.34
Dec-16	$ 428.34
Nov-16	$ 342.67
Oct-16	$ 414.74
Sep-16	$ 407.94
Aug-16	$ 407.94
Jul-16	$ 407.94
Jun-16	$ 407.94
May-16	$ 407.94
Apr-16	$ 407.94
Mar-16	$ 407.94
Feb-16	$ 407.94
Jan-16	$ 407.94
Dec-15	$ 407.94
Nov-15	$ 407.94
Oct-15	$ 393.69
Sep-15	$ 388.51
Aug-15	$ 388.51
Jul-15	$ 388.51
Jun-15	$ 388.51
May-15	$ 388.51
Apr-15	$ 388.51
Mar-15	$ 388.51
TOTALS	**$ 10,071.37**

The above account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

All recommended FIMs for this facility have been removed from the final scope by Broward County. Please refer to Section G of this report for documentation of these originally proposed opportunities.

D.3. BCJC N Wing

FACILITY DESCRIPTION

The BCJC North Wing is, as its name suggest, a wing of the Broward County Judicial Complex. This 7 story, 245,745 square foot facility is located at 201 Southeast 6th Street, Ft Lauderdale, FL 33301. This building is the main judicial branch of the Broward County Courts system and was constructed in 1995. The building features 4 stories of court rooms with waiting areas and offices, a third floor lobby, and a law library and offices on the first and second floor. The North Wing holds the chiller plant that feeds chilled water to several wings of the judicial complex. The general hours of this facility are as follows:

Facility Hours of Operation:

Monday – Friday: 8AM – 5PM
Saturday – Sunday: Closed

COOLING SYSTEM:

Cooling for the building is provided by three (3) 740 ton McQuay water cooled chillers located in the chiller room at the base of the building. Only two out of three chillers are functional, per the data collected during the investment grade audit. It is important to note that Broward County started the process of replacing the existing chillers with a 3rd party during the investigation period of this investment grade audit. Siemens was not involved in the replacement process of these chillers.

McQuay Water Cooled Chillers

The chilled water system is equipped with three (3) 100 ton chilled water pumps on the return water lines and three (3) 100 ton condenser water pumps. All six pumps are not equipped with variable frequency drives.



Chilled Water and Condenser Water Pumps

The chilled water system is equipped with three (3) Evapco cooling towers


Cooling Towers

A total of thirty (30) water cooled air handlers where found in the north wing tower. Some of the air handlers were equipped with variable frequency drives to control the CFM output of the air handlers.






Air Handlers

Other pieces of mechanical equipment were found during the site visit. A small 5 ton DX York unit is outside of the North Wing. The area which this unit serves could not be determined at the time of the site visit. Two (2) water heaters were found inside the chiller room that provide hot water for the North Wing.


Other Mechanical Equipment

The table below summarizes the nameplate specifications of the equipment that was documented during the site visit and investigation of this facility.

BROWARD COUNTY FLORIDA

SIEMENS

Nameplate data of mechanical equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
BCJC N Wing												
Chiller 1	McQuay	PEH100	3X70101200	R-134A	1992		740					
Chiller 2	McQuay	PEH100	5XFC101100	R-134A	1992		740					
Chiller 3	McQuay	PEH100	5XF0100800	HFC-134A	2003		740	460	3	552		395.8
CHWP 3		M2555T	4E057W116H1		2008	100		460	3	119	94.10%	79.6
CHWP 2		M2555T	16301Y101			100		460	3	115	91.70%	81.5
CHWP 1	Baldor	12555T				100		460	3	115	91.70%	81.5
CWP 3	Baldor	M2555T	4E057W116H1			100		460	3	119	94.10%	79.6
CWP2	Baldor	M2555T	16301Y101			100		460	3	115	91.70%	77.0
CWP 1	Baldor	M2555T	4E057W116H1		with VFD (c	100		460	3	119	94.10%	79.6
DX Unit	York	H1RD060S46B	W0A9517988	R-22	compressor		5	460	3	8.4	11	6.0
					fan			460	1	0.7		0.3
DX AHU		MA20DN41B			fan	1		460	1	3.7		1.5
OA Fan 1	Scrobic Air	TD150			fan	15		460	3	19.5	89.50%	14.0
OA Fan 2	Scrobic Air	B0154BLE1BM			fan	15		460	3	19.5	89.50%	14.0
AHU-1N	Snyder	MSL128CH		1st Floor	with VFD							
AHU-2N	Snyder	MSL137DH		1st Floor	with VFD							
AHU-3	Snyder	MSL122DH		1st Floor	with VFD							
AHU-4	Snyder			1st Floor	with VFD							
AHU-5	Snyder			2nd Floor	with VFD							
AHU-6	Snyder			2nd Floor	with VFD							
AHU-26	McQuay			2nd Floor	hanging							
AHU-31	McQuay			2nd Floor	hanging							
AHU-7	McQuay	MSL141DH		3rd Floor	with VFD							
AHU-8N	Snyder	MSL141DH		3rd Floor	with VFD							
AHU-9	McQuay	LSL104CV		3rd Floor								
AHU-27		MSL150DH		3rd Floor	with VFD							
AHU-10				4th Floor	with VFD							
AHU-11	Snyder	MSL141DH		4th Floor	with VFD							
AHU-12	Snyder	MSL134CH		4th Floor	with VFD							
AHU-13				5th Floor	with VFD							
AHU-14				5th Floor	with VFD							
AHU-15				5th Floor	with VFD							
AHU-16				6th Floor	with VFD							
AHU-17				6th Floor	with VFD							
AHU-18				6th Floor	with VFD							
AHU-28	York	AP 400	CHKM 07117D	6th Floor	with VFD	30		460	3	37.5		26.9
AHU-29	York	AP 360	CHKM 07118D	6th Floor	with VFD	25		460	3	30.3		21.7
AHU-30	York	AP 360	CHKM 07116D	6th Floor	with VFD	25		460	3	30.3		21.7
Cooling Tower 1	Evapco					30		460	3	34	93.60%	23.6
Cooling Tower 2	Evapco					30		460	3	34	93.60%	23.6
Cooling Tower 3	Evapco					30		460	3	34	93.60%	23.6
Water Heater	Lochnivar	100148508	103228876	element 1				480	3			
				element 2				480	3			
				element 3				480	3			
Water Heater	Lochnivar	100148508	103241116	element 1				480	3			
				element 2				480	3			
				element 3				480	3			

LIGHTING SYSTEM:

Interior lighting consists of T8 lighting primarily in 2x4 fixtures and other fixtures of various wattages including T8 2x2 lighting fixtures with U shape bulbs.

T8 Interior Lighting

Aside from T8 lighting, the facility also has compact fluorescent and high intensity discharge lighting.

Compact Fluorescent and HID Lighting

The exterior lighting for this facility includes metal halide and high intensity discharge lighting.

Exterior Lighting Examples

DOMESTIC WATER SYSTEM:

Domestic water usage is primarily in the restrooms but also includes kitchen sinks in break rooms. Fixtures and water closets are operated manually and with motion sensors. The following are example of the types of fixture found within facility:

- 2.2 and 0.5 gpm faucets
- 1.5 gpf urinals
- 3.5 and 1.6 gpf toilets
- 2.5 gpm kitchen sinks
- Holding cell water fixtures

Water Fixture Examples

BUILDING CONTROLS SYSTEM:

The building is equipped with a JCI building automation system. Available trending data was downloaded from the BAU. The following lists the available points being trended:

- Chiller 1, 2, and 3
  - supply and return temperatures
  - amperage
  - wattage
  - water flow rate
- Chilled water loop
  - return temperature
  - water flow rate
- Condenser water loop
  - supply and return temperatures
  - supply temperature set point
- AHU 1-30
  - fan status
  - supply temperature
  - static pressure set point
  - static pressure


Building Controls

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric use at this facility is monitored by one (1) electric meter. The billing account utilizes the Commercial/Industrial Load Control Agreement (CILC-1D) rate structure. When creating the baseline (shown below), the most recent 24 month billing data was utilized (obtained directly from the Florida Power and Light website).

The following table documents both the rate structure values used to calculate energy savings, and the established demand and consumption values representing baseline electric usage for the facility.

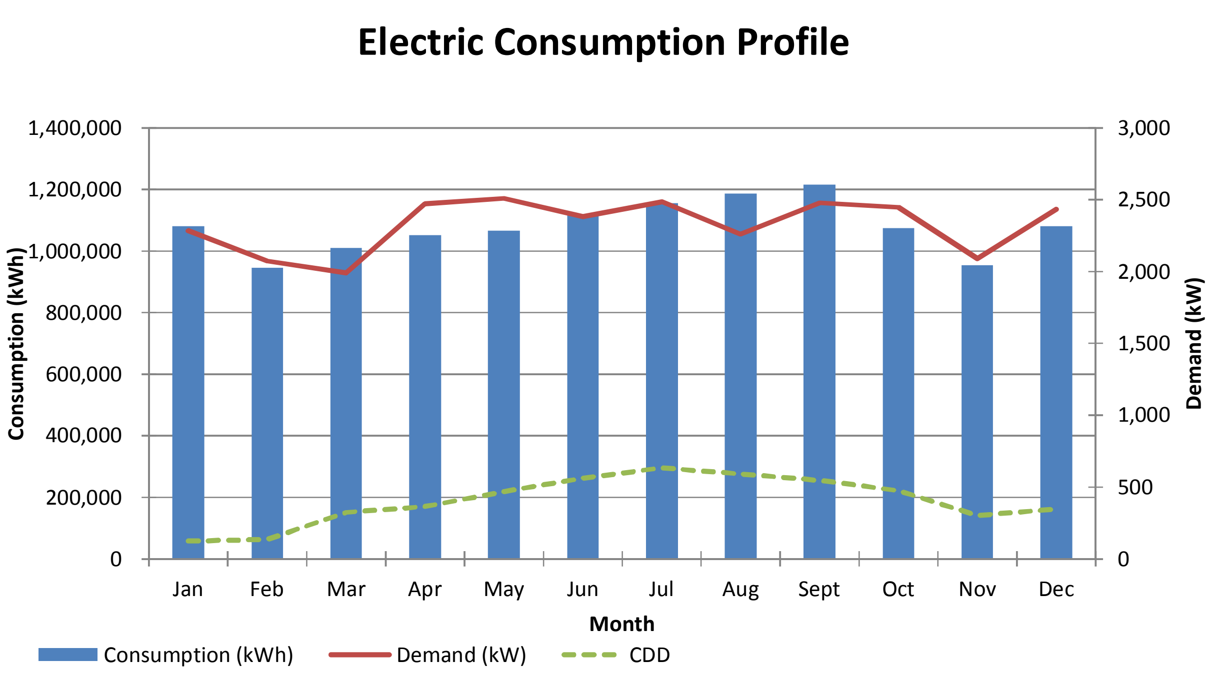
Electric Baseline Summary

Facility	# of Meters	Rate Structure	Year-Round		$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak				
BCJC N Wing	1	CILC-1D	$0.04809	$0.04224	$ 13.04	12,939,960	27,906	2619

The data in the table above was generated using the following electric billing data.

Meter RV763V0; Account: 20375-29597; Address: 220 SE 6th Street

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak				Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 225	1,129,200	342,154	787,046	$ 46,737	2,370	$ -	$ 503	$ 1,948	$ 4,773	$ 82,594
Jul-15	$ 225	1,174,800	355,971	818,829	$ 48,624	2,431	$ -	$ 514	$ 1,991	$ 4,878	$ 84,419
Aug-15	$ 225	1,110,000	336,337	773,663	$ 45,942	1,971	$ -	$ 481	$ 1,863	$ 4,566	$ 79,005
Sep-15	$ 225	1,082,880	328,119	754,761	$ 44,820	2,405	$ -	$ 488	$ 1,889	$ 4,629	$ 80,101
Oct-15	$ 225	996,480	301,939	694,541	$ 41,244	2,366	$ -	$ 468	$ 1,810	$ 4,434	$ 76,730
Nov-15	$ 225	954,960	289,359	665,601	$ 39,525	2,091	$ -	$ 444	$ 1,720	$ 4,213	$ 72,910
Dec-15	$ 225	1,081,440	327,683	753,757	$ 44,760	2,433	$ -	$ 482	$ 1,868	$ 4,575	$ 79,175
Jan-16	$ 225	1,081,440	327,683	753,757	$ 44,760	2,284	$ -	$ 462	$ 1,787	$ 4,378	$ 75,757
Feb-16	$ 225	946,080	286,668	659,412	$ 39,158	2,072	$ -	$ 422	$ 1,632	$ 3,998	$ 69,188
Mar-16	$ 225	1,010,160	306,084	704,076	$ 41,810	1,991	$ -	$ 436	$ 1,688	$ 4,135	$ 71,546
Apr-16	$ 225	1,050,480	318,302	732,178	$ 43,479	2,471	$ -	$ 444	$ 1,718	$ 4,210	$ 72,844
May-16	$ 225	1,027,680	311,393	716,287	$ 42,535	2,398	$ -	$ 440	$ 1,704	$ 4,175	$ 72,246
Jun-16	$ 225	1,105,920	335,100	770,820	$ 45,774	2,398	$ -	$ 458	$ 1,774	$ 4,347	$ 75,221
Jul-16	$ 225	1,133,760	343,536	790,224	$ 46,926	2,541	$ -	$ 471	$ 1,822	$ 4,463	$ 77,227
Aug-16	$ 225	1,262,880	382,660	880,220	$ 52,270	2,549	$ -	$ 497	$ 1,923	$ 4,711	$ 81,515
Sep-16	$ 225	1,349,520	408,913	940,607	$ 55,856	2,550	$ -	$ 518	$ 2,004	$ 4,910	$ 84,974
Oct-16	$ 225	1,153,200	349,426	803,774	$ 47,730	2,530	$ -	$ 472	$ 1,827	$ 4,476	$ 77,459
Nov-16	$ 225				$ -		$ -	$ -	$ -	$ -	
Dec-16	$ 225				$ -		$ -	$ -	$ -	$ -	
Jan-17	$ 225				$ -		$ -	$ -	$ -	$ -	
Feb-17	$ 225				$ -		$ -	$ -	$ -	$ -	
Mar-17	$ 225				$ -		$ -	$ -	$ -	$ -	
Apr-17	$ 225				$ -		$ -	$ -	$ -	$ -	
May-17	$ 225	1,104,480	334,664	769,816	$ 45,714	2,619	$31,796.92	$ 519	$ 2,009	$ 4,923	$ 85,187
Yearly Averages		**12,939,960**	**3,920,885**	**9,019,075**	**$ 408,833**	**27,906**	**$15,898.46**	**$4,260**	**$ 16,488**	**$ 40,397**	**$919,761**



The energy use profile, illustrated above, is influenced by cooling needs throughout the year, and identified by comparing monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is not constant from month to month, meeting building consumption needs. The average peak for the 24 month period evaluated occurs in September, while the average low occurs in February; this further confirms the influence of outdoor weather conditions on building electric consumption.

The billing is analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
BCJC N Wing	Courthouse	52.66	13.2	15.9	19.2

Overall, this building is operating **above the 75th percentile** of comparable facilities. This indicates improvement opportunities beyond the standard equipment efficiency improvements.

UTILITY DATA ANALYSIS - WATER

The following table summarizes the water consumption data that was available for this facility.

BCJC North

Account #	2097110	**Meter #**	70134765-M
Rate			
Meter Size	8"	**Meter Type**	W/S/ST/+F

Date	Total Charges
Mar-17	$ 59,184.64
Feb-17	$ 80,384.25
Jan-17	$ 71,982.26
Dec-16	$ 68,619.55
Nov-16	$ 71,352.54
Oct-16	$ 99,956.79
Sep-16	$ 64,144.31
Aug-16	$ 48,635.28
Jul-16	$ 60,594.58
Jun-16	$ 69,478.41
May-16	$ 67,584.34
Apr-16	$ 79,218.22
Mar-16	$ 72,824.11
Feb-16	$ 66,350.79
Jan-16	$ 76,547.41
Dec-15	$ 71,816.90
Nov-15	$ 77,645.16
Oct-15	
Sep-15	$ 85,058.32
Aug-15	
Jul-15	
Jun-15	
May-15	
Apr-15	
Mar-15	
TOTALS	**$1,291,377.86**

This facility only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDIND LEVEL SUMMARY

The following table summarizes the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As previously stated, the fixed cost associated with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
BCJC N Wing	Lighting - Interior	$ 47,553.20	$ -	$ -	$ 13,813	$ 61,366.20	$ 685,399.86	11.2
Breakage Fee							$ 41,776.65	
PA Cost							$ 816.78	
Total		**$ 47,553.20**	**$ -**	**$ -**	**$ 13,813**	**$61,366.20**	**$ 727,993.29**	**11.9**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all proposed lighting scope of work.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize the type of linear LED T8 and T5 lamps used throughout the buildings. We recommend a non-proprietary proven LED tube that will provide the greatest performance and energy savings of other lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp recommended for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that does not require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation, as well as to reduce future maintenance. This LED retrofit strategy being recommended will maintain the recommended light levels, reduce energy consumption, and standardize lamp types.

All fixtures retrofitted will be dry wiped to remove dust and particulate matter, and improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, there is less flexibility in lamp wattage when dealing with U-shaped lamps; installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, and in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Pin-Based Compact Fluorescent Fixtures

In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, our design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps and remove the existing fluorescent ballasts. In some cases it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

LED Replacement for High Intensity Discharge Interior

The replacement of HID (high intensity discharge), including metal halide or high-pressure sodium, provide significant energy reduction opportunities when changing to LED. New types of LED fixtures and retrofit kits can be installed across many existing HID applications not previously available.

Various fixture types utilize HID sources at Broward County, with the most common application in high bay or low bay industrial style fixtures. Due to the efficient optical distribution of LED sources in new fixtures, replacing industrial HID fixtures with new LED industrial high bays is the recommended solution, greatly reducing input power, increasing lighting quality, and extending the life of the system.

Some interior fixture types do not lend themselves to cost-effective replacement , such as decorative sconces, pendants and some parking garage fixtures. In these cases the fixtures will be relamped with high output, screw-based LED lamps, and the ballasts will be removed.

Emergency Lighting

Backup power for emergency lighting is supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of these various systems, existing battery backup ballasts in fluorescent fixtures requires replacement of the battery ballasts as they are not compatible with UL Type B LED lamps. In these cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

NOTE: Some building lighting systems fall outside of the dominant scenario and require an adjusted design approach. For example, some spaces use architectural bowl pendants and sconces with metal halide lamping to indirectly light rooms. Pendants of this type can potentially have very tight lamp compartments that require precise installation of the lamp arc in order to provide smooth distribution. The design proposed for these situations is to replace the HID lamp and ballast with a custom LED board with a dedicated driver in lieu of a screw based LED lamp replacement.

Interior Lighting retrofit scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
BCJC N Wing	Existing T8 Fluorescent - Proposed Retrofit LED	2,546	2,546
	Existing T8 Fluorescent - Proposed New LED Fixture	339	339
	Existing High Intensity Discharge - Proposed Retrofit LED	41	41
	Existing Compact Fluorescent - Proposed Relamp LED	1	1
	Existing Compact Fluorescent - Proposed Retrofit LED	2,212	2,212
	Existing T8 Fluorescent U Tube - Proposed New LED Fixture	20	20

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime of new lighting fixtures are reduced in areas where lighting occupancy sensors are recommended. This runtime reduction was determined based on lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting space operating hours, are provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 590,593 kWh

Annual Electric Demand: 1,607.40 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
BCJC N Wing	Lighting - Interior	$ 47,553.20	$ -	$ -	$ 13,813	$ 61,366.20	$ 685,399.86	11.2

D.4. BCJC States Attorney Office (LTS)

FACILITY DESCRIPTION

The BCJC State Attorney's Office Victim Resource Center is an 8,000 square foot, 2-story, office building located at 16 SE 6th Street, Fort Lauderdale, FL 33301. It was constructed in the 1970s, with a major renovation completed in 1995. The office building consists of a lobby, conference rooms, kitchen, and offices. The hours of operation are as follows:

Monday – Friday: 8:00AM – 5:00PM
Saturday, Sunday: Closed

COOLING SYSTEM:

Cooling is provided by two (2) combined air handler systems, each with three (3) direct expansion (DX) condensing units. The total cooling capacity is approximately 20 Tons. The DX units were manufactured in 2003 and current use R-22 refrigerant. The following table documents nameplate data acquired both onsite and from online Product Data Sheets.

Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	**Mfctr**	**Model**	**Serial**	**Description**	**Notes**	**HP**	**Tons/ MBTU**	**V**	**Ph**	**Amps**	**Eff /EER**	**Cal kW**
BCJC State Attorney Office												
AHU-1		NFCX6000C3	X033660068	HCFC-22	2003	0.75		240	1	6		1.0
DX Unit	Heil	HAC260AKC4	E041019146	compressor	R-22		5	240	1	28.8	12 SEER	4.8
				fan		0.25		240	1	1.5		0.3
AHU-2		NFCX6000C3	X062014422	HCFC-22	2003	0.75		240	1	6		1.0
DX Unit	Heil	HAC260AKA5	E031042841	compressor	R-22		5	240	1	28.8	12 SEER	4.8
				fan		0.25		240	1	1.5		0.3
AHU-3		NFCX6000C3	X033660079	HCFC-22	2003	0.75		240	1	6		1.0
DX Unit	Heil	HAC260AKC4	E041051921	compressor	R-22		5	240	1	28.8	12 SEER	4.8
				fan		0.25		240	1	1.5		0.3
AHU-4		NFCX6000C3	X033660073	HCFC-22	2003	0.75		240	1	6		1.0
DX Unit				compressor	R-22			240	1	28.8	12 SEER	4.8
				fan		0.25		240	1	1.5		0.3
AHU-5		NFCX6000C3	X032014425	HCFC-22	2003	0.75		240	1	6		1.0
DX Unit	Heil	HAC260AKA5	E031626923	compressor	R-22		5	240	1	28.8	12 SEER	4.8
				fan		0.25		240	1	1.5		0.3
AHU-6		NFCX6000C3	X032014424	HCFC-22	2003	0.75		240	1	6		1.2
DX Unit	Heil	HAC260AKA4	L021633160	compressor	R-22		5	240	1	28.8	12 SEER	5.5
				fan		0.25		240	1	1.5		0.3

Each floor is conditioned by a one of these combined systems which consisting of three (3) unified air handlers and three (3) DX units. Each system is located in a mechanical room on the 1st floor. The supply air ducts of each three air handler assembly are connected to a common supply duct for the floor served, and controlled by one thermostat. Only two thermostats were installed to control both systems; one for the 1st floor and another for the 2nd floor. The thermostat of the 1st floor is located inside the mechanical room at the south end of the building. The thermostat corresponding to the 2nd floor system is in the hallway by the return grille.

Air Conditioning System

LIGHTING SYSTEM:

Interior lighting primarily consists of 32 Watt, T8 fluorescent lamps in 2-lamp 2x4 fixtures. No occupancy sensors are installed.

Interior Lighting Examples

DOMESTIC WATER SYSTEM:

Domestic water is limited to the restrooms. Fixtures and water closets are all operated manually. The following are the types of fixture found in the restrooms:

- 2.2 gpm faucets
- 1.0 gpf urinals
- 3.5 and 1.6 gpf toilets

Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM:

The building is not equipped with a building automation system. There are a total of two (2) thermostats that control each bank of AHUs.

HVAC Control Equipment

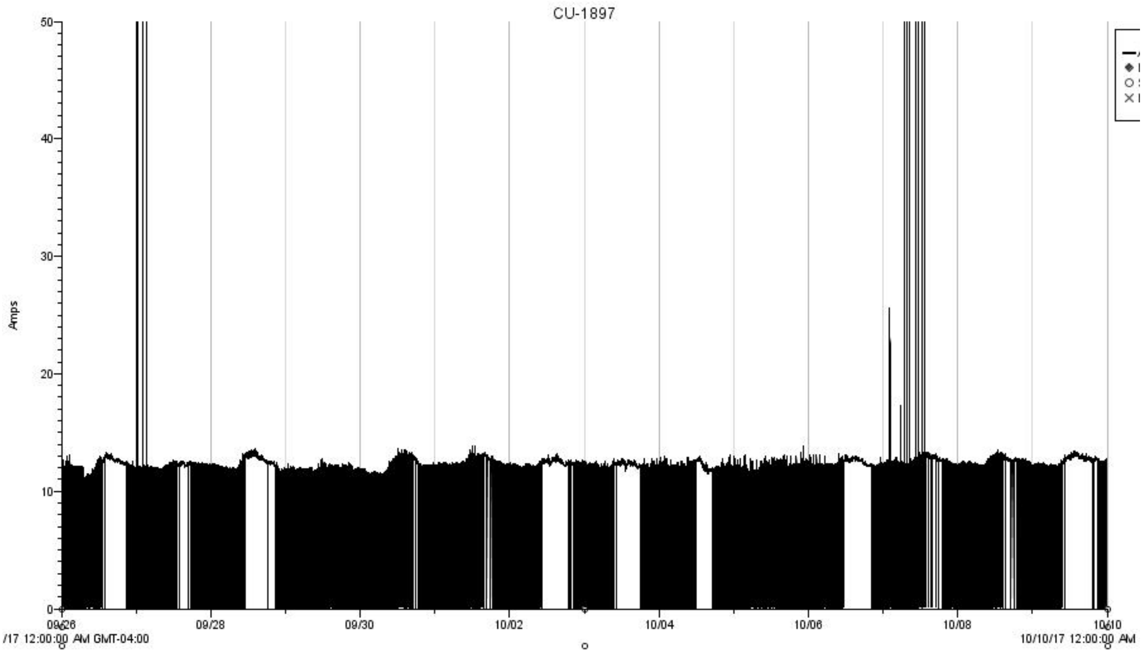
Observed Issues:

- The thermostats measure the average temperature of the 1st and 2nd floors; individual spaces have no control of room temperature
- Temperature distribution in the building is not even. On both floors the North side is warmer than the south side
- Air circulation is not sufficient, and causes an unpleasant smell in the building

TRENDING DATA AQUISITION:

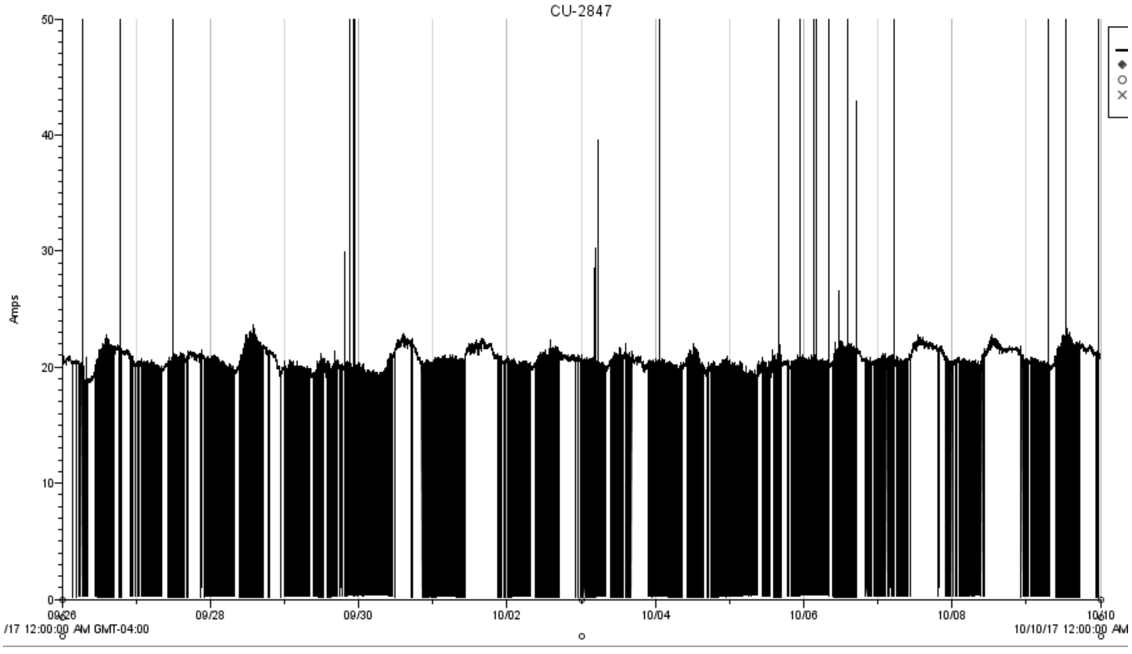
In order to determine the runtime f each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – Condensing Unit: CU-1897



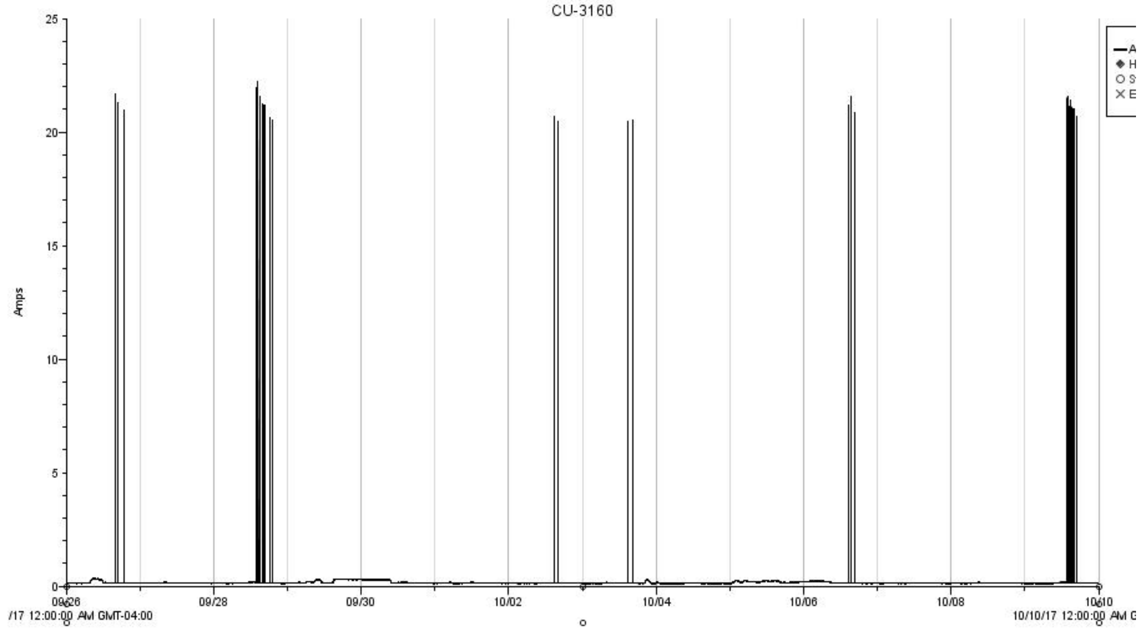
This unit registered an average of 12.42 amps and was operating for a total of 126.38 hours during a one week period.

Trending Data – Condensing Unit: CU-2847



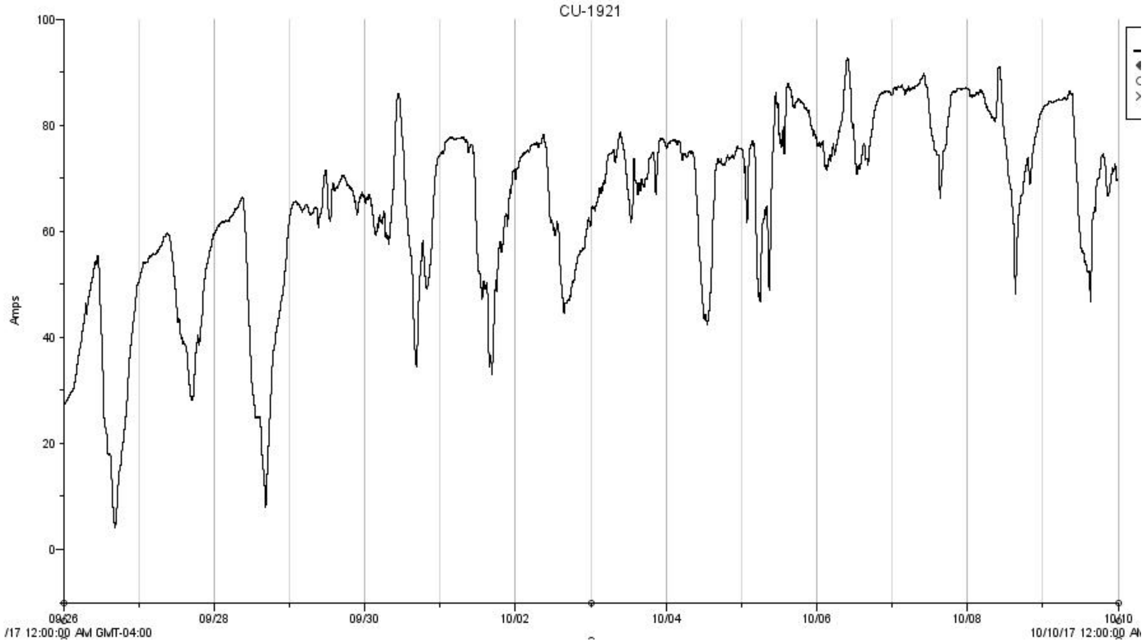
This unit registered an average of 20.78 amps and was operating for a total of 132.94 hours during a one week period.

Trending Data – Condensing Unit: CU-3160



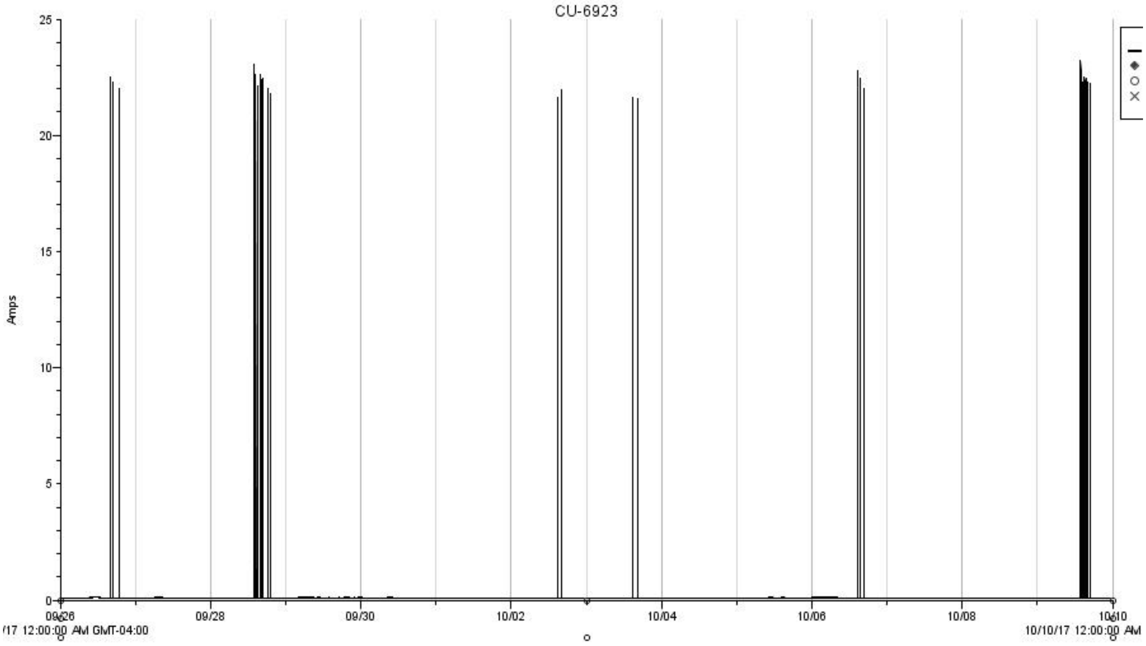
This unit registered an average of 20.98 amps and was operating for a total of 0.62 hours during a one week period.

Trending Data – Condensing Unit: CU-1921



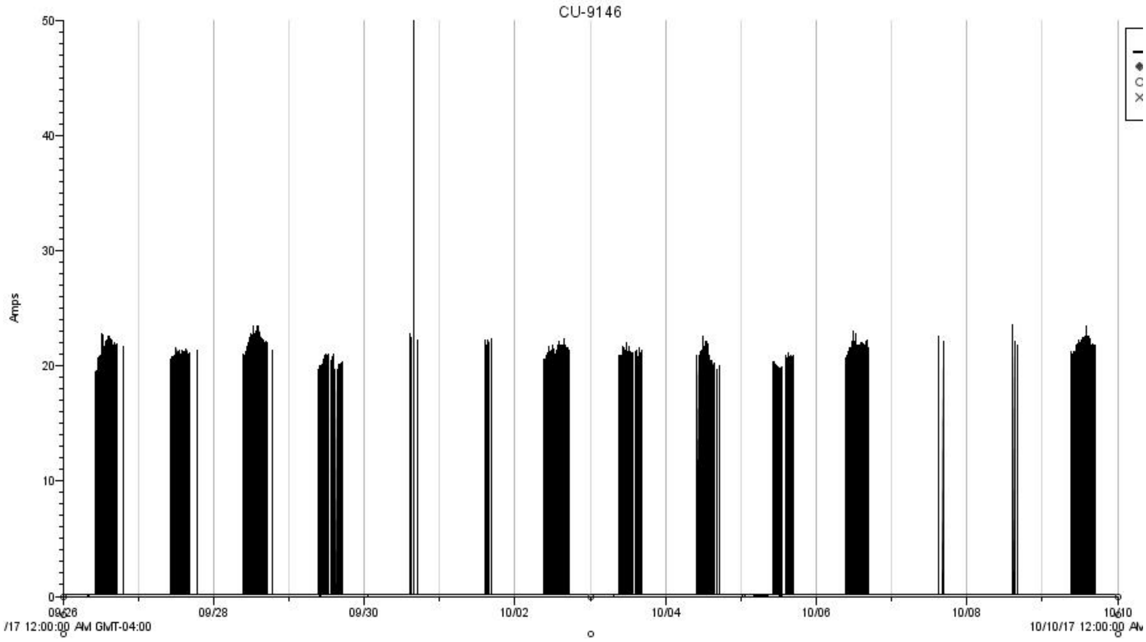
This unit registered an average of 65.70 amps and was operating for a total of 166.98 hours during a one week period.

Trending Data – Condensing Unit: CU-6923



This unit registered an average of 22.10 amps and was operating for a total of 0.61 hours during a one week period.

Trending Data – Condensing Unit: CU-9146



This unit registered an average of 21.31 amps and was operating for a total of 8.75 hours during a one week period.

The following table compares the operating hours of each unit with the hours of service for the facility.

Day	Hours of Service	Run Time CU 9146	Run Time CU 1897	Run Time CU 1921	Run Time CU 2847	Run Time CU 3160	Run Time CU 6923
Monday	8:00AM - 5:00PM	9:30AM - 5:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	Off	Off
Tuesday	8:00AM - 5:00PM	10:30AM - 7:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	Off	Off
Wednesday	8:00AM - 5:00PM	10:00AM - 7:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	Off	Off
Thursday	8:00AM - 5:00PM	9:30AM - 7:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	Off	Off
Friday	8:00AM - 5:00PM	9:30AM - 5:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	Off	Off
Saturday	Closed	2:00PM - 4:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	Off	Off
Sunday	Closed	2:00PM - 4:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	Off	Off

The only unit that is working in a scheduled manner is the unit with serial number ending in 9146. The units with serial number ending in 1897, 1921, and 2847 were running continuously through the week of data logging. The units with serial numbers ending in 3160 and 6923 are designated as "Off" because these units only ran about half an hour for the entire duration of data logging so these units have very seldom use.

BROWARD COUNTY FLORIDA

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized, and was obtained directly from the Florida Power and Light website.

The following table documents both the rate structure values used to calculate energy savings and the established demand and consumption values representing baseline electric usage for the facility.

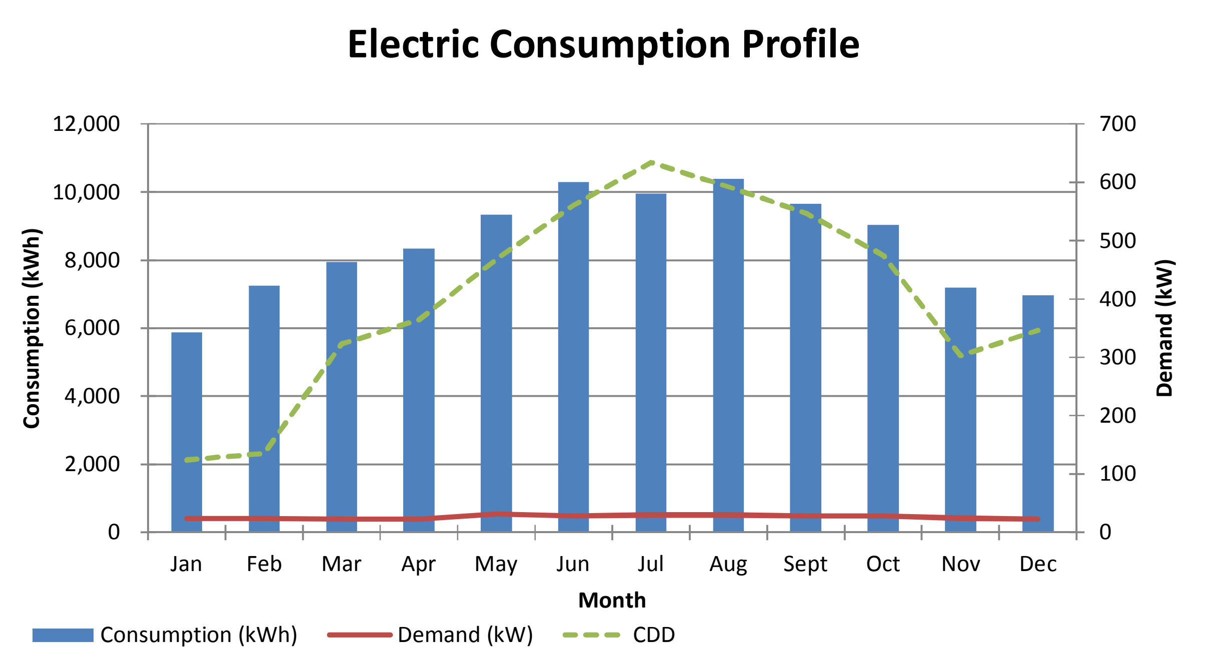
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
BCJC States Attorney Office (LT	1	GSD	$ 0.05963	$ 11.21	102,240	313	35

The data in the table above was generated using the following electric billing data.

Meter KT38148; Account: 8177049023; Address: 16 SE 6TH ST FT LAUDERDALE

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	9,900	$ 545	28	$ 297	$ 49	$ 911
Jul-15	$ 19.48	9,300	$ 512	27	$ 286	$ 47	$ 865
Aug-15	$ 19.48	11,340	$ 625	29	$ 308	$ 50	$ 1,002
Sep-15	$ 19.48	10,560	$ 582	28	$ 297	$ 47	$ 946
Oct-15	$ 19.48	10,080	$ 555	31	$ 329	$ 49	$ 952
Nov-15	$ 19.48	7,680	$ 423	23	$ 244	$ 37	$ 724
Dec-15	$ 19.48	7,380	$ 374	21	$ 223	$ 43	$ 659
Jan-16	$ 19.48	5,640	$ 286	22	$ 222	$ 46	$ 574
Feb-16	$ 19.48	6,900	$ 350	22	$ 222	$ 53	$ 645
Mar-16	$ 19.48	7,980	$ 404	23	$ 233	$ 39	$ 695
Apr-16	$ 19.48	8,100	$ 410	23	$ 233	$ 39	$ 701
May-16	$ 19.48	10,020	$ 508	28	$ 283	$ 48	$ 858
Jun-16	$ 20.24	10,680	$ 508	28	$ 292	$ 72	$ 892
Jul-16	$ 20.24	10,620	$ 506	32	$ 333	$ 75	$ 935
Aug-16	$ 20.24	9,420	$ 448	30	$ 313	$ 67	$ 848
Sep-16	$ 20.24	8,760	$ 417	27	$ 281	$ 61	$ 780
Oct-16	$ 20.24	7,980	$ 380	25	$ 261	$ 57	$ 717
Nov-16	$ 20.24	6,720	$ 320	25	$ 261	$ 52	$ 652
Dec-16	$ 20.24	6,540	$ 311	24	$ 250	$ 89	$ 670
Jan-17	$ 25.00	6,120	$ 315	25	$ 265	$ 53	$ 658
Feb-17	$ 25.00	7,620	$ 392	25	$ 265	$ 79	$ 761
Mar-17	$ 25.00	7,920	$ 425	22	$ 233	$ 61	$ 744
Apr-17	$ 25.00	8,580	$ 461	22	$ 233	$ 64	$ 783
May-17	$ 25.00	8,640	$ 487	35	$ 371	$ 54	$ 937
Yearly Averages		**102,240**	**$ 5,272**	**313**	**$ 3,267**	**$ 666**	**$ 9,456**



The energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year, and identified by comparing monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in June/August, while the average low occurs in January (further confirming the influence of outdoor weather conditions on building electric consumption).

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
BCJC States Attorney Office (LT	Office - Government	12.78	7.9	11.9	17.1

Overall, this building is operating just over the average percentile of comparable facilities. This indicates improvement opportunities are limited to either direct efficiency improvements of existing equipment and/or improved building automation control.

UTILITY DATA ANALYSIS - WATER

The following table summarizes the water consumption data that was available for this facility.

LTS Building

Account #	2028876	**Meter #**	200202926-M
Rate		**Address**	
Meter Size	1"	**Meter Type**	W/S/ST

Date	Total Charges
Mar-17	$ 278.25
Feb-17	$ 130.05
Jan-17	$ 130.05
Dec-16	$ 107.25
Nov-16	$ 123.35
Oct-16	$ 80.96
Sep-16	$ 88.76
Aug-16	$ 99.62
Jul-16	$ 99.62
Jun-16	$ 99.62
May-16	$ 88.76
Apr-16	$ 132.20
Mar-16	$ 88.76
Feb-16	$ 99.62
Jan-16	$ 88.76
Dec-15	$ 88.76
Nov-15	$ 93.58
Oct-15	$ 254.75
Sep-15	$ 92.34
Aug-15	$ 102.68
Jul-15	$ 102.68
Jun-15	$ 102.68
May-15	$ 92.34
Apr-15	$ 102.68
Mar-15	$ 92.34
TOTALS	**$ 2,860.46**

This facility only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDIND LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
BCJC State Attourney's Office (LTS)	Lighting - Interior	$ 1,315.42	$ 719.63	$ -	$ 250	$ 2,285.05	$ 18,716.50	8.2
BCJC State Attourney's Office (LTS)	Split Systems COMBINED	$ 3,087.50	$ 970.90	$ -	$ -	$ 4,058.40	$ 108,494.87	26.7
BCJC State Attourney's Office (LTS)	Split System Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 3,761.69	-
Breakage Fee							$ 1,360.00	
PA Cost							$ 1,368.47	
Total		**$ 4,402.92**	**$ 1,690.53**	**$ -**	**$ 250**	**$ 6,343.45**	**$ 133,701.53**	**21.1**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps: The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures: In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Screw Based Incandescent and Compact fluorescent fixtures: Our design strategy for the replacement of screw based incandescent and compact fluorescent lamps is to replace them with screw based LED where the application permits. LED has become an attractive replacement option when incandescent fixtures are controlled by dimmers due to its excellent dimming capability.

Emergency Lighting: Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
BCJC States Attorney Office (LTS)	Existing T8 Fluorescent - Proposed Retrofit LED	111	111
	Existing Incandescent - Proposed Relamp LED	1	1
	Existing T8 Fluorescent - Proposed Retrofit LED Reduce Lamp Qty	25	25

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 22,061 kWh

Annual Electric Demand: 63.84 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
BCJC State Attourney's Office (LTS)	Lighting - Interior	$ 1,315.42	$ 719.63	$ -	$ 250	$ 2,285.05	$ 18,716.50	8.2

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

Cooling for is provided by two (2) combined air handler systems with three (3) direct expansion (DX) condensing units each. The total cooling capacity is approximately 20 Tons. The DX units were manufactured in 2003 and current use R-22 refrigerant.

PROJECT SCOPE

This FIM addresses the replacement of six (6) DX systems. the current assembly on each floor to a 2-stage system.

The new equipment will be of equal capacity and include, as part of the installation, package new programmable thermostats provided by Siemens. The thermostats will be able to communicated, via their own IP address, to remote BAUs for additional access. The units will be placed on a time of day schedule. The new schedule will command the units to turn on 1.5 hours before the facility opens and 1.5 hours after it closes.

Scope of work

Building	Equipment	Make	Model	Tons	Existing EER	New kW
BCJC State Attorney Office	Condenser	Heil	HAC2S0AKC4	5	12	4.1
BCJC State Attorney Office	Condenser	Heil	HAC260AKA5	5	12	4.1
BCJC State Attorney Office	Condenser	Heil	HAC260AKC4	5	12	4.1
BCJC State Attorney Office	Condenser	-	-		12	2.6
BCJC State Attorney Office	Condenser	Heil	HAC260AKA5	5	12	4.0
BCJC State Attorney Office	Condenser	Heil	HAC260AKA4	5	12	4.6
BCJC State Attorney Office	AHU		NFCX6000C3			
BCJC State Attorney Office	AHU		NFCX6000C3			
BCJC State Attorney Office	AHU		NFCX6000C3			
BCJC State Attorney Office	AHU		NFCX6000C3			
BCJC State Attorney Office	AHU		NFCX6000C3			
BCJC State Attorney Office	AHU		NFCX6000C3			

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 51,783 kWh

Annual Electric Demand: 86.45 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
BCJC State Attourney's Office (LTS)	Split Systems COMBINED	$ 3,087.50	$ 970.90	$ -	$ -	$ 4,058.40	$ 108,494.87	26.7

Code Compliance: Associated with the scope of work summarized above are code compliance issued uncovered by contracted MEPs (mechanical, electrical, and plumbing vendor). This cost was requested to be listed separately. For this facility, the code compliance cost is:

- $3,761.69 - The identified issue at State Attorney Office (LTS) includes changes in outside air requirements as stated by current building code.

D.5. Emergency Operations Center

FACILITY DESCRIPTION

The Emergency Operations Center (EOC) is a 3-story building, with a 4th floor penthouse data room, that is approximately 42,000 square feet size, constructed in 1997. The building is located at 201 NW 84 Ave within a complex that houses two other Broward County facilities: the West Regional Courthouse and the West Regional Library. The EOC building consists of the County's emergency call center and point of convergence for all officials and County workers during states of emergency. The local media is also allocated space within the building to interview, broadcast, and conduct press conference with City officials.

EOC Hours:

Saturday and Sunday:	8AM-12PM
Monday – Friday:	8:30AM – 5PM
Potentially Occupied:	7AM – 6PM; M-F

COOLING SYSTEM:

Cooling for the building is provided by a chiller plant consisting of one (1) air-cooled Trane rotary liquid chiller. The plant is located in a concrete, open-roof enclosure on the exterior of the building. The chiller is original to the building's construction, 1997. It is approximately 110 tons, has a history of failures and the coils are visibly, extensively damaged.

Plant Observations during Visit:

- 43F chilled water setpoint
- Leaving water temperature: 41.4 – incorrect reading at panel
- Returning water temperature: 48.7 – incorrect reading at panel
- Operating RLA: 725

Chiller

Chilled-water is distributed via two (2) available pumps; each with 10 HP motors.

Chiller Plant Pumps

AIR DISTRIBUTION SYSTEM

Chilled water is distributed to approximately three (3) air handling units (AHUs) throughout the building. All AHUs are located in mechanical rooms, used as plenums, and are all equipped with VFDs. The units are capable of modulating return but not outside air intake via dampers. The air is then distributed throughout the building via a variable air volume (VAV) system. The following table breaks down the AHU equipment identified.

Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Emergency Ops Center												
Chiller	Trane	RTAA 1104 XQ01	U05C00676	compressor			110	460	3	101		72.4
				compressor				460	3	84		60.2
Pump -1	Century	T57032	SA5232025			10		460	3	1.5	91.70%	1.0
Pump -2	Century	T57032	SA5231890			10		460	3	1.5	91.70%	1.0
AHU-1	Trane	MCCA010GANO	K96L86770		1996	5		460	3			3.7
AHU-2	Trane	MCCA035BBF	K96L98932	1996	with VFD	5						3.7
AHU-3	Trane	MCCA035BBF	K96L898950		1996	5						3.7
FCU-1						0.5						0.4
FCU-4	lagic Air	48/60-BMW/BMX	960978936		1996	0.75		230	1	5.1		1.1
FCU-5	lagic Air	24-BVW/BVX-A	960978566		1996	0.25		115	1	5.3		0.5
Unitary Unit	Fujitsu											

A 2-ton water source heat pump serves the 4th floor data center. The unit was manufactured in 1996 and is equipped with a 0.75 HP fan motor.

Heat Pumps

A 1-ton water source heat pump serves the 1st floor data center. The unit was manufactured in 1996 and is equipped with a 0.25 HP fan motor. The thermostat associated with this unit has writing that suggests the existence of a night temperature setback.

Heat Pumps

Observed Issued during Site Visit

- One restroom is significantly cold. The same AHU struggles to cool a data center nearby. An additional fan coil unit (FCU) was installed in the data center to help cool the space.

Observed Issues

LIGHTING SYSTEM:

Interior lighting primarily consists of 32 Watt, T8 fluorescent lamps in 2 and 3-lamp fixtures and compact fluorescent lamps in recessed cans.

Interior Lighting Examples

Exterior Lighting consists of 250 Watt HPS lamps in parking lot light in shoebox framed fixtures, wall packs, and garage ceiling mounted box fixtures.

Exterior Lighting Examples

The building makes use of occupancy sensors in various spaces.

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restroom and the chiller plant. The following are example of the types of fixture found within the restroom of the facility:

- 1.5 gpm faucets
- 1.6 gpf toilets
- 2.5 gpm shower heads

All faucets, toilets and urinal are operated manually.

Sample Restroom Fixtures

MISCELLANEOUS EQUIPMENT OF INTEREST

The building's kitchen and cafeteria contains several ice and vending machines.

Miscellaneous Equipment

BUILDING CONTROLS SYSTEM:

The building is equipped with a JCI building automation system. Available trending data was downloaded from the BAU. The following lists the available points being trended:

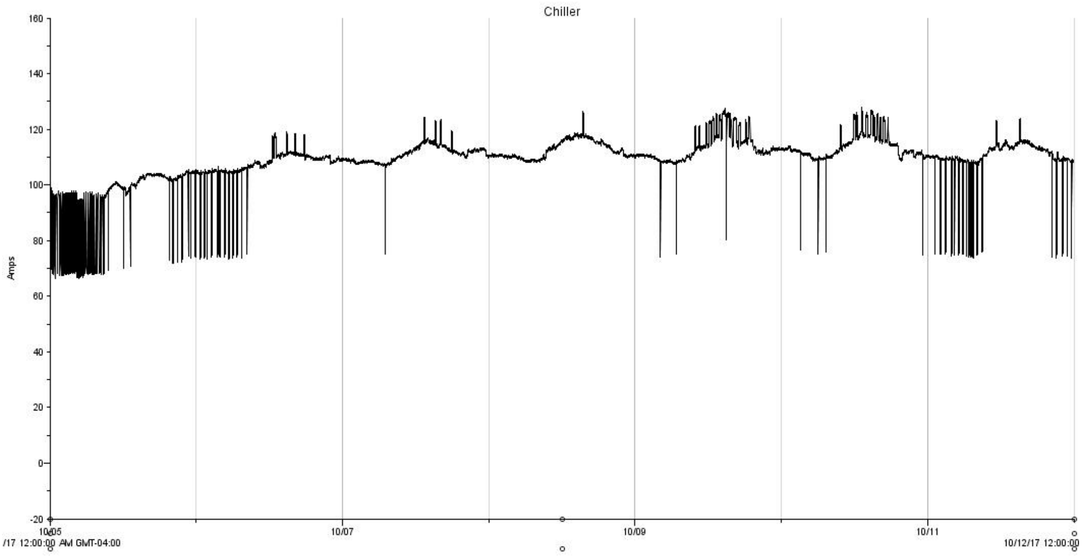
- Chiller supply and return temperatures
- Chilled-water pump 1 and 2 status
- AHU 1
  - fan status
  - supply temperature
  - return air temperature
- AHU 2
  - fan status,
  - supply temperature
  - supply air setpoint
  - return air temperature
  - VFP speed
  - static pressure setpoint
- AHU 3
  - fan status
  - supply temperature
  - supply air setpoint
  - return air temperature
  - VFP speed
  - static pressure setpoint
- AHU 4
  - fan status
  - supply temperature
  - supply air setpoint
  - return air temperature
- FCU-1 fan status and zone temperature
- VAV terminal boxes zone températures


Building Controls

TRENDING DATA AQUISITION:

In order to determine the runtime and power draw of onsite HVAC equipment, data loggers were installed to obtain more data than currently available. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – 30 ton Condensing Unit



This unit registered an average of 60.03 amps and was operating for a total of 96.12 hours during a one week period.

BROWARD COUNTY FLORIDA

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand Time of Use (GSTD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

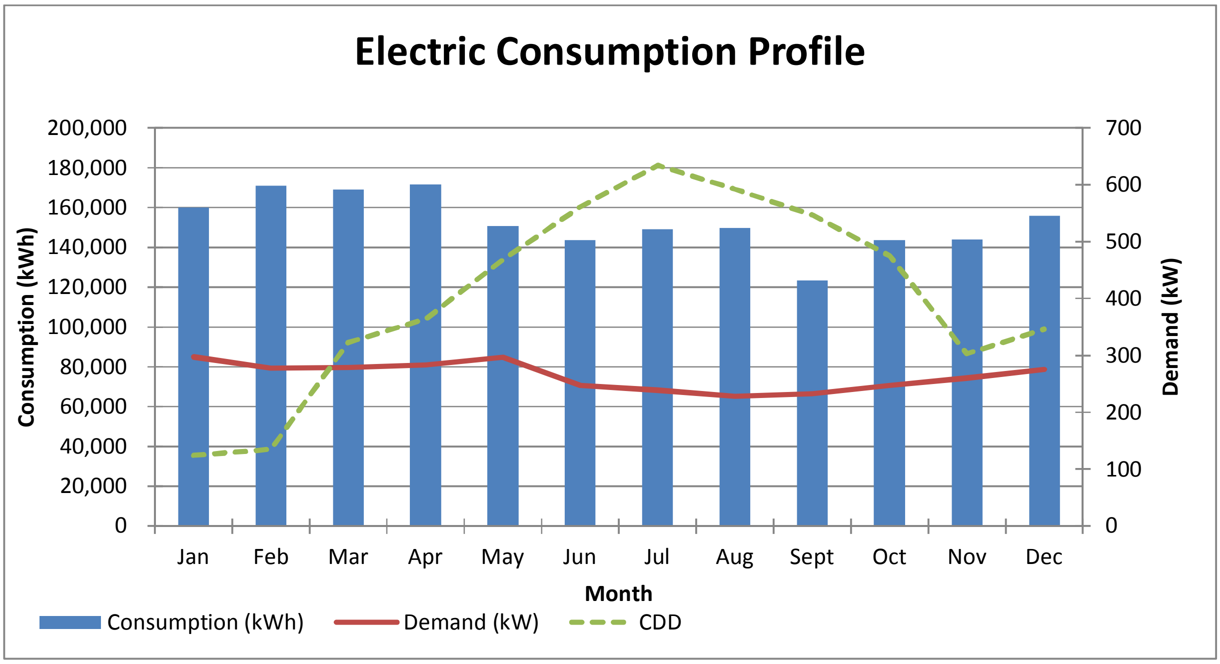
Electric Baseline Summary

Facility	# of Meters	Rate Structure	Year-Round		$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak				
Emergency Ops Center	1	GSTD-1	$0.08275	$0.04458	$ 11.25	1,831,740	3,164	317

The data in the table above was generated using the following electric billing data.

Meter MV56936; Account: 7180926151; Address: 201 NW 84TH AVE, PLANTATION

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak				Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 25.96	148,080	41,880	106,200	$ 7,998	314	$ 3,332	$ 81	$ 293	$ 248	$ 11,977
Jul-15	$ 25.96	163,080	43,320	119,760	$ 8,672	269	$ 2,854	$ 90	$ 298	$ 234	$ 12,174
Aug-15	$ 25.96	151,320	45,000	106,320	$ 8,280	276	$ 2,928	$ 83	$ 290	$ 215	$ 11,821
Sep-15	$ 25.96	171,720	45,120	126,600	$ 9,107	282	$ 2,992	$ 94	$ 313	$ 189	$ 12,722
Oct-15	$ 25.96	148,080	42,960	105,120	$ 8,050	277	$ 2,939	$ 81	$ 284	$ 169	$ 11,550
Nov-15	$ 25.96	133,440	34,920	98,520	$ 7,070	226	$ 2,398	$ 73	$ 245	$ 153	$ 9,965
Dec-15	$ 25.96	131,160	30,600	100,560	$ 6,769	220	$ 2,334	$ 72	$ 236	$ 164	$ 9,601
Jan-16	$ 25.96	141,720	30,840	110,880	$ 6,607	200	$ 2,022	$ 92	$ 224	$ 539	$ 9,509
Feb-16	$ 25.96	109,200	26,400	82,800	$ 5,211	205	$ 2,073	$ 71	$ 189	$ 455	$ 8,024
Mar-16	$ 25.96	135,120	31,320	103,800	$ 6,387	238	$ 2,406	$ 88	$ 228	$ 578	$ 9,713
Apr-16	$ 25.96	137,280	37,080	100,200	$ 6,729	257	$ 2,598	$ 89	$ 242	$ 223	$ 9,908
May-16	$ 25.96	144,720	41,880	102,840	$ 7,222	276	$ 2,790	$ 94	$ 259	$ 236	$ 10,627
Jun-16	$ 26.97	171,960	44,880	127,080	$ 7,816	281	$ 2,928	$ 158	$ 280	$ 673	$ 11,882
Jul-16	$ 26.97	178,920	49,680	129,240	$ 8,257	287	$ 2,991	$ 165	$ 293	$ 704	$ 12,436
Aug-16	$ 26.97	186,360	50,280	136,080	$ 8,539	282	$ 2,938	$ 171	$ 299	$ 719	$ 12,694
Sep-16	$ 26.97	171,360	47,400	123,960	$ 7,900	284	$ 2,959	$ 158	$ 283	$ 648	$ 11,976
Oct-16	$ 26.97	153,240	42,840	110,400	$ 7,084	317	$ 3,303	$ 141	$ 270	$ 622	$ 11,447
Nov-16	$ 26.97	153,960	39,480	114,480	$ 6,969	269	$ 2,803	$ 142	$ 254	$ 584	$ 10,778
Dec-16	$ 26.97	167,160	36,720	130,440	$ 7,310	257	$ 2,678	$ 154	$ 260	$ 595	$ 11,024
Jan-17	$ 25.00	158,040	36,000	122,040	$ 7,575	257	$ 2,724	$ 133	$ 268	$ 628	$ 11,353
Feb-17	$ 25.00	137,640	32,760	104,880	$ 6,648	260	$ 2,756	$ 116	$ 244	$ 574	$ 10,363
Mar-17	$ 25.00	152,400	34,320	118,080	$ 7,633	256	$ 2,714	$ 128	$ 269	$ 640	$ 11,408
Apr-17	$ 25.00	150,600	40,080	110,520	$ 7,765	263	$ 2,788	$ 127	$ 274	$ 653	$ 11,630
May-17	$ 25.00	166,920	48,720	118,200	$ 8,760	275	$ 2,915	$ 140	$ 303	$ 722	$ 12,866
Yearly Average		**1,831,740**	**477,240**	**1,354,500**	**$ 90,179**	**3,164**	**$ 33,082**	**$ 1,371**	**$ 3,199**	**$ 5,582**	**$ 133,724**



The building functions as an emergency response center and, therefore, use fluctuates from minimal to overcapacity. As a result, the energy usage profile, illustrated above, does not adhere to weather conditions and cannot be assumed to be a typical baseline. Instead, the above profile serves as an indication of a minimum energy usage need.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Emergency Ops Center	Office - Government	43.61	7.9	11.9	17.1

Overall, this building is operating above the 75th percentile of what is defined as a government office facility. However, as already mentioned, this facility cannot be compared to a typical government office building

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Emergency Operations Center

Account #	76372-01	**Meter #**	08089931
Rate		**Address**	
Meter Size		**Meter Type**	W/S

Date	Total Charges
Mar-17	$ 321.07
Feb-17	$ 299.79
Jan-17	$ 408.79
Dec-16	$ 272.69
Nov-16	$ 298.49
Oct-16	$ 326.88
Sep-16	$ 285.17
Aug-16	$ 273.01
Jul-16	$ 256.59
Jun-16	$ 257.20
May-16	$ 273.01
Apr-16	$ 276.66
Mar-16	$ 265.11
Feb-16	$ 300.98
Jan-16	$ 254.77
Dec-15	$ 246.87
Nov-15	$ 274.22
Oct-15	$ 283.96
Sep-15	$ 252.37
Aug-15	$ 243.78
Jul-15	$ 249.50
Jun-15	$ 255.81
May-15	$ 271.85
Apr-15	$ 293.63
Mar-15	$ 258.10
TOTALS	**$ 7,000.30**

This account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDIND LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Emergency Operations Cent	Lighting - Interior	$ 11,922.50	$ -	$ -	$ 1,922	$ 13,844.50	$ 143,957.92	10.4
Breakage Fee							$ 7,140.00	
PA Cost							$ 422.46	
Total		**$ 11,922.50**	**$ -**	**$ -**	**$ 1,922**	**$13,844.50**	**$ 151,520.38**	**10.9**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Pin-Based Compact Fluorescent Fixtures

In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, our design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps and remove the existing fluorescent ballasts. In some cases, it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

LED Replacement for Screw Based Incandescent and Compact fluorescent fixtures

Our design strategy for the replacement of screw based incandescent and compact fluorescent lamps is to replace them with screw based LED where the application permits. LED has become an attractive replacement option when incandescent fixtures are controlled by dimmers due to its excellent dimming capability.

LED Replacement for High Intensity Discharge Interior

The replacement of HID (high intensity discharge), including metal halide or high-pressure sodium provide significant energy reduction opportunities when changing to LED. New types of LED fixtures and retrofit kits can be installed across many existing HID applications not previously available.

Various fixture types utilize HID sources at Broward County. The most common application is high bay or low bay industrial style fixtures. Due to the efficient optical distribution of LED sources in new fixtures, replacing industrial HID fixtures with new LED industrial high bays is the recommended solution, greatly reducing input power, increasing lighting quality and extending the life of the system.

Some fixture types don't lend themselves to replacement from a cost perspective for interior spaces, such as decorative sconces, pendants and some parking garage fixtures. In these cases, the fixtures will be relamped with high output, screw-based LED lamps and the ballasts will be removed.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
Emergency Operations Center	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	41	41
	Existing T8 Fluorescent - Proposed Retrofit LED	218	218
	Existing T8 Fluorescent - Proposed New LED Fixture	314	314
	Existing High Intensity Discharge - Proposed Retrofit LED	23	23
	Existing Incandescent - Proposed Relamp LED	30	30
	Existing Compact Fluorescent - Proposed Retrofit LED	49	49

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 136,887 kWh

Annual Electric Demand: 337.44 kW

Fim Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Emergency Operations Center	Lighting - Interior	$ 11,922.50	$ -	$ -	$ 1,922	$ 13,844.50	$ 143,957.92	10.4

D.6. Highway and Bridge Administration

FACILITY DESCRIPTION

The Highway and Bridge Administration actually consists of two (2) single-story buildings located at 1600 NW 30 Ave. The administration building is a 5,711 square foot office space facility. The assembly building is another 5,711 square foot building consisting of a large cafeteria space that has been repurposed for assembly tasks and computer stations.

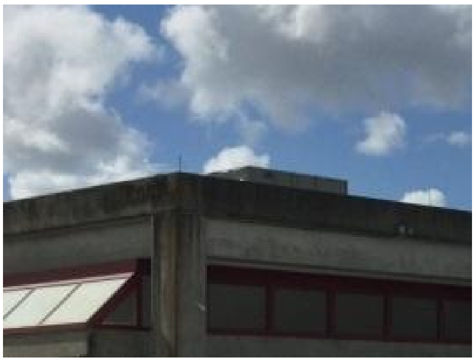
The hours of operations are typically from 6:30AM until 5PM; Mondays through Fridays. Periodically, there are employees that work after hours as far as 7PM into the evening


Highway and Bridge Facilities

COOLING SYSTEM:

The entire building is cooled by one (1) Carrier roof-top unit (RTU). It was reported during the site visit that this unit was recently replaced; within two (2) years.

The assembly building is cooled by one (1) Trane roof-top unit. This unit was reported to have been replaced prior to the Carrier serving the Administration building although still fairly recent; within four (4) years.

Roof-top Units

Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	**Mfctr**	**Model**	**Serial**	**Description**	**Notes**	**HP**	**Tons/ MBTU**	**V**	**Ph**	**Amps**	**Eff /EER**	**Cal kW**
Highway and Bridge Administration												
RTU-1	Carrier	50TC-D24ABA6A	3113P18228	compressor	R-410A		20	460	3	18.6	11	13.3
				compressor	2-stage			460	3	14.7		10.5
				Outdoor fans				460	1	3.6		1.5
				Inddor fan				460	3	8.6		6.2
RTU 2	Trane	TCD240E400BA	916100081D	compressor	2009		20	460	3	19.2	9.7	13.8
				compressor	R-410A			460	3	12.2		8.7
				fan		1		460	1	2.9		1.2
				fan		1		460	1	2.9		1.2

LIGHTING SYSTEM

Interior lighting primarily consists of 32 Watt, T8 fluorescent lamps in either 2 or 4-lamp 2x4 fixtures. The building also consists of 32 watt, 2-lamp, T8 fluorescent, U-bend fixtures.

Interior Lighting Examples

Exterior Lighting consists of HPS parking lights, flood lights, recessed cans, and wall packs.

Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 faucets
- 3.5 gpf toilets
- 1.0 gpf urinals

All water fixtures are operated manually.

Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM

There is a Johnson Controls panel within the assembly building; however, it was reported during the walkthrough that both RTUs are controlled locally via thermostats.

The digital thermostat located in the administration is locked away to prevent tampering. One employee has the key and is responsible for maintain usage schedules and temperature setpoints. It was reported that the temperature setpoint is 72F during occupied hours and 76F during unoccupied hours (which is currently assumed to begin at 8PM, Monday – Friday and weekends).

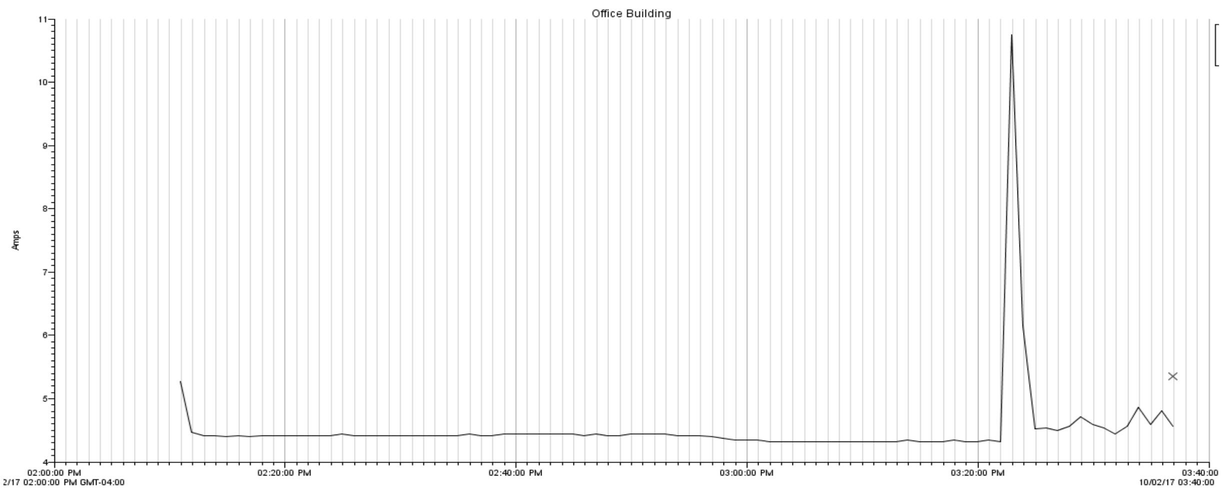
The exterior lighting of the building is controlled via a time clock.

Building Controls

TRENDED DATA ANALYSIS

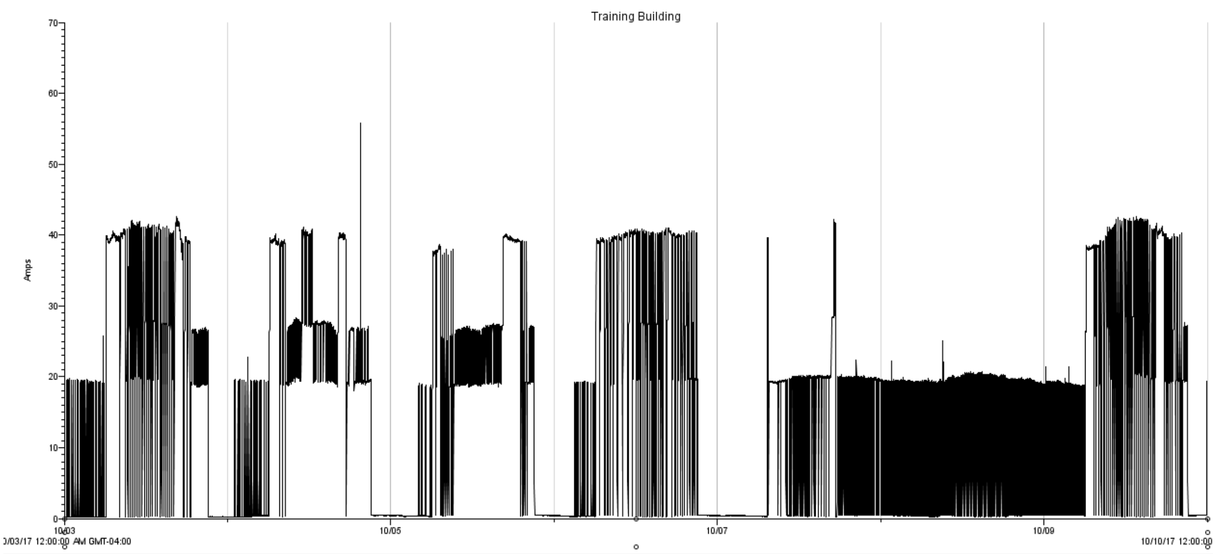
In order to determine the runtime of the chiller currently being considered for replacement as a capital improvement project, data loggers were installed to obtain more data that the current BAU could provide. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – Office Building unit



The data logger failed during trending. Information was not able to be collected for this unit.

Trending Data – Training Building Unit



This unit registered an average of 40 amps when both compressors ran and 19 amps when only one compressor ran. The unit was on a total of 98.85 hours during a one week period.

BROWARD COUNTY FLORIDA

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the Seasonal Demand Time of Use (SDTR-1A) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

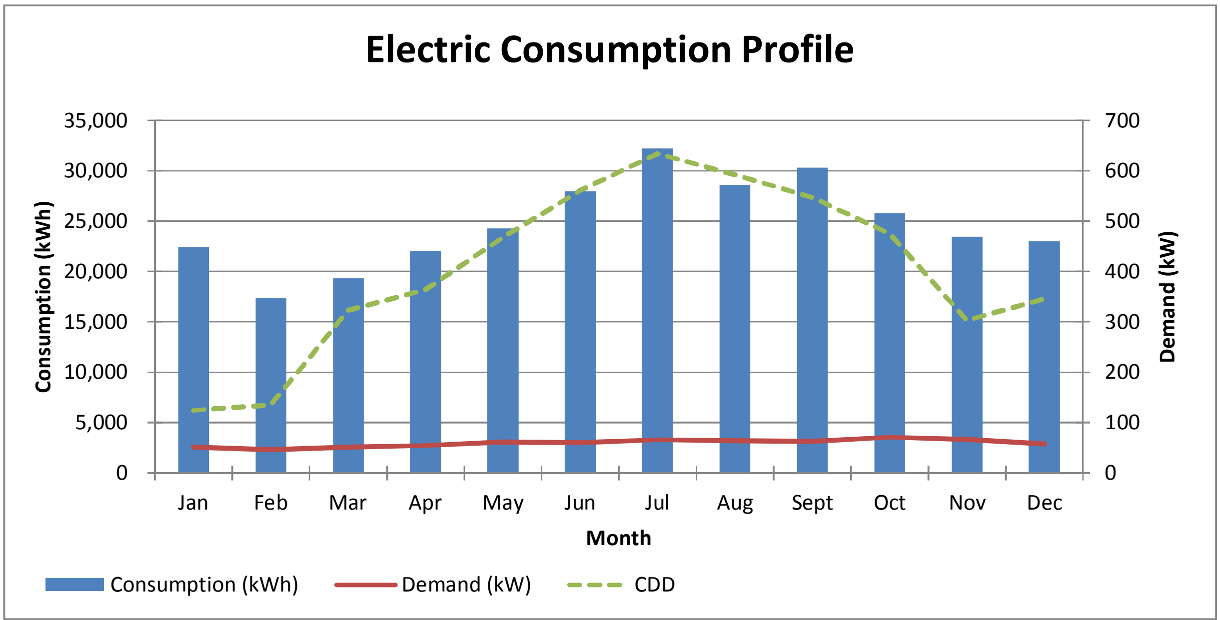
Electric Baseline Summary

Facility	# of Meters	Rate Structure	June - Sept		$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak					
HIGH and BRDG Administration	1	SDTR-1A	$ 0.12879	$ 0.04064	$ 0.05622	$ 10.94	296,700	713	75

The data in the table above was generated using the following electric billing data.

Meter MV3199A; Account: 4591456399; Address: 1600 NW 30TH AVE

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak				Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 25.96	29,040	1,560	27,480	$ 1,208	61	$ 739	$ 16	$ 51	$ 267	$ 2,308
Jul-15	$ 25.96	32,400	3,000	29,400	$ 1,379	71	$ 861	$ 18	$ 58	$ 387	$ 2,729
Aug-15	$ 25.96	30,120	2,880	27,240	$ 1,284	62	$ 751	$ 17	$ 53	$ 364	$ 2,496
Sep-15	$ 25.96	29,460	2,940	26,520	$ 1,259	61	$ 739	$ 16	$ 52	$ 355	$ 2,448
Oct-15	$ 25.96	25,320	1,260	24,060	$ 1,020	75	$ 909	$ 14	$ 50	$ 287	$ 2,306
Nov-15	$ 25.96	25,080	0	25,080	$ 1,010	71	$ 861	$ 14	$ 49	$ 288	$ 2,248
Dec-15	$ 25.96	23,280	0	23,280	$ 938	57	$ 691	$ 13	$ 43	$ 279	$ 1,989
Jan-16	$ 25.96	21,480	0	21,480	$ 1,074	47	$ 460	$ 14	$ 40	$ 97	$ 1,711
Feb-16	$ 25.96	16,080	0	16,080	$ 804	41	$ 401	$ 10	$ 32	$ 76	$ 1,350
Mar-16	$ 25.96	18,240	0	18,240	$ 912	51	$ 499	$ 12	$ 37	$ 93	$ 1,579
Apr-16	$ 25.96	20,880	0	20,880	$ 1,044	46	$ 450	$ 14	$ 39	$ 39	$ 1,612
May-16	$ 25.96	21,900	0	21,900	$ 1,095	53	$ 518	$ 14	$ 42	$ 46	$ 1,742
Jun-16	$ 26.97	26,820	1,560	25,260	$ 1,156	60	$ 706	$ 25	$ 49	$ 118	$ 2,080
Jul-16	$ 26.97	31,980	3,240	28,740	$ 1,493	61	$ 717	$ 29	$ 58	$ 140	$ 2,465
Aug-16	$ 26.97	27,060	3,120	23,940	$ 1,295	65	$ 764	$ 25	$ 54	$ 130	$ 2,295
Sep-16	$ 26.97	31,140	3,180	27,960	$ 1,456	65	$ 764	$ 29	$ 58	$ 134	$ 2,469
Oct-16	$ 26.97	26,280	1,440	24,840	$ 1,227	67	$ 675	$ 24	$ 50	$ 115	$ 2,119
Nov-16	$ 26.97	21,780	0	21,780	$ 1,017	63	$ 635	$ 20	$ 43	$ 101	$ 1,843
Dec-16	$ 26.97	22,740	0	22,740	$ 1,062	58	$ 585	$ 21	$ 43	$ 100	$ 1,838
Jan-17	$ 25.00	23,340	0	23,340	$ 1,183	56	$ 577	$ 19	$ 46	$ 110	$ 1,960
Feb-17	$ 25.00	18,600	0	18,600	$ 943	51	$ 525	$ 15	$ 39	$ 91	$ 1,638
Mar-17	$ 25.00	20,400	0	20,400	$ 1,080	52	$ 536	$ 16	$ 42	$ 101	$ 1,801
Apr-17	$ 25.00	23,280	0	23,280	$ 1,233	62	$ 639	$ 19	$ 49	$ 117	$ 2,081
May-17	$ 25.00	26,700	0	26,700	$ 1,414	70	$ 721	$ 21	$ 56	$ 133	$ 2,370
Yearly Totals		**296,700**	**12,090**	**284,610**	**$ 13,793**	**713**	**$ 7,861**	**$ 217**	**$ 568**	**$ 1,986**	**$ 24,738**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is relatively constant from month to month, indicating a consistent consumption need/usage. The average peak for the 24 month period evaluated occurs in July while the average low occurs in February; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
HIGH and BRDG Administration	Office - Government	25.97	7.9	11.9	17.1

Overall, this building is operating above the 75th percentile of comparable facilities. This indicates significant opportunities for improved efficiency and operation. However, as previously described, the HVAC equipment and control have already recently been upgraded. The 24 months of data used to generate the above results does not take into consideration these recent changes/upgrades.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

All recommended FIMs for this facility have been removed from the final scope by Broward County. Please refer to Section G of this report for documentation of these originally proposed opportunities.

D.7. South Regional Courthouse

FACILITY DESCRIPTION

South Regional Court House is a 72,656 square foot 3-story building located at 3600 Hollywood Blvd, Fort Lauderdale, FL 33021. The building was originally built in 1977. The building consists of courthouses, offices, conference rooms, and other areas supporting the courthouse, such as a chiller plant, mechanical rooms, etc. Building operating hours are the following:

Office Hours

Monday – Friday:	8:00AM – 3:30PM
Saturday, Sunday:	Closed

COOLING SYSTEM:

The chilled water system consists of two (2) water-cooled screw chillers, two (2) chilled-water pumps, two (2) condenser water pumps, and two (2) cooling towers. They are located in the chiller plant on the 1st floor.

Two (2) water cooled chillers provides the chilled water to AHUs distributed in different mechanical rooms throughout the building. The total nominal tonnage of the two units is 180 Ton. The units were made in 1996 by Trane, and the refrigerant is R-22.

Two chilled-water pumps run in parallel; as do the two condenser pumps. The horsepower for each pump including chilled water and condenser water is 10 HP, they are not equipped with VFDs. One of the two chilled water pump motors and one condenser water pump motor were replaced with premium efficiency motors in recent years, and the other two motors are old inefficient motors.

Primary only constant volume chilled water system is employed. Three-way control valves were installed at all AHUs.

Two count-flow cooling towers made by Protech were installed about 2 years ago. Each tower is equipped with a 5-HP fan with a VFD. Pneumatic control valves were installed at the inlets and outlets. No water meter for measuring makeup water consumption is existed.

Chilled Water System

The following table summarizes chilled water system motor information.

Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
South Regional Courthouse												
Chiller 1	Trane	RTWA0904XB010	U96F04926	compressor			90	460	3	72		51.6
				compressor				460	3	54		38.7
Chiller 2	Trane	RTWA0904XA01D	U96F94925	compressor			90	460	3	72		51.6
				compressor				460	3	54		38.7
Pump	Baldor	JMM3714T	37M031T9YYH1			10		460	3	12.8	89.5%	8.3
Pump		B083A				10		460	3	13.6	88.5%	9.8
Pump-1	AO Smith					10		460	3	13.4	89.5%	8.3
Pump-2	DB51					10		460	3	13.6	90.2%	9.2
Cooling Tower 1	Protec	PCT-175 S/S	4870			5		460	3			
Cooling Tower 2	Protec	PCT-175 S/S	4870			5		460	3			
AHU-1					with VFD							
AHU-2					with VFD							
AHU-11												
AHU-12												
AHU-13	Daikin				with VFD							
AHU-16	Daikin				with VFD							
CU		NAC030AKA5	E033129223	compressor	R-22			230	1	13.7		
				fan		0.2		230	1	1.4		
Unitary AC												
Condenser	Goodman											

AIR DISTRIBUTION SYSTEM

There are 19 AHUs located in mechanical rooms closed to the space they serve. Among the 19 AHUs, 17 AHUs have been replaced with Daikin units in recent years, and supply fans are equipped with VFDs. AHU11 and AHU12 are the two old units waiting for replacement. All air handling systems are single duct systems. Each system has one Siemens programmable thermostat. The air handing systems have electric heaters.

HVAC System Examples

Most mechanical rooms also function as mixed air chambers. A CO_2 sensor exists in each mechanical room to measure the return air CO_2 level except for where AHU11 and AHU12 are located. Outdoor air is mixed with return air at each mechanical room. A modulating control damper was installed on OA intake duct of each unit. The minimum damper position is 30%. No outdoor air fan is installed.

The occupied cooling temperature default set point is 74 ^{O}F, and heating default value is 70^{O}F.

Night setback control strategy was implemented in the building automation control system. The cooling night temperature set point is 78^{O}F, and the heating set point is 68^{O}F.

Observed Issues

- Water marks on ceiling tiles from roof water leakage
- Water leakage from A/C condensation serving the Telcom room by the chiller plant
- Inefficient chilled water and condenser motors
- Inefficient R-22 noisy chillers
- Inoperable AHUs
- Less than 6 ^{O}F chilled water supply and return temperature difference

Observed Issues

LIGHTING SYSTEM:

Interior lighting primarily consists of T8 fluorescent lamps in 2x2 fixtures and CFL in recessed fixtures.

Interior Lighting Examples

Exterior Lighting mainly consists of wall mounted HID exterior lights. No occupancy sensors are installed for lighting control in the building.

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms. Fixtures and water closets are all operated manually. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 gpm faucets
- 1.5 gpf urinals
- 3.5 gpf toilets

BUILDING CONTROLS SYSTEM

The building is equipped with integrated system with Johnson Controls and Siemens DDC building automation systems. Any changes to the controls operation is handled from the Government Center. Available trending data was downloaded from the BAU. The following lists the available points being trended:

- Chiller 1 and 2 supply and return temperatures
- Chilled-water pump 1 and 2 status
- AHU 1 through 10
  - fan status
  - supply temperature
  - return air temperature
  - OA damper position

From the acquired trending data, the following HVAC schedules were determined as part of the usage baseline:

HVAC Typical Operating Schedule:

Monday–Saturday: 5:00AM/6:15AM – 8:00PM

Sunday: Off

OTHER SYSTEMS

There is a 217 kVA and 175 kW generator located in the chiller plant.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by two (2) electric meters. The meter dedicated to the garage is on a General Service (GS-1) rate structure. The building meter utilizes the Seasonal Demand Time of Use Rider (GSDTR-1A) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

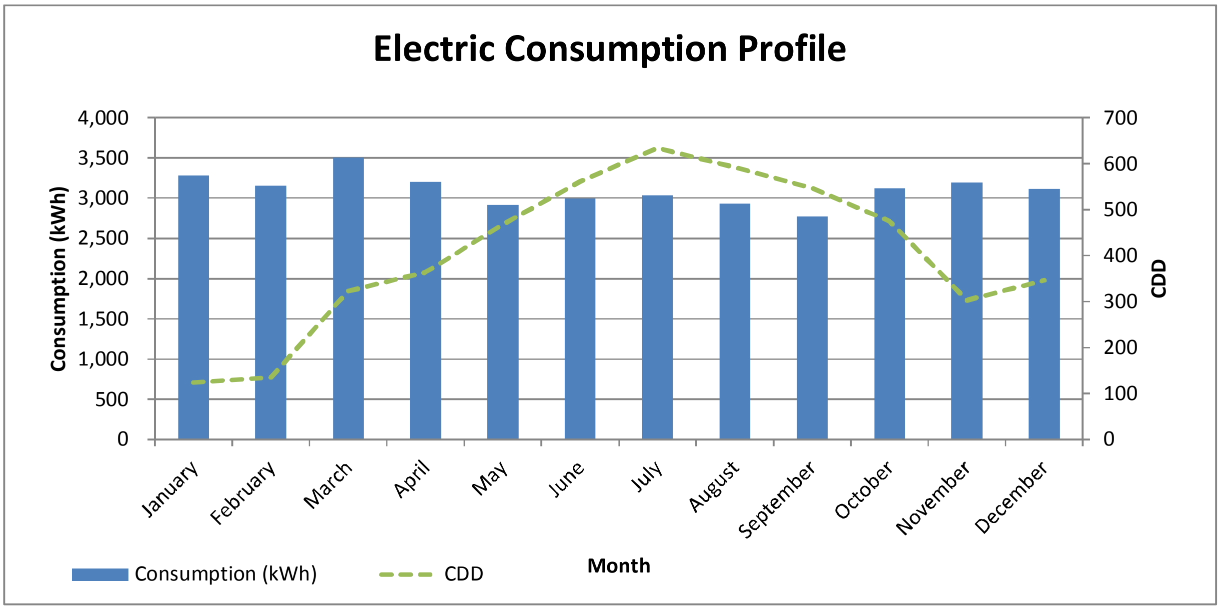
Electric Baseline Summary

Facility	# of Meters	Rate Structure	June - Sept		$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak					
South Regional	Garage	GS-1	-	-	$ 0.10097	-	37,210	-	-
Courthouse	Bldg	SDTR-1A	$ 0.12898	$ 0.04070	$ 0.05630	$ 10.95	1,177,020	2,722	276

The data in the table above was generated using the following electric billing data.

Meter KJ70668; Account: 7850857793; Address: 3550 HOLLYWOOD BLVD # GARAG

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 10.00	3,104	$ 299	$ 16	$ 325
Jul-15	$ 10.00	3,255	$ 311	$ 20	$ 340
Aug-15	$ 10.00	3,011	$ 287	$ 18	$ 315
Sep-15	$ 10.00	3,562	$ 340	$ 20	$ 370
Oct-15	$ 10.00	3,811	$ 364	$ 21	$ 395
Nov-15	$ 10.00	3,981	$ 380	$ 23	$ 413
Dec-15	$ 10.00	3,639	$ 347	$ 21	$ 378
Jan-16	$ 10.00	3,930	$ 353	$ 33	$ 396
Feb-16	$ 10.00	3,721	$ 334	$ 31	$ 375
Mar-16	$ 10.00	3,581	$ 322	$ 31	$ 363
Apr-16	$ 10.00	3,112	$ 280	$ 20	$ 310
May-16	$ 10.00	2,578	$ 232	$ 16	$ 258
Jun-16	$ 10.00	2,880	$ 253	$ 25	$ 287
Jul-16	$ 10.00	2,808	$ 247	$ 24	$ 280
Aug-16	$ 10.00	2,846	$ 250	$ 24	$ 284
Sep-16	$ 10.00	1,984	$ 174	$ 16	$ 200
Oct-16	$ 10.00	2,438	$ 214	$ 20	$ 244
Nov-16	$ 10.00	2,400	$ 211	$ 20	$ 240
Dec-16	$ 10.00	2,598	$ 228	$ 21	$ 259
Jan-17	$ 10.00	2,630	$ 234	$ 24	$ 269
Feb-17	$ 10.00	2,582	$ 230	$ 24	$ 264
Mar-17	$ 10.00	3,426	$ 305	$ 43	$ 358
Apr-17	$ 10.00	3,285	$ 293	$ 41	$ 344
May-17	$ 10.00	3,257	$ 290	$ 41	$ 341
Yearly Averages		**37,210**	**$ 3,388**	**$ 296**	**$ 3,804**

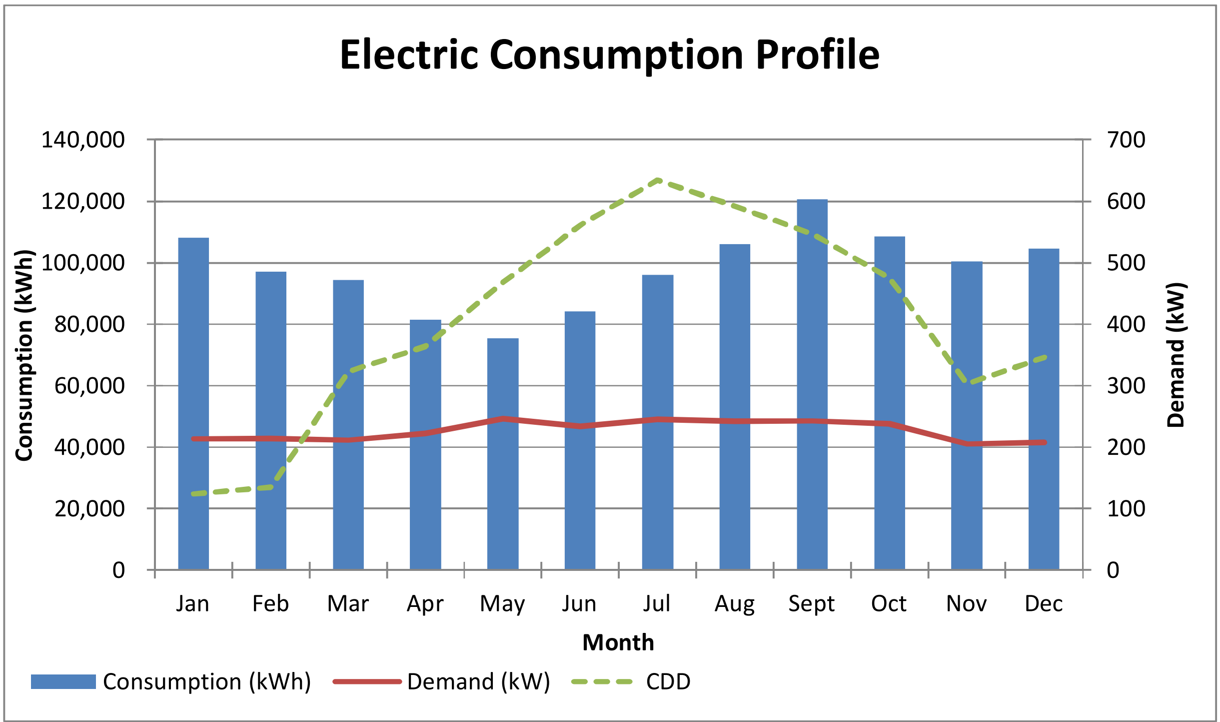


The resulting energy usage profile, illustrated above, for this account is not influenced by cooling needs as this is a garage. Instead, the usage is based lighting requirements for the parking structure. The average peak for the 24 month period evaluated occurs in March while the average low occurs in July.

The data in the baseline summary was also generated from the following electric billing data.

Meter MV5840A; Account: 7888856783; Address: 3550 HOLLYWOOD BLVD

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak				Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 25.96	90,240	4,887	85,353	$ 3,755.35	209	$ 2,533	$ 50	$ 163	$ 833	$ 7,360
Jul-15	$ 25.96	103,200	12,694	90,506	$ 4,468.55	218	$ 2,642	$ 57	$ 184	$ 1,443	$ 8,820
Aug-15	$ 25.96	101,040	13,176	87,864	$ 4,393.32	218	$ 2,642	$ 56	$ 182	$ 1,467	$ 8,767
Sep-15	$ 25.96	111,840	12,278	99,562	$ 4,806.48	214	$ 2,594	$ 62	$ 192	$ 1,410	$ 9,090
Oct-15	$ 25.96	98,760	0	98,760	$ 3,979.04	219	$ 2,654	$ 54	$ 172	$ 1,203	$ 8,089
Nov-15	$ 25.96	89,160	0	89,160	$ 3,592.26	200	$ 2,424	$ 49	$ 156	$ 1,087	$ 7,334
Dec-15	$ 25.96	90,120	0	90,120	$ 3,630.93	199	$ 2,412	$ 50	$ 157	$ 1,102	$ 7,377
Jan-16	$ 25.96	95,760	0	95,760	$ 4,788.96	204	$ 1,995	$ 62	$ 176	$ 423	$ 7,471
Feb-16	$ 25.96	82,320	0	82,320	$ 4,116.82	214	$ 2,093	$ 54	$ 161	$ 387	$ 6,838
Mar-16	$ 25.96	80,640	0	80,640	$ 4,032.81	202	$ 1,976	$ 52	$ 156	$ 392	$ 6,635
Apr-16	$ 25.96	80,520	0	80,520	$ 4,026.81	212	$ 2,073	$ 52	$ 158	$ 177	$ 6,513
May-16	$ 25.96	69,000	0	69,000	$ 3,450.69	276	$ 2,699	$ 45	$ 159	$ 239	$ 6,619
Jun-16	$ 26.97	78,120	4,800	73,320	$ 3,388.98	259	$ 3,046	$ 72	$ 167	$ 402	$ 7,103
Jul-16	$ 26.97	88,800	14,160	74,640	$ 4,574.97	272	$ 3,199	$ 82	$ 202	$ 485	$ 8,570
Aug-16	$ 26.97	111,000	14,760	96,240	$ 5,474.60	266	$ 3,128	$ 102	$ 224	$ 538	$ 9,493
Sep-16	$ 26.97	129,360	14,160	115,200	$ 6,127.61	271	$ 3,187	$ 119	$ 242	$ 559	$ 10,261
Oct-16	$ 26.97	118,080	7,920	110,160	$ 5,511.97	257	$ 2,591	$ 109	$ 211	$ 485	$ 8,935
Nov-16	$ 26.97	111,840	0	111,840	$ 5,220.69	210	$ 2,117	$ 103	$ 191	$ 439	$ 8,098
Dec-16	$ 26.97	119,280	0	119,280	$ 5,567.99	216	$ 2,177	$ 110	$ 202	$ 463	$ 8,547
Jan-17	$ 25.00	120,480	0	120,480	$ 6,107.13	223	$ 2,297	$ 96	$ 218	$ 520	$ 9,263
Feb-17	$ 25.00	111,720	0	111,720	$ 5,663.09	214	$ 2,204	$ 89	$ 204	$ 495	$ 8,681
Mar-17	$ 25.00	108,360	0	108,360	$ 5,737.66	221	$ 2,276	$ 87	$ 208	$ 509	$ 8,842
Apr-17	$ 25.00	82,440	0	82,440	$ 4,365.20	233	$ 2,400	$ 66	$ 176	$ 429	$ 7,461
May-17	$ 25.00	81,960	0	81,960	$ 4,339.78	217	$ 2,235	$ 66	$ 171	$ 417	$ 7,253
Yearly Averages		**1,177,020**	**49,418**	**1,127,603**	**$ 55,560.84**	**2,722**	**$ 29,797**	**$ 871**	**$ 2,215**	**$ 7,954**	**$ 96,710**



The resulting energy usage profile, illustrated above, for this account is somewhat influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Since this is a courthouse, the usage is based on a consistent scheduling of hearings and controlled occupancy. This is evident in the January through April and usage is both high than in summer months and decreases each subsequent month. When the summer season begins, the usage patterns emulate that of cooling needs with regards to CCDs. Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in September, a cooling design month, while the average low occurs in May.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
South Regional Courthouse	Courthouse or probation office	16.71	13.2	15.9	19.2

Overall, this building is operating just over the average percentile of comparable facilities. This indicates improvement opportunities are limited to either direct efficiency improvements of existing systems' equipment or improved building automation control.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

South Regional Courthouse

Account # 170467-145110	**Meter #** 60691695
Rate	**Address**
Meter Size	**Meter Type** IRR

Date	Total Charges
May-17	$ 54.04
Apr-17	$ 54.04
Mar-17	$ 54.04
Feb-17	$ 54.04
Jan-17	$ 54.04
Dec-16	$ 54.04
Nov-16	$ 54.04
Oct-16	$ 54.04
Sep-16	$ 54.04
Aug-16	$ 54.04
Jul-16	$ 54.04
Jun-16	$ 54.04
May-16	$ 54.04
Apr-16	$ 54.04
Mar-16	$ 54.04
Feb-16	$ 54.04
Jan-16	$ 54.04
Dec-15	$ 54.04
Nov-15	$ 54.04
Oct-15	$ 54.04
Sep-15	$ 54.04
Aug-15	$ 54.04
Jul-15	$ 54.04
Jun-15	$ 54.04
May-15	$ 695.38
TOTALS	**$ 1,992.34**

South Regional Courthouse

Account # 170469-220170	**Meter #** 70123919
Rate	**Address**
Meter Size	**Meter Type** W/S/ST

Date	Consumption ()	Total Charges
May-17	14800	$ 2,171.75
Apr-17	14300	$ 2,111.40
Mar-17	13200	$ 1,979.73
Feb-17	13400	$ 2,003.67
Jan-17	13700	$ 2,039.58
Dec-16	15300	$ 2,231.10
Nov-16	15000	$ 2,195.19
Oct-16	15900	$ 2,302.92
Sep-16	16700	$ 2,398.68
Aug-16	19700	$ 2,757.78
Jul-16	17500	$ 2,494.44
Jun-16	14500	$ 2,135.34
May-16	12900	$ 1,943.82
Apr-16	16100	$ 2,326.86
Mar-16	10900	$ 1,704.42
Feb-16	18700	$ 2,638.08
Jan-16	11100	$ 1,728.36
Dec-15	15500	$ 2,255.04
Nov-15	14300	$ 2,111.40
Oct-15	19500	$ 2,733.84
Sep-15	17800	$ 2,530.35
Aug-15	20600	$ 2,865.51
Jul-15	19500	$ 2,733.84
Jun-15	18700	$ 2,638.08
May-15		$ 2,566.26
TOTALS	**379600**	**$57,597.44**

Account 170469-220170 had most of the consumption and expense data for a 24 month period. The average monthly consumption is 15,817 thousand gallons. The average monthly expense amount is $2,303.90, and the blended dollar per thousand gallons rate is $6.87.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated within with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
South Regional Courthouse	Water - Retrofits	$ 567.95	$ -	$ 5,823.77	$ 408	$ 6,799.77	$ 79,267.19	11.7
South Regional Courthouse	Chiller Replacement &	$ 11,666.25	$ -	$ -	$ -	$ 11,666.25	$ 416,758.54	35.7
South Regional Courthouse	Chiller Lead/Lag	$ -	$ 1,741.65	$ -	$ -	$ 1,741.65	$ 7,166.56	4.1
Breakage Fee							$ 12,351.52	
PA Cost							$ 4,908.09	
Total		**$ 12,234.20**	**$ 1,741.65**	**$5,823.77**	**$ 408**	**$20,207.67**	**$ 520,451.90**	**25.8**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

WATER CONSERVATION

This FIM addresses the reduction of water consumption, wastewater production, and hot water energy usage through the installation of highly efficient, plumbing products and controls. The use of these devices and others are detailed below and were selected not only for their efficiency, but also to provide for durable, long-term use with minimal maintenance and improved hygiene.

PROJECT SCOPE

Bathroom Faucets/Aerators: Most faucets utilize aerators to restrict the volume of water at the mouth of a faucet and to generate a more comfortable flow. High efficiency aerators can greatly reduce flow rates from faucets and create a comfortable flow for hand washing and cleaning. Restricting faucet flow rates enables a facility to conserve water and reduce energy usage associated with heating water. Faucets without the threading necessary to accept an aerator can be replaced with threaded faucets. Installation of 0.5 GPM aerator or faucet retrofit will replace existing equipment that currently consumes 2.2 GPM.

Tank Style Water Closets: Tank style water closets utilize a tank fill valve on top of the bowl which uses gravity to drain large volumes of water into the bowl during evacuation. Pressure assisted tank valves use domestic water pressure to pressurize the tank water allowing for more forceful evacuations with less water volume. Installation of 1.00 gallons per flush (GPF) tank type, pressure assist, ADA style water closet will replace existing equipment that currently consumes 1.6 to 3.5 GPF.

Flush Valves: Most commercial facilities utilize flush valve water closets. Flush valves are designed to release precise volumes of water when activated. High efficiency flush valves can enable a facility to greatly reduce its water consumption by reducing flush valve flow rates and the amount of water required for evacuation. Installation of 1.28 gallons per flush (GPF) flush valve will replace existing equipment that currently consumes 1.6 to 3.5 GPF.

Urinals: High efficiency flush valve and china combinations for urinals can enable a facility to greatly reduce its water consumption by reducing flush valve flow rates and the amount of water required for evacuation. Installation of 0.125 GPF high efficiency urinal systems will replace existing equipment that currently consumes 1.0 to 1.5 GPF.

SAVINGS

The energy and cost savings were developed using spreadsheet modeling. Based on site interviews, facility type, square footage, and standard factors for allocation of business in square foot per person and visitors per day the total population and occupancy days for this facility were determined. Total water closet, urinal, faucet and shower use figures were determined for the facility using standard factors for equipment use based on industry research and case studies coupled together with the total population of the facility and the occupancy days. The current water usage minus the proposed water usage leads to the total water savings in gallons.

The savings value take the water savings and multiply them by the rate detailed in the Utility Data Analysis Section H, Appendices or water of this report. Energy savings were only taken in the form of hot water savings for any equipment that utilize hot water.

Deferred maintenance savings were considered and calculated by a percentage of reduction in replacement cost for any new fixtures that will be installed. These savings are referred to as Savings O&M on the financial summary table below.

FIM SAVINGS SUMMARY

Annual Water savings: 510,857 gallons

Annual Energy savings: 7,223 kWh

All analysis for water savings, energy savings, deferred maintenance savings, and financial details is provided in Section H, Appendices of this report.

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
South Regional Courthouse	Water - Retrofits	$ 567.95	$ -	$ 5,823.77	$ 408	$ 6,799.77	$ 79,267.19	11.7

CHILLER REPLACEMENT AND CHILLER PLANT OPTIMIZATION

The chiller replacement aims to improve chiller plant energy efficiency by replacing the aged inefficient chillers with new chillers of similar models and better efficiency. The associated chiller plant optimization measures will also be implemented to maximize chiller plant energy savings.

PROJECT SCOPE

The followings are included in the scope of work of the chiller replacement:

- Provide two (2) 90 nominal ton R-134a water-cooled chiller
- Provide VFDs for two (2) 10-HP chilled water pumps
- Remove the old chillers and be responsible for the proper demolition of the units.
- Replace the old chillers with new chillers
- Connect the new chillers to the piping system.
- Start up the new chillers

After chillers are replaced, the chiller plant operation will be optimized. The energy conservation measures include chilled water pump speed control based on cooling load, and cooling tower fan speed control to maintain condenser water temperature set point.

- Sequence of operations for those proposed measures will be developed
- Associated control program will be implemented.

Chiller Replacement: Cooling for the building is provided by two (2) 90-ton water cooled chillers. The chillers were made by Trane in 1996, and the refrigerant is R-22. Both units are operating inefficiently and at the end of their useful life. Especially the refrigerant will be phased out in 2020. The two existing chillers will be replaced by two (2) new 90-ton water cooled R-134a chillers with better efficiency

Chiller Plant Optimization: Chiller plant optimization systematically controls mechanical components consisting of the plant to improve the plant efficiency. Chiller plant optimization includes chilled water pump speed control based on dynamic differential pressure that reflects the cooling load, and condenser water temperature control by modulating cooling tower fan speed to improve chiller efficiency.

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Appendix. All calculations were based off Trane manufacturer cut-sheets, also provided as part of the Appendix.

Full calculations are provided in Section H, Appendices of this Report.

FIM SAVINGS SUMMARY

Annual Energy Consumption Savings: 141,495 kWh.

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
South Regional Courthouse	Chiller	$ 11,666.25	$ -	$ -	$ -	$ 11,666.25	$ 416,758.54	35.7

AUTOMATION OPTIMIZATION

Automation optimization improves the energy efficiency of existing central chiller plant, and heating, cooling and air conditioning systems (HVAC) to reduce energy consumption and costs by implementing optimization control strategies. During automation optimization, the sequence of operation for each measure for controlled devices is developed based on in-depth investigations of the existing mechanical and control systems, and the measure is implemented in existing control systems through control programming.

PROJECT SCOPE

Based on trending data and site visits, the following facility improvement measures are proposed to improve the energy efficiency of the existing systems.

- Optimal equipment start

To implement the optimization measures:

- Sequence of operations for those proposed measures will be developed, and associated control program will be implemented.
- Sensors required for the measures will be calibrated, repaired or installed

The implementation of the optimization measures are based on the condition that the existing mechanical equipment and control devices are operable normally and allow the implementation of the proposed measures. If during the implementation, the mechanical equipment, and the devices are deteriorated and prevent the implementations, the measures may be cancelled or modified accordingly.

Optimal Chiller Start to Reduce Electric Demand: The purpose of this measure is to avoid high electric demand charge caused by both chillers starting at the full load. When the 2nd chiller is called due to cooling load increase or lead- lag switch, limit the lead chiller current to 80% (adjustable) before turning on the second chiller. The current limit for the 2nd chiller is also limited to 80% (adjustable) during starting. After both chillers are on for 30 minutes (adjustable), release the current limits back to normal values.

During lead-lag switch, reduce the current of the running chiller before turning on another chiller. When the 2nd chiller is turned on, limiting its current to 80% (adjustable) for 30 minutes (adjustable) before changing back to the normal limit.

The similar strategy can be applied to other HVAC equipment.

SAVINGS

The savings for Automation Optimization were calculated according to some or all of the followings: building load profiles which were simulated based on available trending data and building electricity use in 24 months, existing operation schedules provided by the County in June 2017, nameplate data, onsite measurements, trending data from control systems, and assumptions. Models and calculations were built and conducted in Excel spreadsheets. The Bin weather data was used for annual energy consumption simulation. The average blended electric rate calculated based on electric bills from 24 months was applied for energy cost calculations.

Full calculations are provided in Section H, Appendices this Report.

FIM SAVINGS SUMMARY

The annual energy savings for each measure is summarized as follows:

Optimal equipment start: 11.05 kW per year

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
South Regional Courthouse	Chiller Lead/Lag	$ -	$ 1,741.65	$ -	$ -	$ 1,741.65	$ 7,166.56	4.1

D.8. West Regional Courthouse

FACILITY DESCRIPTION

West Regional Court House is a 65,000 square foot 2-story building located at 100 N. Pine Island Road, Plantation, FL 33324. The building was originally built in 1986. The building consists of courtrooms, offices, conference rooms, and other areas supporting the courthouse, such as mechanical rooms. Building operating hours are the following:

Office Hours

Monday – Friday: 8:00AM – 3:30PM

Saturday, Sunday, holidays: Closed

CHILLED WATER SYSTEM:

The chilled water system consists of 2 water-cooled chillers, 2 primary chilled water pumps, 2 condenser water pumps, and 2 cooling towers. They are located in the Utility Building.

Two (2) water cooled chillers provide the chilled water to AHUs distributed in different mechanical rooms. The nominal tonnage of each chiller is 200 Ton. The units were manufactured by Daikin McQuay in 2012, and the refrigerant is R-134a. The design chilled water supply and return temperature is 44/54°F.

Two chilled water pumps run in parallel; so do the 2 condenser pumps. The motor horsepower for each primary chilled water pump is 20 HP. The motor horsepower for each condenser water pump water pump is 15 HP. VFDs manufactured by S-Flex were installed on chilled water and condenser water pumps.

Primary only chilled water system is employed. Three-way control valves were installed at AHUs.

Two cooling towers made by Evapco were installed. VFDs were installed on cooling tower fans.

Chilled Water System Examples

HVAC SYSTEMS:

The building is primarily served by 4 single duct variable air volume (VAV) air handling systems with VAV terminal boxes. Each floor is served by 2 AHUs located in two mechanical rooms. The first floor is served by AHU-1E and AHU-1W, and the second floor is served by AHU-2E and AHU-2W. YASKAWA VFDs were installed on AHU supply fans. AHU-1E and AHU-1W were manufactured by York; AHU-2E and AHU-2W were made by McQuay.

VAV terminal boxes are controlled to maintain zone space temperature set points. Some boxes have electric heaters. The minimum design airflow for terminal boxes with heaters is about 15%, and is zero for boxes without heaters.

Sensors measure building CO_2 levels exist. OA intake is through the louvers located in mechanical rooms.

HVAC System Examples

The following table summarizes equipment located onsite.

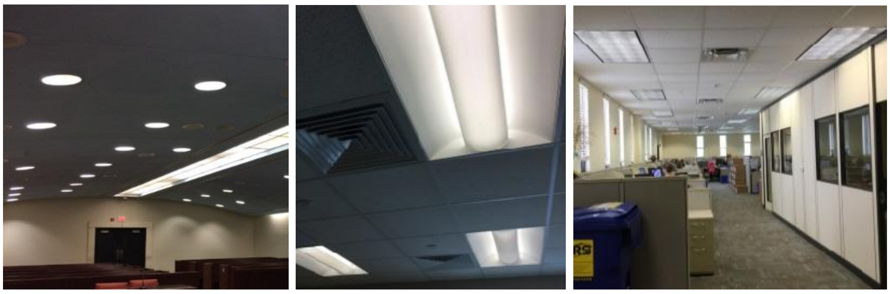
Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	**Mfctr**	**Model**	**Serial**	**Description**	**Notes**	**HP**	**Tons/ MBTU**	**V**	**Ph**	**Amps**	**Eff /EER**	**Cal kW**
West Regional Courthouse												
Chiller 1	McQuay	WMC250DBS-ER10	STNU120200083	compressor	off		250	480	3	85		63.6
				compressor	off			480	3	85		63.6
Chiller 2	McQuay	WMC250DBS-ER10	STNU120200082	compressor			250	480	3	85		63.6
				compressor				480	3	85		63.6
CHWP-1	Baldor	EM2334T	09P011Y583G1			20		460	3	24	93.00%	16.1
CHWP-2	Baldor	EM2334T	09P011Y583G1			20		460	3	24	93.00%	16.1
CWP-1	Baldor	EM2333T	09P011X717G1			15		460	3	18.5	92.40%	12.1
CWP-2	Baldor	EM2333T	09P011X717G1			15		460	3	18.5	92.40%	12.1
Cooling Tower 1	Evapco	USS 19-711	4-104167									
Cooling Tower 2	Evapco	USS 19-711	4-104168									
AHU-1E	York	XTI-078X120-FAMA	CHBM XT0198		with VFD	20		460	3	24.3		17.4
AHU-1W	York	XTI-078X120-FAMA	CHBM XT0199		with VFD	20		460	3	24.3		17.4
AHU-2E	McQuay	LBL 164DH		100% OA	with VFD	25		460	3	31	91.70%	20.5
AHU-2W	McQuay	LSL 150DH	9WH0641104	100% OA	with VFD							
AHU-1	York	XTI-036X057-FAHA	CEBM XT0150		with VFD	5		460	3	6.6		4.7

LIGHTING SYSTEM

Interior lighting primarily consists of T8 fluorescent lamps and compact fluorescent lamps in various fixtures.

Exterior Lighting mainly consists of HID exterior lights



Interior Lighting Examples

Exterior Lighting Examples

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms and kitchen sinks. Fixtures and water closets are all operated manually. The following are example of the types of fixture found within the facility:

- 2.2 and 0.5 gpm faucets
- 1.5 gpf urinals
- 3.5 gpf toilets
- 2.5 gpm kitchen sinks

Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM

The building is equipped with integrated system with Johnson Controls and Siemens DDC building automation systems. Any changes to the controls operation is handled from the Government Center.

Control Examples

HVAC Typical Operating Schedule:

Monday–Sunday: 0:00 – 24:00

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the Seasonal Demand Time of Use Rider (SDTR-1A) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

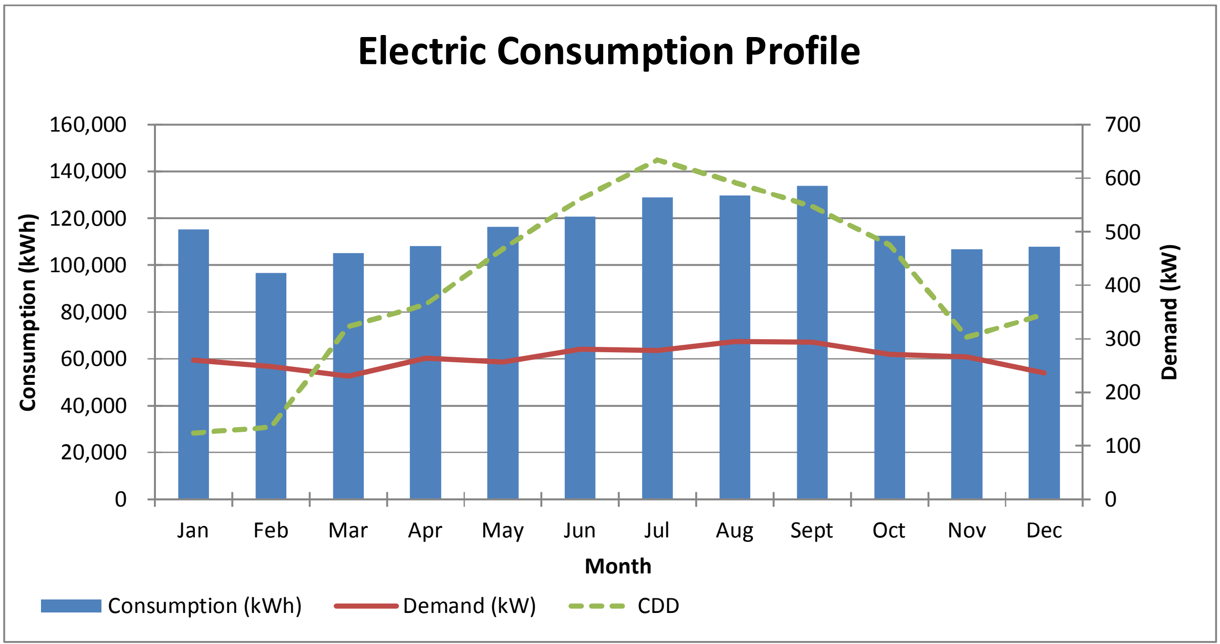
Electric Baseline Summary

Facility	# of Meters	Rate Structure	June - Sept		$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak					
West Regional Courthouse	1	SDTR-1A	$ 0.12886	$ 0.04066	$ 0.05624	$ 10.94	1,381,680	3,179	307

The data in the table above was generated using the following electric billing data.

Meter RV588V0; Account: 30638-60708; Address: 100 N Pine Island Road

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
						Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 25.96	112,800	$ 197	293	$ 3,551				$ 9,892
Jul-15	$ 25.96	126,600	$ 222	281	$ 3,406				$ 10,908
Aug-15	$ 25.96	122,400	$ 214	307	$ 3,721				$ 10,913
Sep-15	$ 25.96	140,160	$ 245	303	$ 3,672				$ 11,929
Oct-15	$ 25.96	113,400	$ 4,569	276	$ 3,345				$ 9,562
Nov-15	$ 25.96	106,680	$ 4,298	266	$ 3,224				$ 9,068
Dec-15	$ 25.96	107,880	$ 4,346	236	$ 2,860				$ 8,801
Jan-16	$ 25.96	115,320	$ 5,767	260	$ 2,543				$ 9,144
Feb-16	$ 25.96	96,720	$ 4,837	248	$ 2,425				$ 7,992
Mar-16	$ 25.96	105,000	$ 5,251	230	$ 2,249				$ 8,280
Apr-16	$ 25.96	108,240	$ 5,413	264	$ 2,582				$ 8,516
May-16	$ 25.96	105,480	$ 5,275	263	$ 2,572				$ 8,362
Jun-16	$ 26.97	128,520	$ 299	267	$ 3,140				$ 9,767
Jul-16	$ 26.97	131,160	$ 306	276	$ 3,246				$ 10,472
Aug-16	$ 26.97	137,040	$ 319	283	$ 3,328				$ 10,787
Sep-16	$ 26.97	127,440	$ 297	284	$ 3,340				$ 10,275
Oct-16	$ 26.97	111,600	$ 5,209	267	$ 2,691				$ 8,710
Nov-16	$ 26.97		$ -		$ -				
Dec-16	$ 26.97		$ -		$ -				
Jan-17	$ 25.00		$ -		$ -				
Feb-17	$ 25.00		$ -		$ -				
Mar-17	$ 25.00		$ -		$ -				
Apr-17	$ 25.00		$ -		$ -				
May-17	$ 25.00	127,080	$ 6,729	250	$ 2,575	$ 102	$ 242	$ 580	$ 10,253
Yearly Average		**1,381,680**	**$ 26,897**	**3,179**	**$ 27,236**				**$ 112,715**



The resulting energy usage profile, illustrated above, for this account is somewhat influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Since this is a courthouse, the usage is based on a consistent scheduling of hearings and controlled occupancy. This is evident in the January and February as usage is both comparable to summer months and decreases each subsequent month. When the summer season begins, the usage patterns emulate that of cooling needs with regards to CCDs. Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in September, a cooling design month, while the average low occurs in February.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
West Regional Courthouse	Courthouse	21.26	13.2	15.9	19.2

Overall, this building is operating above the 75th percentile of comparable facilities. This indicates improvement opportunities beyond the regular building automation solutions.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

West Regional Bus Terminal & Courthouse Chiller Plant

Account #	23317-06	**Meter #**	06552272
Rate		**Address**	
Meter Size		**Meter Type**	W/S

Date	Total Charges
Mar-17	$ 123.94
Feb-17	$ 118.87
Jan-17	$ 131.03
Dec-16	$ 100.45
Nov-16	$ 123.94
Oct-16	$ 97.14
Sep-16	$ 96.50
Aug-16	$ 94.15
Jul-16	$ 100.43
Jun-16	$ 104.68
May-16	$ 161.44
Apr-16	$ 250.96
Mar-16	$ 169.14
Feb-16	$ 192.93
Jan-16	$ 190.65
Dec-15	$ 180.68
Nov-15	$ 219.11
Oct-15	$ 302.18
Sep-15	$ 203.34
Aug-15	$ 215.25
Jul-15	$ 176.60
Jun-15	$ 368.30
May-15	$ 170.20
Apr-15	$ 169.29
Mar-15	$ 151.92
TOTALS	**$ 4,213.12**

West Regional Courthouse

Account #	82367-03	**Meter #**	08362954
Rate		**Address**	
Meter Size		**Meter Type**	W/S

Date	Total Charges
Mar-17	$ 472.00
Feb-17	$ 464.90
Jan-17	$ 454.59
Dec-16	$ 395.89
Nov-16	$ 497.15
Oct-16	$ 408.79
Sep-16	$ 420.14
Aug-16	$ 437.78
Jul-16	$ 409.82
Jun-16	$ 407.99
May-16	$ 453.06
Apr-16	$ 438.99
Mar-16	$ 479.73
Feb-16	$ 479.12
Jan-16	$ 525.84
Dec-15	$ 386.71
Nov-15	$ 430.48
Oct-15	$ 409.20
Sep-15	$ 413.38
Aug-15	$ 396.19
Jul-15	$ 387.60
Jun-15	$ 416.25
May-15	$ 421.98
Apr-15	$ 397.91
Mar-15	$ 404.79
TOTALS	**$ 10,810.28**

These accounts only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
West Regional Courthouse	Chiller Plant	$ 7,696.90	$ -	$ -	$ -	$ 7,696.90	$ 23,591.99	3.1
Breakage Fee							$ 11,050.00	
PA Cost							$ 247.00	
Total		**$ 7,696.90**	**$ -**	**$ -**	**$ -**	**$ 7,696.90**	**$ 34,888.99**	**4.5**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

AUTOMATION OPTIMIZATION

Automation optimization improves the energy efficiency of existing central chiller plant, and heating, cooling and air conditioning systems (HVAC) to reduce energy consumption and costs by implementing optimization control strategies. During automation optimization, the sequence of operation for each measure for controlled devices is developed based on in-depth investigations of the existing mechanical and control systems, and the measure is implemented in existing control systems through control programming.

PROJECT SCOPE

Based on trending data and site visits, the following facility improvement measure is proposed to improve the energy efficiency of the existing systems.

- Chiller plant optimization

To implement the optimization measure:

- Sequence of operations for those proposed measures will be developed, and associated control program will be implemented.

The implementation of the optimization measures are based on the condition that the existing mechanical equipment and control devices are operable normally and allow the implementation of the proposed measures. If during the implementation, the mechanical equipment, and the devices are deteriorated and prevent the implementations, the measures may be cancelled or modified accordingly.

Chiller plant optimization: Chiller plant optimization systematically controls mechanical components consisting of the plant to improve the overall plant efficiency. Chiller plant optimization includes chilled water pump speed control based on dynamic differential pressure that reflects the cooling load, and condenser water temperature control to improve chiller efficiency.

SAVINGS

The savings for Automation Optimization were calculated according to some or all of the followings: building load profiles which were simulated based on available trending data and building electricity use in 24 months, existing operation schedules provided by the County in June 2017, nameplate data, onsite measurements, trending data from control systems, and assumptions. Models and calculations were built and conducted in Excel spreadsheets. The Bin weather data was used for annual energy consumption simulation. The average blended electric rate calculated based on electric bills from 24 months was applied for energy cost calculations.

Full calculations are provided in Section H, Appendices of this Report.

FIM SAVINGS SUMMARY

Annual Energy Consumption Savings: 93,525 kWh per year

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
West Regional Courthouse	Chiller Plant	$ 7,696.90	$ -	$ -	$ -	$ 7,696.90	$ 23,591.99	3.1

D.9. Facility - Fleet Services 2

FACILITY DESCRIPTION

Broward County Fleet Services #2 is a 13,280 square foot 1-story building located at 2515 SW 4th Ave, Fort Lauderdale, FL 33315. The building was originally built in 1998. It is a maintenance and repair facility for light duty vehicles.

Office Hours

Monday – Friday: 9:00AM – 5:30PM

Saturday, Sunday: Closed

COOLING SYSTEM:

The building is mainly served by two (2) DX units, AHU-1 and AHU-2. The nominal cooling capacity of each unit is 6 Ton with 5 kW electric heating capability. They were made by Trane in 1999, and the refrigerant is R-22.

Cooling System

The following table presents the full equipment inventory data for this facility:

Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Fleet Services 2												
Unitary FCU	Halcyon											
Condenser	Thermal Zone	242-1005-C					2	230	1	8.75	13 SEER	
Unitary FCU	Halcyon											
Condenser	Fujitsu	AOU9RL2	EXN018784		R-410A		0.75	115	1	7.5	16SEER	0.8
AHU 1	Trane	TWE060A300CA			1999	0.75		230	3	3.1		1.1
DX Unit	Thermal Zone	TZAA-360-CC757	W101505366	compressor	2015		5	230	3	17.3	11	6.2
				fan		0.2		230	3	1.2		0.4
AHU 2	Trane	TWE060A300CA	P263LXG5H		1999	0.75		230	3	3.1		1.1
DX Unit	Allegiance 10	7C0060B300A0	R162N4N4F	compressor	2000		5	230	3	21	9.2	7.5
				fan		0.25		230	3	1.9		0.7

LIGHTING SYSTEM

Interior lighting primarily consists of 32W T8 fluorescent 2 lamps, and low bay pendant MH400.



Interior Lighting Examples

Exterior Lighting mainly consists of wall mounted MH175.

No occupancy sensors are installed for lighting control in the building.

DOMESTIC WATER SYSTEM

The water fixtures used in the facility are as follows:

- 0.5 gpm faucets
- 1.0 gpf urinals
- 1.6 gpf toilets
- 2.5 gpm shower
- 2.5 gpm Eye/shower wash

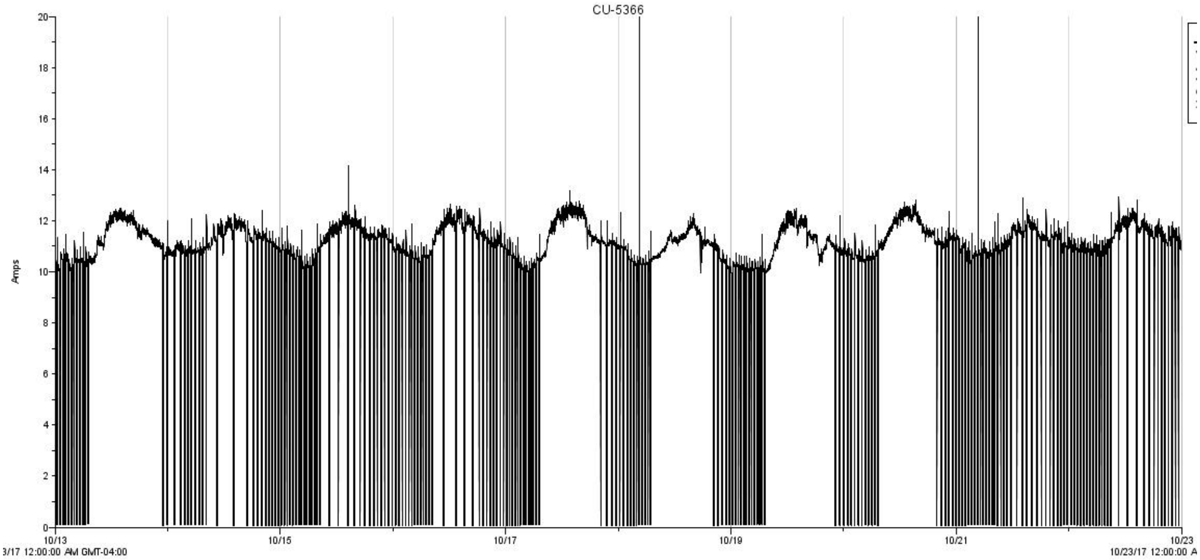
BUILDING CONTROLS SYSTEM

The facility is not equipped with a building automation system. All AHUs are controlled by factory installed controllers.

TRENDING DATA AQUISITION:

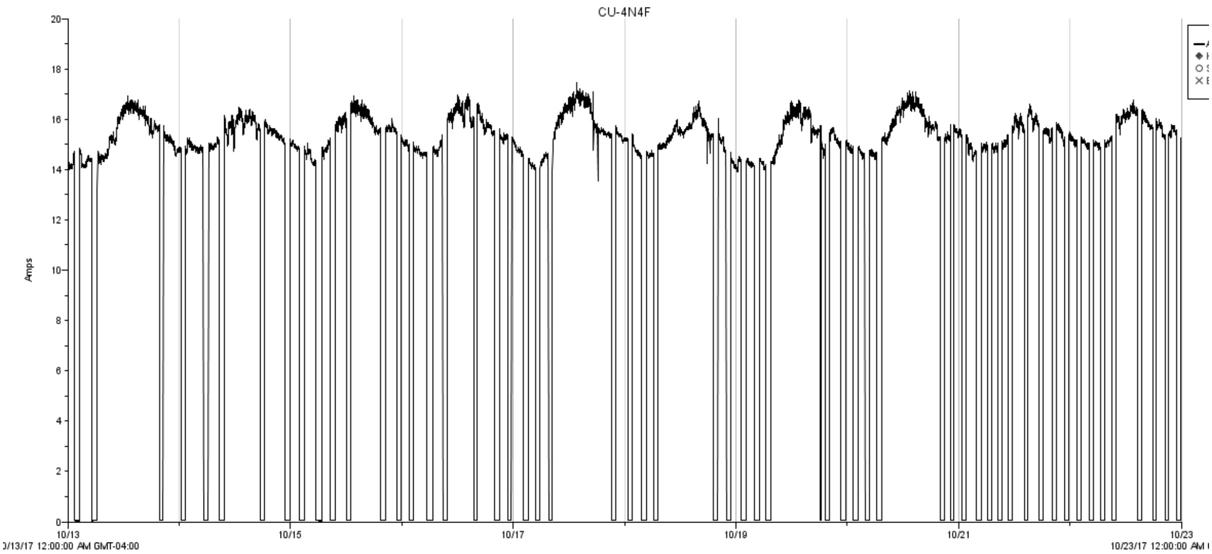
In order to determine the runtime and power draw of onsite HVAC equipment, data loggers were installed to obtain more data than currently available. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – 5 Ton Condensing Unit



This unit registered an average of 11.25 amps and was operating for a total of 140.73 hours during a one week period.

Trending Data – 5 ton Condensing Unit



This unit registered an average of 15.42 amps and was operating for a total of 134.22 hours during a one week period.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the Seasonal Demand Time of Use Rider (SDTR-1A) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

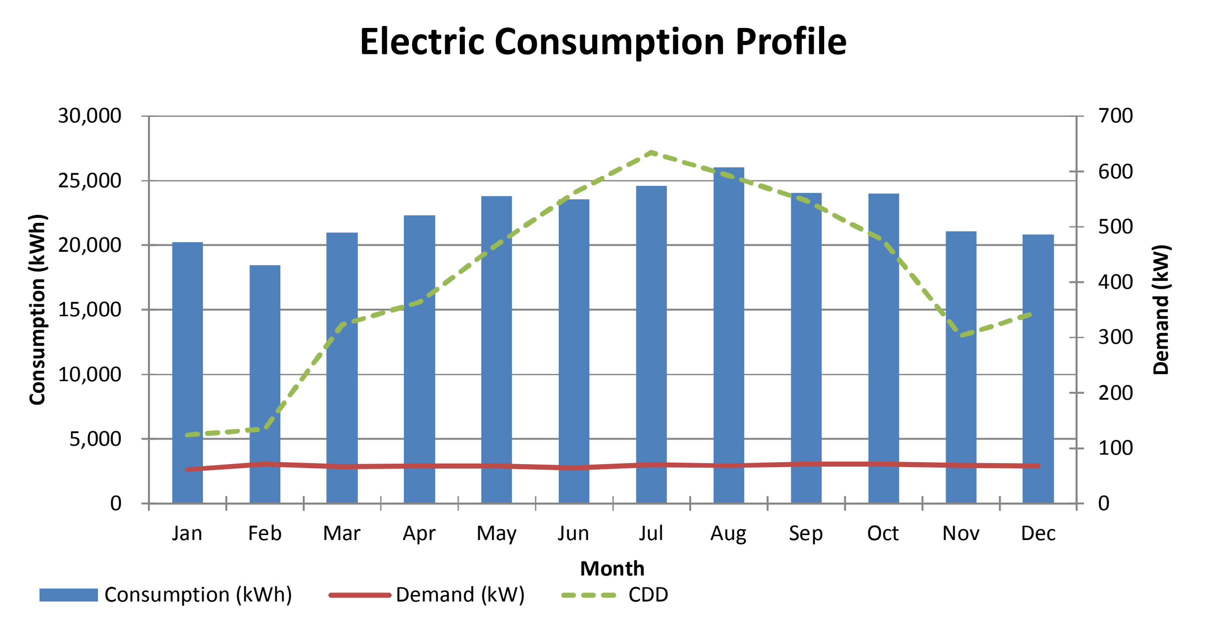
Electric Baseline Summary

Facility	# of Meters	Rate Structure	June - Sept		$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak					
Fleet Services #2 - SR84	1	SDTR-1A	0.129012628	$ 0.04071	$ 0.05631	$ 10.95	269,940	817	74

The data in the table above was generated using the following electric billing data.

Meter MU3717A; Account: 4863494235; Address: 2515 SW 4TH AVE FORT LAUD

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak				Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 25.96	23,820	1,560	22,260	$ 998	65	$ 788	$ 13	$ 47	$ 248	$ 2,120
Jul-15	$ 25.96	23,460	2,220	21,240	$ 1,000	70	$ 848	$ 13	$ 48	$ 296	$ 2,231
Aug-15	$ 25.96	26,100	2,400	23,700	$ 1,110	69	$ 836	$ 14	$ 51	$ 319	$ 2,357
Sep-15	$ 25.96	24,480	2,340	22,140	$ 1,044	74	$ 897	$ 13	$ 51	$ 302	$ 2,333
Oct-15	$ 25.96	25,500	720	24,780	$ 1,027	74	$ 897	$ 14	$ 50	$ 293	$ 2,308
Nov-15	$ 25.96	23,820	0	23,820	$ 960	74	$ 897	$ 13	$ 49	$ 267	$ 2,211
Dec-15	$ 25.96	23,700	0	23,700	$ 955	72	$ 873	$ 13	$ 48	$ 267	$ 2,182
Jan-16	$ 25.96	21,960	0	21,960	$ 1,098	68	$ 665	$ 14	$ 46	$ 112	$ 1,962
Feb-16	$ 25.96	19,620	0	19,620	$ 981	68	$ 665	$ 13	$ 43	$ 105	$ 1,833
Mar-16	$ 25.96	20,820	0	20,820	$ 1,041	65	$ 636	$ 14	$ 44	$ 111	$ 1,871
Apr-16	$ 25.96	21,480	0	21,480	$ 1,074	67	$ 655	$ 14	$ 45	$ 60	$ 1,874
May-16	$ 25.96	22,740	0	22,740	$ 1,137	70	$ 685	$ 15	$ 48	$ 62	$ 1,972
Jun-16	$ 26.97	23,280	1,620	21,660	$ 1,026	64	$ 753	$ 21	$ 47	$ 113	$ 1,987
Jul-16	$ 26.97	25,740	2,460	23,280	$ 1,190	70	$ 823	$ 24	$ 53	$ 128	$ 2,244
Aug-16	$ 26.97	25,980	2,460	23,520	$ 1,199	68	$ 800	$ 24	$ 52	$ 127	$ 2,229
Sep-16	$ 26.97	23,640	2,280	21,360	$ 1,094	68	$ 800	$ 22	$ 50	$ 116	$ 2,109
Oct-16	$ 26.97	22,500	720	21,780	$ 1,050	68	$ 685	$ 21	$ 46	$ 107	$ 1,936
Nov-16	$ 26.97	18,300	0	18,300	$ 854	64	$ 645	$ 17	$ 40	$ 93	$ 1,676
Dec-16	$ 26.97	17,940	0	17,940	$ 837	64	$ 645	$ 17	$ 39	$ 92	$ 1,657
Jan-17	$ 25.00	18,540	0	18,540	$ 940	55	$ 567	$ 15	$ 40	$ 96	$ 1,682
Feb-17	$ 25.00	17,280	0	17,280	$ 876	74	$ 762	$ 14	$ 43	$ 104	$ 1,824
Mar-17	$ 25.00	21,120	0	21,120	$ 1,118	69	$ 711	$ 17	$ 48	$ 118	$ 2,036
Apr-17	$ 25.00	23,160	0	23,160	$ 1,226	69	$ 711	$ 19	$ 51	$ 124	$ 2,156
May-17	$ 25.00	24,900	0	24,900	$ 1,318	65	$ 670	$ 20	$ 52	$ 128	$ 2,213
Yearly Averages		**269,940**	**9,390**	**260,550**	**$ 12,577**	**817**	**$ 8,956**	**$ 196**	**$ 564**	**$ 1,895**	**$ 24,501**



The resulting energy usage profile, illustrated above, for this account is minimally influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Energy usage spikes in the summer but overall usage can be considered consistent for a vehicle repair shop. The building's energy usage depends primarily of the type of work being done on any given month. Electric demand usage is relatively constant from month to month, indicating a base consumption need.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Fleet Services #2 - SR84	Vehicle service or repair	20.33	4.5	7.5	11.7

Overall, this building is operating above the 75th percentile of comparable facilities. This indicates improvement opportunities beyond the regular building automation solutions and, possibly, improvements in equipment energy efficiency.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Fleet Services #2	Split System COMBINED	$ 5,421.68	$ 1,411.52	$ -	$ -	$ 6,833.20	$ 57,644.39	8.4
Breakage Fee							$ 2,257.60	
PA Cost							$ 603.52	
Total		**$ 5,421.68**	**$ 1,411.52**	**$ -**	**$ -**	**$ 6,833.20**	**$ 60,505.51**	**8.9**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

The building is mainly served by two (2) DX units, AHU-1 and AHU-2. The nominal cooling capacity of each unit is 6 Ton with 5 kW electric heating capability. They were made by Trane in 1999, and the refrigerant is R-22.

PROJECT SCOPE

This FIM addresses the replacement of two air handlers and condensing units of the (2) DX systems. The new equipment will be of equal capacity and include, as part of the installation, package new programmable thermostats provided by Siemens. The thermostats will be able to communicated, via their own IP address, to remote BAUs for additional access. The units will be placed on a time of day schedule. The new schedule will command the units to turn on 1.5 hours before the facility opens and 1.5 hours after it closes.

Scope of Work

Building	Equipment	Make	Model	Tons	Existing EER	New kW
Fleet Services 2	Condenser	Thermal Zone	TZAA-360-CC757	5	11	0.95
Fleet Services 2	Condenser	Allegiance 10	7C0060B300A0	5	9.2	0.95
Fleet Services 2	AHU	Trane	TWE060A300CA			
Fleet Services 2	AHU	Trane	TWE060A300CA			

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 83,347 kWh

Annual Electric Demand: 128.48 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Fleet Services #2	Split System COMBINED	$ 5,421.68	$ 1,411.52	$ -	$ -	$ 6,833.20	$ 57,644.39	8.4

D.10. Facility - Fleet Services 3 & 4

FACILITY DESCRIPTION

Fleet Services Center 3 & 4 is a 32,057 square foot single-story facility located at 1600 NW 30 Ave; behind the Highway and Bridges Administration building. The building is primarily mechanic bays for the upkeep and maintenance of County cars, trucks, and other such vehicles. The Parts and Main Office sections of the building are large storage areas and offices. The facility operates from 7AM until 5PM; Mondays through Thursdays. There is reportedly one employee that works on Fridays in the building; however, the majority of fleet services are closed Friday through Sunday.

COOLING SYSTEM:

The building is cooled by either direct expansion (DX) units or unitary space coolers ("window shakers"). The Main Office, located on the east side of the building, and the Parts area, located on the west side of the building, are each cooling by a dedicated DX system. On each end of the Main Office and Parts areas are individual offices. These offices are those services by unitary space coolers. A third split DX system (2 tons in size) serves offices by a repair shop on the west side of the building.

The Main Office AHU is a RUUD model with a 0.5 HP fan motor. The accompanying condensing unit is a 5-ton Rheem manufactured in 2003. The parts AHU is a Payne model with a 0.75 HP fan motor. Its accompanying condensing unit is a 2-ton Carrier single package hat pump.

Split DX Equipment

Split DX Equipment

The following table presents the full mechanical equipment inventory data for this facility:

Nameplate data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	**Mfctr**	**Model**	**Serial**	**Description**	**Notes**	**HP**	**Tons/ MBTU**	**V**	**Ph**	**Amps**	**Eff /EER**	**Cal kW**
Fleet Services 3 & 4												
DX Unit	Rheem	RAKA-060CAS	4991 M1903	compressor	R-22		5	230	3	17	9	6.1
				fan	2003	2						1.5
DX AHU	Ruud	UEAB-2010BSS	T M2791 2915			0.5		208	1	4.8		0.9
DX Unit		PA13HR048-H	3708X70430	compressor	R-22		4	230	1	20.2		4.2
				fan		0.25		230	1	1.4		0.3
AHU	Payne	PF1MNA048	5102A50178		R-22	0.75		230	1	4.3		0.9
RTU	Carrier	50HS-024---311AA	1001G40510	compressor			2	230	1	11.2	9.2	2.3
				O.D. fan				230	1	1.4		0.3
				I.D. fan				230	1	2		0.4

LIGHTING SYSTEM

Interior lighting consists of Metal Halide and HPS High Bay fixtures in the mechanic shop areas and 2-lamp, 32 Watt, T8 fluorescent fixtures in the office areas.

Interior Lighting Examples

Exterior Lighting consists of HPS flood lights.

Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

Occupancy Sensor Opportunities

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms. All water fixtures are operated manually. The following are example of the types of fixture found within the restroom of the facility:

- 2.0 faucets
- 1.0 gpf toilets
- 2.5 gpm showerheads

Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM

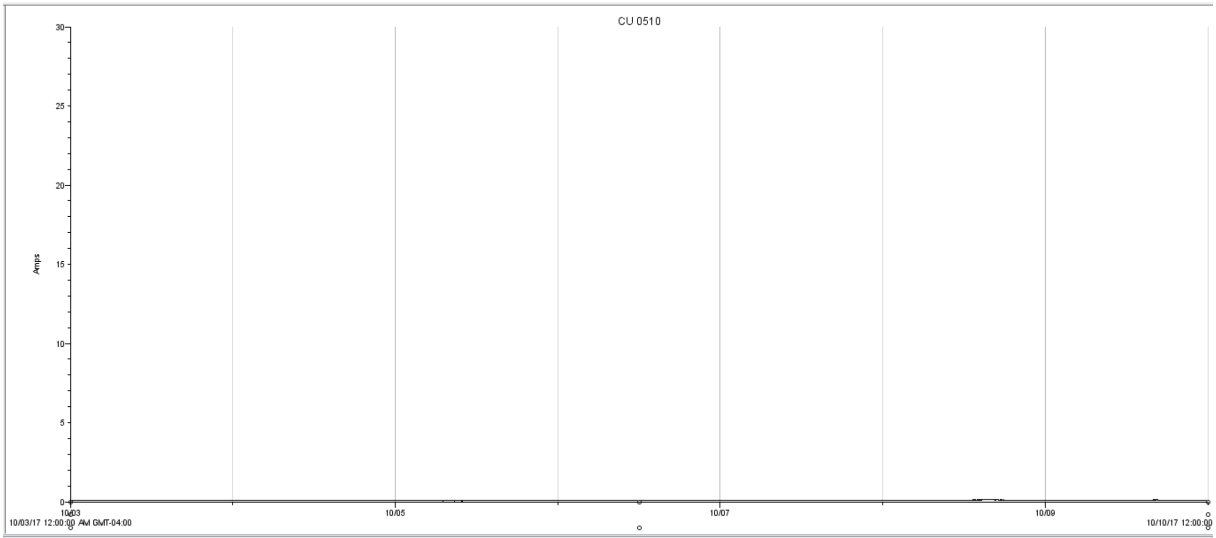
The split DX units are controlled locally via dedicated thermostats. These thermostats are not programmed with night setback temperatures or operating schedules.

HVAC Controls Equipment

TRENDING DATA AQUISITION:

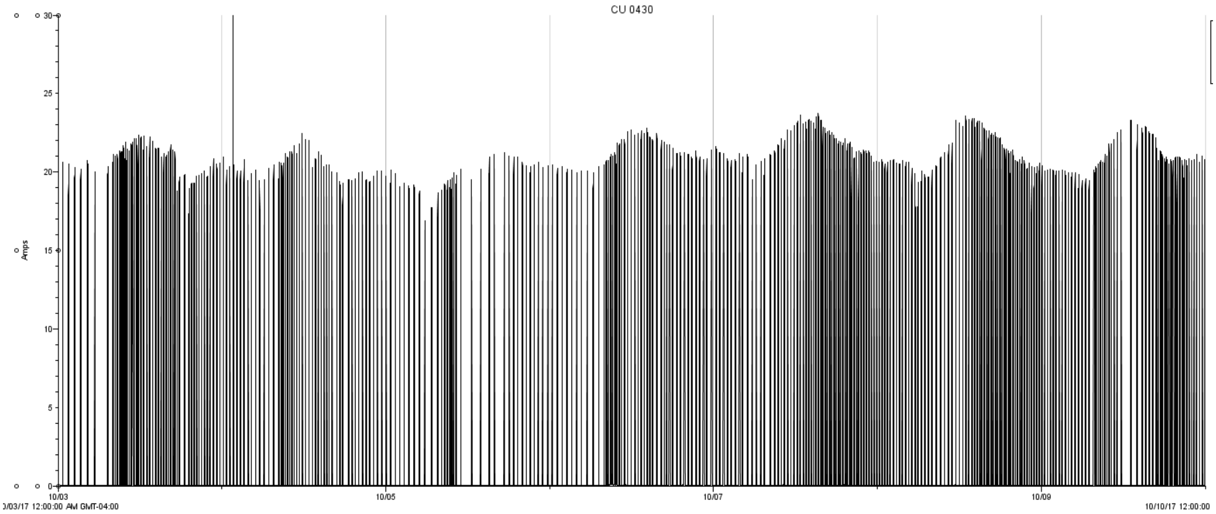
In order to determine the runtime and power draw of onsite HVAC equipment, data loggers were installed to obtain more data than currently available. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – 2 Ton Condensing Unit



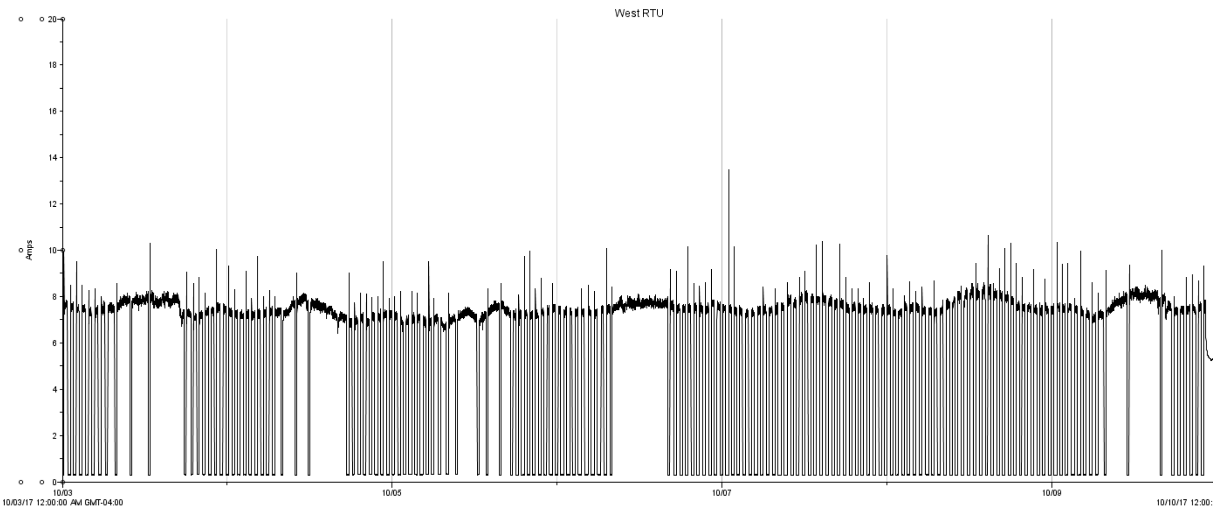
This data logger failed to trend data while installed

Trending Data – 4 Ton Condensing Unit



This unit registered an average of 20.68 amps and was operating for a total of 32.83 hours during a one week period.

Trending Data – 5 Ton Condensing Unit



This unit registered an average of 7.49 amps and was operating for a total of 108.45 hours during a one week period.

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

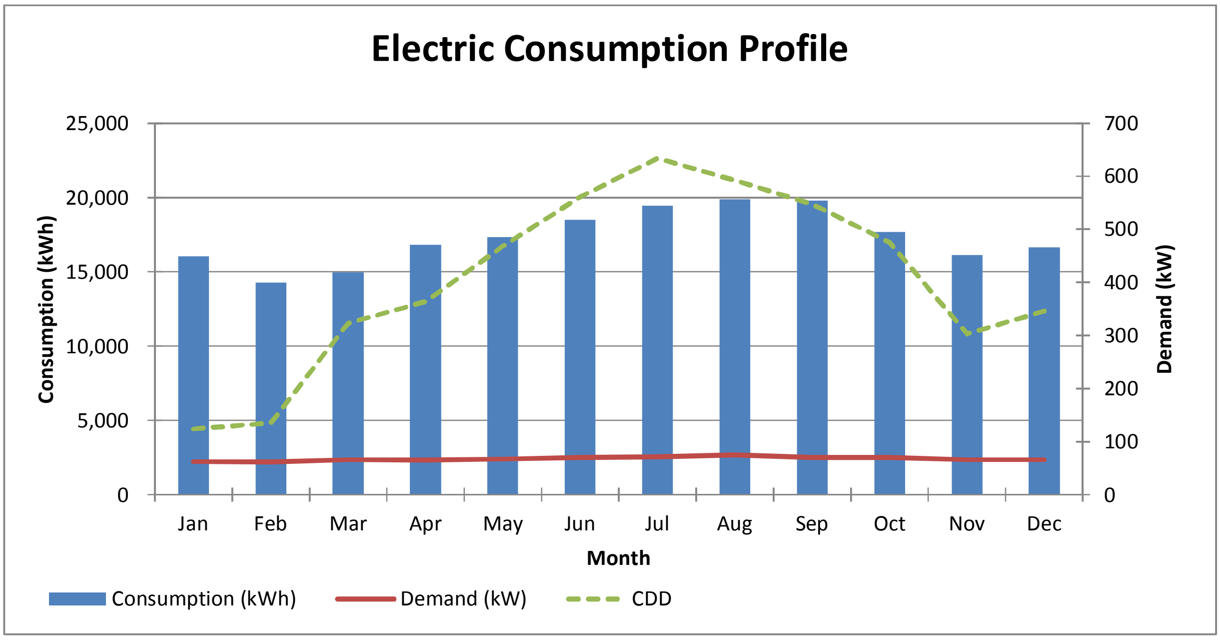
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Fleet Services #3	1	GSD-1	$ 0.05801	$ 11.45	207,330	810	79

The data in the table above was generated using the following electric billing data.

Meter KV30318; Account: 4592452314; Address: 1600 NW 30TH AVE # N FS 3/4

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	17,520	$ 965	69	$ 732	$ 103	$ 1,820
Jul-15	$ 19.48	18,120	$ 998	71	$ 753	$ 106	$ 1,877
Aug-15	$ 19.48	19,500	$ 1,074	71	$ 753	$ 109	$ 1,956
Sep-15	$ 19.48	19,200	$ 1,058	70	$ 743	$ 101	$ 1,921
Oct-15	$ 19.48	16,920	$ 932	70	$ 743	$ 97	$ 1,791
Nov-15	$ 19.48	16,560	$ 912	66	$ 700	$ 92	$ 1,724
Dec-15	$ 19.48	14,400	$ 730	62	$ 658	$ 148	$ 1,555
Jan-16	$ 19.48	15,360	$ 778	62	$ 627	$ 124	$ 1,549
Feb-16	$ 19.48	13,380	$ 678	62	$ 627	$ 115	$ 1,440
Mar-16	$ 19.48	14,820	$ 751	68	$ 687	$ 130	$ 1,588
Apr-16	$ 19.48	17,880	$ 906	68	$ 687	$ 104	$ 1,716
May-16	$ 19.48	17,580	$ 891	71	$ 718	$ 107	$ 1,735
Jun-16	$ 20.24	19,440	$ 925	72	$ 750	$ 148	$ 1,844
Jul-16	$ 20.24	20,760	$ 988	72	$ 750	$ 153	$ 1,912
Aug-16	$ 20.24	20,220	$ 962	79	$ 823	$ 157	$ 1,963
Sep-16	$ 20.24	20,340	$ 968	71	$ 740	$ 147	$ 1,875
Oct-16	$ 20.24	18,480	$ 880	70	$ 729	$ 139	$ 1,768
Nov-16	$ 20.24	15,660	$ 745	65	$ 677	$ 123	$ 1,566
Dec-16	$ 20.24	18,840	$ 897	69	$ 719	$ 139	$ 1,775
Jan-17	$ 25.00	16,680	$ 858	62	$ 657	$ 134	$ 1,675
Feb-17	$ 25.00	15,180	$ 781	61	$ 647	$ 126	$ 1,579
Mar-17	$ 25.00	15,060	$ 809	63	$ 668	$ 131	$ 1,632
Apr-17	$ 25.00	15,720	$ 844	62	$ 657	$ 133	$ 1,660
May-17	$ 25.00	17,040	$ 915	63	$ 668	$ 140	$ 1,748
Yearly Averages		**207,330**	**$ 10,623**	**810**	**$ 8,457**	**$ 1,503**	**$ 20,834**



The resulting energy usage profile, illustrated above, for this account is somewhat influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Energy usage spikes in the summer but overall usage can be considered consistent for a vehicle repair shop. The building's energy usage depends primarily of the type of work being done on any given month. Electric demand usage is relatively constant from month to month, indicating a base consumption need.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Fleet Services #3	Vehicle service or repair	6.47	4.5	7.5	11.7

Overall, this building is operating just below the average percentile of comparable facilities. This indicates improvement opportunities beyond regular building automation solutions and, possibly, improvements in equipment energy efficiency.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Fleet Services #3	Lighting - Interior	$ 3,166.67	$ 2,617.91	$ -	$ 650	$ 6,434.58	$ 72,748.50	11.3
Fleet Services #3	Lighting - Exterior	$ 1,798.82	$ 990.90	$ -	$ 157	$ 2,946.71	$ 36,331.68	12.3
Fleet Services #3	HVAC work - COMBINED	$ 3,214.80	$ 342.95	$ -	$ -	$ 3,557.75	$ 50,431.89	14.2
Fleet Services #3	HVAC Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 4,734.21	-
Breakage Fee							$ 5,449.69	
PA Cost							$ 1,719.48	
Total		**$ 8,180.29**	**$ 3,951.75**	**$ -**	**$ 807**	**$12,939.04**	**$ 171,415.45**	**13.2**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for High Intensity Discharge Interior

The replacement of HID (high intensity discharge), including metal halide or high-pressure sodium provide significant energy reduction opportunities when changing to LED. New types of LED fixtures and retrofit kits can be installed across many existing HID applications not previously available.

Various fixture types utilize HID sources at Broward County. The most common application is high bay or low bay industrial style fixtures. Due to the efficient optical distribution of LED sources in new fixtures, replacing industrial HID fixtures with new LED industrial high bays is the recommended solution, greatly reducing input power, increasing lighting quality and extending the life of the system.

Some fixture types don't lend themselves to replacement from a cost perspective for interior spaces, such as decorative sconces, pendants and some parking garage fixtures. In these cases, the fixtures will be relamped with high output, screw-based LED lamps and the ballasts will be removed.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
FLET SERV, # 3, Pompano Beach	Existing T8 Fluorescent - Proposed Retrofit LED	32	32
	Existing High Intensity Discharge - Proposed New LED High-Bay Fixture	79	79
	Existing T8 Fluorescent - Proposed Retrofit LED With Reflector kit	36	36

PROJECT SCOPE – EXTERIOR LIGHTING

LED Replacement for High Intensity Discharge Exterior

The replacement of HID (high intensity discharge), including metal halide or high-pressure sodium n exterior applications provides significant energy reduction opportunities when changing over to LED. For exterior pole mounted applications, often the number of fixtures can be reduce based on the improved photometric and light distribution of the new LED fixtures that wasn't previously available in HID fixtures. All proposed LED fixtures are from recognized manufacturers that have met the required standards for light quality, efficiency and longevity. In our design effort and fixture selection process, consideration is given to the maintenance benefits of the prescribed solution resulting in less future costs to maintain exterior fixtures in difficult to reach applications. The proposed LED fixture replacement has been specified to furnish light levels that are in compliance with recommended light levels and support the existing site condition requirements. Where time clocks or automated lighting controls are not in place, proposed LED building and site lighting will incorporate an integral photocell to maximize energy savings.

In general, the design approach is to replace existing HID luminaires with new LED luminaires of like type, ie: shoeboxes, wallpacks, floodlights. Some fixture types are replaced with new LED fixtures of a different type, ie: recessed canopy lights replaced with low profile LED canopy lights.

Where deemed appropriate in parks and office buildings, integral occupancy sensors have been used on pole mounted shoebox luminaires in parking lots to automatically dim the lighting during hours of inactivity.

Decorative post top luminaires, recessed step lights, and bollards typically use low wattage HID lamps in architectural form factors. Replacement luminaires of this type are relatively high in cost, with relatively low energy savings potential. As a result, the proposed design typically calls for removing the HID lamp and ballast, and installing a new screw based LED lamp.

Exterior Lighting Retrofit Scope

BUILDING	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
FLET SERV, #3, Pompano Beach	Existing High Intensity Discharge - Proposed New LED Fixture	21	21

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 85,599 kWh

Annual Electric Demand: 315.78 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Fleet Services #3	Lighting - Interior	$ 3,166.67	$ 2,617.91	$ -	$ 650	$ 6,434.58	$ 72,748.50	11.3
Fleet Services #3	Lighting - Exterior	$ 1,798.82	$ 990.90	$ -	$ 157	$ 2,946.71	$ 36,331.68	12.3

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

The building is cooled by either direct expansion (DX) units or unitary space coolers ("window shakers"). The Main Office, located on the east side of the building, and the Parts area, located on the west side of the building, are each cooling by a dedicated DX system. On each end of the Main Office and Parts areas are individual offices. These offices are those services by unitary space coolers. A third split DX system (2 tons in size) serves offices by a repair shop on the west side of the building.

The Main Office AHU is a RUUD model with a 0.5 HP fan motor. The accompanying condensing unit is a 5-ton Rheem manufactured in 2003. The parts AHU is a Payne model with a 0.75 HP fan motor. Its accompanying condensing unit is a 2-ton Carrier single package hat pump.

PROJECT SCOPE

This FIM addresses the replacement of three (3) DX systems and one (1) roof top unit have been identified for replacement. The DX spit systems require replacement of both the condensing unit and air handler.

The new equipment will be of equal capacity and include, as part of the installation, package new programmable thermostats provided by Siemens. The thermostats will be able to communicated, via their own IP address, to remote BAUs for additional access. The units will be placed on a time of day schedule. The new schedule will command the units to turn on 1.5 hours before the facility opens and 1.5 hours after it closes.

Scope of Work

Building	Equipment	Make	Model	Tons	Existing EER	New EER
Fleet Services 3&4	Condenser	Rheem	RAKA-060CAS	5	9	11.76
Fleet Services 3&4	AHU	Ruud	UEAB-2010BSS			
Fleet Services 3&4	Condenser		PA13HR048-H	4	9	11.76
Fleet Services 3&4	AHU	Payne	PF1MNA048			
Fleet Services 3&4	RTU	Carrier	50HS-024---311AA	2	2	11.76

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 55,423 kWh

Annual Electric Demand: 30.4 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Fleet Services #3	HVAC work - COMBINED	$ 3,214.80	$ 342.95	$ -	$ -	$ 3,557.75	$ 50,431.89	14.2

Code Compliance: Associated with the scope of work summarized above are code compliance issued uncovered by contracted MEPs (mechanical, electrical, and plumbing vendor). This cost was requested to be listed separately. For this facility, the code compliance cost is:

- $4,734.21

The identified issue at Fleet Services #3 concerns updated oautside air requirements that currenlty are not met by onsite conditions.

D.11. Facility - Mass Transit

FACILITY DESCRIPTION

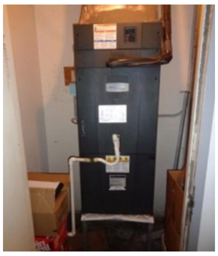
The Mass Transit building is the Broward County Central Terminal located in the heart of downtown Ft. Lauderdale. The building is one of the main hubs of the Broward County Transit system. The building is a one-story 26,553 square foot building located at 101 NW 1st Ave, Ft Lauderdale, FL 33311. The building is utilized for office space and as a break area for bus drivers. There is a public bathroom building at this facility that is not conditioned. This terminal has 24 bays for loading and unloading passengers and this takes up most of the space at the facility. The bays remain in operation outside of the office hours.

Operating Hours:

Monday – Friday: 6AM – 8PM
Saturday – Sunday: 9AM – 4PM

COOLING SYSTEM

Cooling for this building is provided by one Trane split direct expansion system. The coolant being used for this system is R410a and was the equipment was manufactured in 2010. The system is a residential style system and does not have outside air intake. Wall units are used for supplementing air conditioning to the generator room office and the electrical room.


Cooling System Examples

Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Mass Transit Downtown Terminal												
CU	Trane	4A7M3048A1000AA	10273TYTAA	compressor	R-410a			208	1	21.8		4.1
				fan		0.33		208	1	1.7		
AHU	Trane	GAM5A0C42M31SAA	11193L6B2V	fan		0.5		200	1	4.1		0.7

LIGHTING SYSTEM

The interior lighting at this facility consists of T8 fluorescent light fixtures and compact fluorescent light fixtures. The exterior lighting consists of high pressure sodium light fixtures, metal halide light fixtures, and T5 light fixtures.

Exterior Lighting Examples

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 gpm faucets
- 3.5 gpf toilets
- 1.0 gpf urinals

BUILDING CONTROLS SYSTEM

The building is currently not equipped with a building automation system. Each zone has a dedicated thermostat.


HVAC Controls Equipment

TRENDING DATA ACQUISITION

The HVAC system at this facility currently utilizes R410a refrigerant and is in good condition so the trending data was not acquired for the unit.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the Seasonal Demand Time-of-Day Rider (SDTR-1A) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

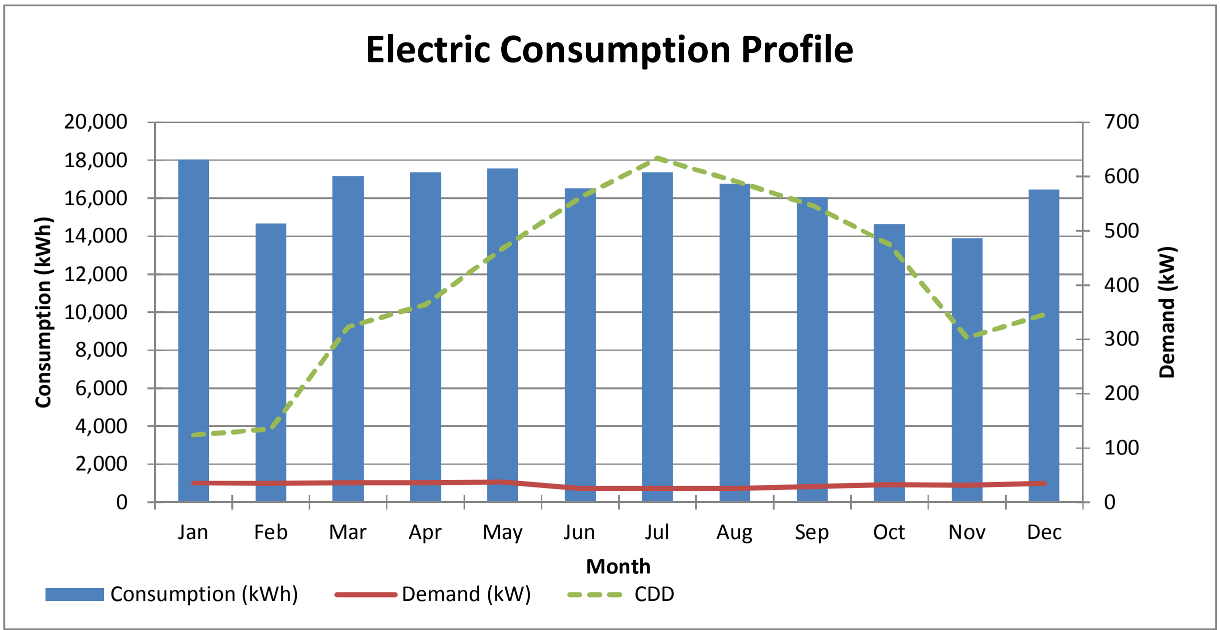
Electric Baseline Summary

Facility	# of Meters	Rate Structure	June - Sept		$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak					
MASS TRAN Downtown Terminal	1	SDTR-1A	0.129016375	$ 0.04071	$ 0.05631	$ 10.95	196,480	383	42

The data in the table above was generated using the following electric billing data.

Meter MEL645A; Account: 1317445359; Address: 150 NW 2ND ST # BUS TERM FT LAUD

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak				Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 25.96	16,012	637	15,375	$ 661	17	$ 206	$ 9	$ 23	$ 124	$ 1,049
Jul-15	$ 25.96	17,601	967	16,634	$ 733	18	$ 218	$ 10	$ 25	$ 155	$ 1,167
Aug-15	$ 25.96	15,862	909	14,953	$ 661	19	$ 230	$ 9	$ 24	$ 144	$ 1,094
Sep-15	$ 25.96	16,689	883	15,806	$ 694	29	$ 351	$ 9	$ 28	$ 145	$ 1,254
Oct-15	$ 25.96	14,913	357	14,556	$ 601	33	$ 400	$ 8	$ 26	$ 185	$ 1,246
Nov-15	$ 25.96	14,319	0	14,319	$ 577	32	$ 388	$ 8	$ 26	$ 177	$ 1,201
Dec-15	$ 25.96	14,538	0	14,538	$ 586	30	$ 364	$ 8	$ 25	$ 182	$ 1,191
Jan-16	$ 25.96	15,941	0	15,941	$ 797	31	$ 303	$ 10	$ 29	$ 71	$ 1,236
Feb-16	$ 25.96	12,237	0	12,237	$ 612	28	$ 274	$ 8	$ 24	$ 57	$ 1,000
Mar-16	$ 25.96	14,997	0	14,997	$ 750	31	$ 303	$ 10	$ 28	$ 71	$ 1,188
Apr-16	$ 25.96	15,426	0	15,426	$ 771	31	$ 303	$ 10	$ 28	$ 28	$ 1,167
May-16	$ 25.96	15,101	0	15,101	$ 755	32	$ 313	$ 10	$ 28	$ 29	$ 1,161
Jun-16	$ 26.97	17,015	890	16,125	$ 725	33	$ 388	$ 16	$ 30	$ 72	$ 1,257
Jul-16	$ 26.97	17,112	1,537	15,575	$ 783	33	$ 388	$ 16	$ 31	$ 75	$ 1,320
Aug-16	$ 26.97	17,650	1,158	16,492	$ 772	32	$ 376	$ 16	$ 30	$ 74	$ 1,296
Sep-16	$ 26.97	15,413	898	14,515	$ 665	30	$ 353	$ 14	$ 27	$ 63	$ 1,148
Oct-16	$ 26.97	14,349	315	14,034	$ 670	32	$ 323	$ 13	$ 26	$ 61	$ 1,120
Nov-16	$ 26.97	13,500	0	13,500	$ 630	31	$ 312	$ 12	$ 25	$ 59	$ 1,066
Dec-16	$ 26.97	18,387	0	18,387	$ 858	39	$ 393	$ 17	$ 33	$ 78	$ 1,406
Jan-17	$ 25.00	20,153	0	20,153	$ 1,022	40	$ 412	$ 16	$ 38	$ 91	$ 1,604
Feb-17	$ 25.00	17,088	0	17,088	$ 866	41	$ 422	$ 14	$ 34	$ 82	$ 1,443
Mar-17	$ 25.00	19,318	0	19,318	$ 1,023	41	$ 422	$ 15	$ 38	$ 93	$ 1,617
Apr-17	$ 25.00	19,287	0	19,287	$ 1,021	41	$ 422	$ 15	$ 38	$ 93	$ 1,615
May-17	$ 25.00	20,052	0	20,052	$ 1,062	42	$ 433	$ 16	$ 39	$ 97	$ 1,671
Yearly Averages		**196,480**	**4,276**	**192,205**	**$ 9,147**	**383**	**$ 4,149**	**$ 145**	**$ 352**	**$ 1,153**	**$ 15,259**



The resulting energy usage profile, illustrated above, for this account is not influenced by cooling needs as this is a transportation terminal. Instead, the usage is based lighting requirements for the terminal. This is evident in the months of February through May where usage is higher than in summer months. Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in January while the average low occurs in November.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
MASS TRAN Downtown Terminal	-	7.40	-	-	-

Transportation terminals are not commonly assessed by CBECs for energy usage analysis; therefore, this facility does not have metric to compare against.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

All recommended FIMs for this facility have been removed from the final scope by Broward County. Please refer to Section G of this report for documentation of these originally proposed opportunities.

D.12. Facility - Mid-Rise / East Parking

FACILITY DESCRIPTION

The Midrise and East Garage building are two separate entities within one structure located at 540 SE 3 Ave. The north side of the structure is a 5-story parking garage of approximately 636,924 square feet. The south side of the structure, known as the Midrise Building, is a 4-story, 67,152 square foot office building that houses drug testing offices, BSO Probation, Broward Clerk of Courts, Public Defender offices, and State Attorney Offices. The hours of operations for Midrise Building are typically from 8AM to 5PM; Mondays through Fridays.

Facilities

COOLING SYSTEM:

Cooling for the Midrise Building is provided by two (2) package, air-cooled chillers located on the roof; adjacent to the last parking level of the East Garage. Each chiller is equipped with four (4) compressors; each with its own VFD. The chilled-water pumps for each chiller are underneath, and a part, of the overall unit. These pump motors are also equipped with VFDs and are integrated into the control and operation of the chillers. These chillers were installed in November 2016.

Chillers

Chilled-water is distributed to a total of four (4) air handling units (AHUs) and one (1) Liebert. Each AHU is responsible for conditioning a floor of the building. The Liebert is a dedicated unit for the building's data center. All AHUs were replaced after the installation of the new chillers. All dampers, ductwork, and even mechanical room layouts were remodeled and installed anew.

AHU Mechanical Room Equipment

AHU Mechanical Room Equipment

The building also utilizes a main supply air fan as its source of outside air. This unit is also new and controlled by the building automation system.

Supply Air Intake

Air is distributed throughout the building via variable air volume (VAV) boxes. It was reported that the VAV boxes were not a primary focus during the renovations and there may be a need to recommissioning the communication and operation of these units. The only cooling found for the East Garage is one (1) split system dedicated to a maintenance office that is rarely occupied. The condensing unit was replaced in 2014.

Split DX Unit

Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	**Mfctr**	**Model**	**Serial**	**Description**	**Notes**	**HP**	**Tons/ MBTU**	**V**	**Ph**	**Amps**	**Eff /EER**	**Cal kW**
MidRise / East Parking												
DX Condenser	Ruud	TZAA-030-2C757	W441413511	compressor	R-22		2.5	230	1	14.1	11.5	2.9
				fan	2014	0.1667		230	1	0.8		0.2
Package Chiller 1	Carrier	30RBF08065NLNL	4516Q84936	compressor	with VFD		76	460	3	32.7	9.8	23.4
				compressor	with VFD			460	3	32.7		23.4
				compressor				460	3	32.7		23.4
				compressor				460	3	32.7		23.4
				fan	with VFD	3.55		460	3	5.4		3.9
				pump	with VFD	4.8		460	3	7.1		5.1
Package Chiller 2	Carrier	30RBF08065NLNL	4516Q84936	compressor			76	460	3	32.7	9.8	23.4
				compressor				460	3	32.7		23.4
				compressor				460	3	32.7		23.4
				compressor				460	3	32.7		23.4
				fan		3.55		460	3	5.4		3.9
				pump		4.8		460	3	7.1		5.1
OA Supply Fan	FloAire	SA18				3		208	3	8.7		2.8
AHU-1				with VFD	2017	15		460	3	19.3		13.8
AHU-2				with VFD	2017	15		460	3	19.3		13.8
AHU-3	AP305		CAMM 15941D	with VFD	2017	15		460	3	19.3		13.8
AHU-4	AP305	BA0061147	CAMM 15939D	with VFD	2017	15		460	3	19.3		13.8

LIGHTING SYSTEM

Lighting for the East Garage consists of some 32 Watt, T8 fluorescent lamps in 2-lamp 2x4 fixtures but mostly metal halide high bay fixtures for parking structures.

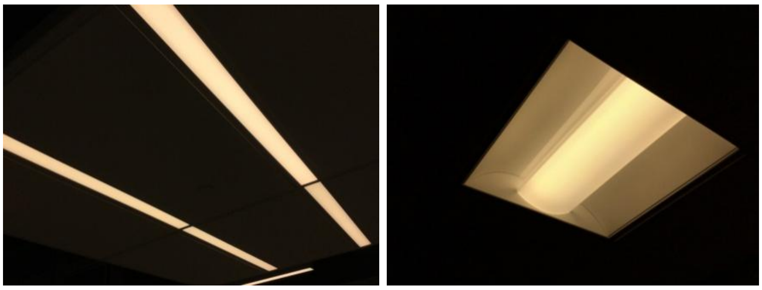


Interior Lighting Examples – East Garage

Exterior lighting for the East Garage is limited to light poles located on the last level parking. The fixtures appear to be HPS lamps.

Exterior Lighting Examples – East Garage

Lighting for the Midrise building is mostly single and 2-lamp T8 fluorescent indirect lighting fixtures.



Interior Lighting Examples – Midrise

Exterior lighting for the Midrise Building consists of HPS lamps in recessed cans.

Exterior Lighting Examples – Midrise

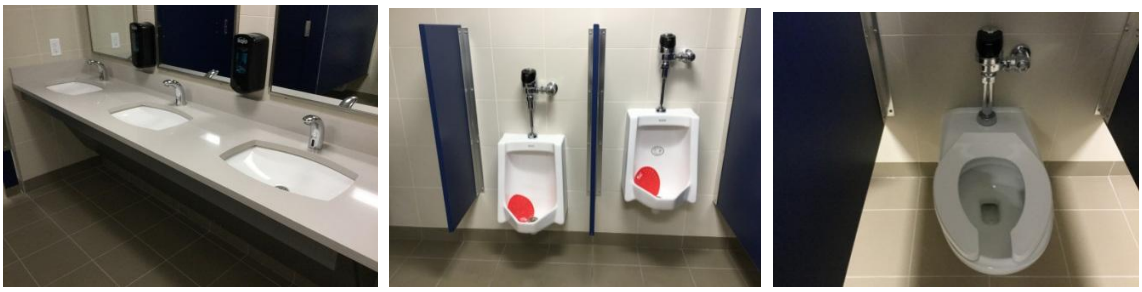
The building already makes use of occupancy sensors in offices and mechanical rooms. These sensors appear to be a part of the recent renovations occurring throughout the building.

Occupancy Sensors

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restroom and the chiller plant. All water fixtures are operated using sensors. The following are example of the types of fixture found within the restroom of the facility:

- 0.5 faucets
- 1.28 gpf toilets
- 0.125 gpf urinals



Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM

A Siemens front end communicates with Johnson Control panels to make up the building automation system for this building. Air handlers reported operate 24 hours a day and are throttled based on max temperature setpoints and VAV damper positions. A VAV position greater than 95% will result in the system increasing the static pressure by 0.05 until conditions are optimal. A VAV position less than 25% will result in the system decreasing the static pressure by 0.05 until conditions are optimal. During unoccupied hours, the AHUs, although running, should see minimal usage based on the programming.

HVAC Controls Equipment

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored one (1) electric meter. The billing account utilizes the Commercial/Industrial Load Control Program Agreement (CILC-1G) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

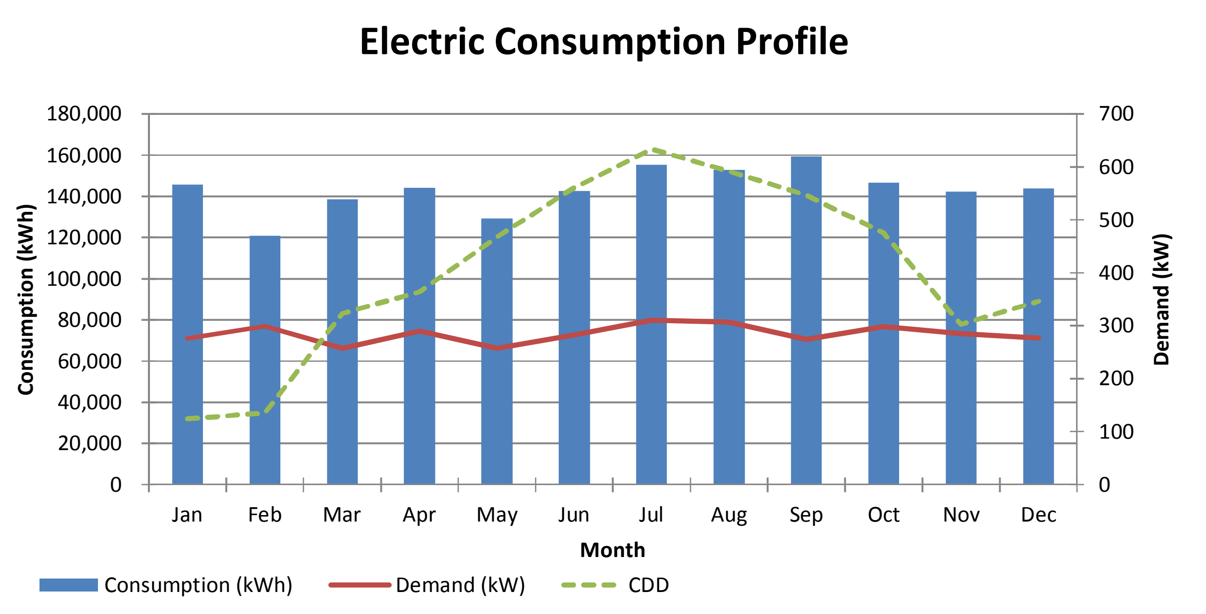
Electric Baseline Summary

Facility	# of Meters	Rate Structure	Year-Round		$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak				
Mid-Rise / East Parking	1	CILC-1G	$0.04652	$0.04085	$ 11.68	1,733,400	3,440	328

The data in the table above was generated using the following electric billing data.

Meter RV793V0; Account: 7440741317; Address: 540 SE 3RD AVE

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)		Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak		L/C	Max		Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 225.00	137,280	*41,608*	*95,672*	$ 5,682		291	$ -	$ 101	$ 239	$ 273	$ 10,237
Jul-15	$ 225.00	153,120	*46,409*	*106,711*	$ 6,338		328	$ -	$ 111	$ 262	$ 301	$ 11,254
Aug-15	$ 225.00	151,680	*45,973*	*105,707*	$ 6,278		304	$ -	$ 109	$ 257	$ 295	$ 11,047
Sep-15	$ 225.00	157,680	*47,791*	*109,889*	$ 6,526		283	$ -	$ 110	$ 258	$ 296	$ 11,094
Oct-15	$ 225.00	141,360	*42,845*	*98,515*	$ 5,851		313	$ -	$ 104	$ 245	$ 280	$ 10,499
Nov-15	$ 225.00	142,320	*43,136*	*99,184*	$ 5,891		285	$ -	$ 102	$ 242	$ 277	$ 10,374
Dec-15	$ 225.00	143,760	*43,572*	*100,188*	$ 5,950		277	$ -	$ 101	$ 239	$ 274	$ 10,263
Jan-16	$ 225.00	145,680	*44,154*	*101,526*	$ 6,030		276	$ -	$ 99	$ 233	$ 268	$ 10,017
Feb-16	$ 225.00	120,960	*36,662*	*84,298*	$ 5,007		299	$ -	$ 88	$ 208	$ 239	$ 8,948
Mar-16	$ 225.00	138,480	*41,972*	*96,508*	$ 5,732		257	$ -	$ 94	$ 223	$ 256	$ 9,570
Apr-16	$ 225.00	144,240	*43,718*	*100,522*	$ 5,970		290	$ -	$ 95	$ 224	$ 257	$ 9,631
May-16	$ 225.00	129,360	*39,208*	*90,152*	$ 5,354		257	$ -	$ 87	$ 206	$ 236	$ 8,832
Jun-16	$ 225.00	147,600	*44,736*	*102,864*	$ 6,109		275	$ -	$ 96	$ 227	$ 260	$ 9,729
Jul-16	$ 225.00	157,680	*47,791*	*109,889*	$ 6,526		293	$ -	$ 102	$ 240	$ 275	$ 10,310
Aug-16	$ 225.00	175,440	*53,174*	*122,266*	$ 7,261		302	$ -	$ 110	$ 260	$ 298	$ 11,148
Sep-16	$ 225.00	161,040	*48,809*	*112,231*	$ 6,665		266	$ -	$ 101	$ 239	$ 274	$ 10,263
Oct-16	$ 225.00	151,920	*46,045*	*105,875*	$ 6,288		284	$ -	$ 98	$ 232	$ 266	$ 9,948
Nov-16	$ 225.00				$ -			$ -	$ -	$ -	$ -	
Dec-16	$ 225.00				$ -			$ -	$ -	$ -	$ -	
Jan-17	$ 225.00				$ -			$ -	$ -	$ -	$ -	
Feb-17	$ 225.00				$ -			$ -	$ -	$ -	$ -	
Mar-17	$ 225.00				$ -			$ -	$ -	$ -	$ -	
Apr-17	$ 225.00				$ -			$ -	$ -	$ -	$ -	
Aug-17	$ 125.00	131,760	39,935	91,825	$ 6,367	359	315	$ 2,794	$ 98	$ 230	$ 264	$ 9,877
Yearly Averages		**1,733,400**	**525,374**	**1,208,026**	**$ 54,913**		**3,440**	**$ 1,397**	**$ 904**	**$ 2,132**	**$ 2,445**	**$ 120,921**



Since there is one meter for both the mid rise Building and Garage, the resulting energy usage profile illustrated above, is a blend of two different usage type buildings. Electric usage for garages is not governed by outdoor weather conditions; however, office buildings typically are in South Florida. Electric usage is not entirely constant from month to month, appears to be affected by building occupancy. The average peak for the 24 month period evaluated occurs in September while the average low occurs in February.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Mid-Rise / East Parking	-	25.81	-	-	-

A combined usage electric meter is not a commonly experienced location for CBECs energy usage analysis; therefore, this facility does not have metric to compare against.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Midrise Office Building

Account #	2028915	**Meter #**	200110981-M
Rate		**Address**	
Meter Size	2"	**Meter Type**	W/S/ST

Date	Total Charges
Mar-17	$ 693.80
Feb-17	$ 739.40
Jan-17	$ 762.20
Dec-16	$ 864.80
Nov-16	$ 802.70
Oct-16	$ 738.28
Sep-16	$ 665.68
Aug-16	$ 958.90
Jul-16	$ 676.54
Jun-16	$ 687.40
May-16	$ 730.84
Apr-16	$ 730.84
Mar-16	$ 643.96
Feb-16	$ 676.54
Jan-16	$ 676.54
Dec-15	$ 1,418.24
Nov-15	$ 706.14
Oct-15	
Sep-15	$ 562.96
Aug-15	$ 542.28
Jul-15	$ 625.00
Jun-15	$ 583.64
May-15	$ 790.44
Apr-15	$ 386.28
Mar-15	$ 573.30
TOTALS	**$17,236.70**

East Parking Garage

Account #	2028916	**Meter #**	200112090-M
Rate		**Address**	
Meter Size	1.5"	**Meter Type**	IRR

Date	Total Charges
Mar-17	$ 929.16
Feb-17	$ 872.31
Jan-17	$ 849.57
Dec-16	$ 580.63
Nov-16	$ 576.87
Oct-16	$ 927.72
Sep-16	$ 1,534.68
Aug-16	$ 733.26
Jul-16	$ 627.57
Jun-16	$ 971.52
May-16	$ 545.40
Apr-16	$ 993.18
Mar-16	$ 657.45
Feb-16	$ 689.94
Jan-16	$ 917.37
Dec-15	$ 993.18
Nov-15	$ 689.94
Oct-15	$ 626.22
Sep-15	$ 667.41
Aug-15	$ 427.09
Jul-15	$ 540.85
Jun-15	$ 512.41
May-15	$ 419.98
Apr-15	$ 412.87
Mar-15	$ 540.85
TOTALS	**$18,237.43**

These accounts only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Mid-Rise / East Parking	Lighting - Interior	$ 23,464.05	$ -	$ -	$ 8,440	$ 31,904.05	$ 197,692.82	6.2
Breakage Fee							$ 10,072.80	
PA Cost							$ 2,069.77	
Total		**$ 23,464.05**	**$ -**	**$ -**	**$ 8,440**	**$31,904.05**	**$ 209,835.39**	**6.6**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices .

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for High Intensity Discharge Interior

The replacement of HID (high intensity discharge), including metal halide or high-pressure sodium provide significant energy reduction opportunities when changing to LED. New types of LED fixtures and retrofit kits can be installed across many existing HID applications not previously available.

Various fixture types utilize HID sources at Broward County. The most common application is high bay or low bay industrial style fixtures. Due to the efficient optical distribution of LED sources in new fixtures, replacing industrial HID fixtures with new LED industrial high bays is the recommended solution, greatly reducing input power, increasing lighting quality and extending the life of the system.

Some fixture types don't lend themselves to replacement from a cost perspective for interior spaces, such as decorative sconces, pendants and some parking garage fixtures. In these cases, the fixtures will be relamped with high output, screw-based LED lamps and the ballasts will be removed.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
Mid-Rise / East Parking	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	104	104
	Existing T8 Fluorescent - Proposed Retrofit LED	110	110
	Existing High Intensity Discharge - Proposed Retrofit LED	316	316

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 396,933 kWh

Annual Electric Demand: 567.72 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Mid-Rise / East Parking	Lighting - Interior	$ 23,464.05	$ -	$ -	$ 8,440	$ 31,904.05	$ 197,692.82	6.2

D.13. Facility - State Attorney Warehouse

FACILITY DESCRIPTION

The State Attorneys and clerks warehouse building is a facility that is used primarily for storage of documents from the state attorney and the county clerk. The building is a single floor and approximately 30,000 ft^2 and is located at 519 SW 2nd Ave, Fort Lauderdale, FL 33301. The building occupancy schedule is below. It is important to note that the HVAC system is used 24/7 because the primary function of the building is to store documents and prevent degradation of those documents.

Occupancy Hours

Monday-Friday: 6AM – 5PM
Saturday – Sunday: Closed

Observed Issues during Visit:

- Cooling system uses R22 refrigerant.
- Some HVAC equipment is past it's useful life

Examples of Observed Issues

COOLING SYSTEM:

Cooling for the State Attorney and Clerks Waterhouse is provided by twelve split DX units that vary largely in terms of model, age, capacity, and condition. All units are 100% return air. Below is a table that summarizes the cooling equipment at this building.

The table shows that there is a large variety of DX systems at this building. It is important to note that any missing information is attributed to degraded nameplates that could not be read.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
State Attorney & Clerks Warehouse												
AHU-3	Rheem	RHGE-0752K	139G2095 1390	R-22	1995	1		460	3	1.8		1.3
DX Condenser	Rheem	RAKA-060CAS	4991 M2895 1783	R-22	compressor		5	230	3	17	9	6.1
				1995	fan	0.3333		230	3	2		0.7
AHU-8	Rheem	RBEA-24J10NUBAI	T M2395 1467			0.5		240	1	3.4		0.7
DX Condenser	Rheem	RAND-042JAZ	7300 M1508 0684	R-22	compressor		3.5	230	1	19.2	12	4.0
				2008	fan	0.2		230	1	1.2		0.2
AHU-12	Rheem	RBEA-21J10NUJAI	T M1895 1551			0.3333		240	1	2.8		0.6
DX Condenser	Rheem	RAND-060CAZ	7305 M1508 0567	R-22	compressor		5	230	3	15.4	11.5	5.5
				2008	fan	0.2		230	3	1.5		0.5
AHU-4	Rheem	RHGL-120ZL	F301103769	R-410A	2011	2		460	3	3.4		2.4
DX Condenser	Rheem	RAWL-120CAZ	7759F171103175	R-410A	compressor		10	230	3	30.1	11.2	10.8
				2011	fan	0.3333		230	3	2.4		0.9
AHU-5	Rheem	RHGL-120ZL	F281102961	R-410A	2011	2		460	3	3.4		2.4
DX Condenser	Rheem	RAWL-120CAZ	7759F161103113	R-410A	compressor		10	230	3	30.1	11.2	10.8
				2011	fan	0.3333		230	3	2.4		0.9
AHU-6	Rheem	RHGL-120ZL	F281102969	R-410A	2011	2		460	3	3.4		2.4
DX Condenser	Rheem	RAWL-120CAZ	7759F171107776	R-410A	compressor		10	230	3	30.1	11.2	10.8
				2011	fan	0.3333		230	3	2.4		0.9
AHU-7	Rheem	RHGL-120ZL	F291102512	R-410A	2011	2		460	3	3.4		2.4
DX Condenser	Rheem	RAWL-120CAZ	7759F161103114	R-410A	compressor		10	230	3	30.1	11.2	10.8
				2011	fan	0.3333		230	3	2.4		0.9
AHU												0.0
DX Condenser	Rheem	RAND-060JAZ	7307 M0408 0398	R-22	compressor		5	230	1	25.3	11.5	4.1
				2008	fan	0.2		230	1	1.2		0.2
AHU-11	Goodman	ARUF37C14AA	1701049562			0.3333		230	1	3		0.6
DX Condenser	Goodman	VSX 140361AC	1612075967	R-410A	compressor		3	230	1	14.1	11.76	2.9
					fan	0.1667		230	1	0.95		0.2
AHU-9	Lennox	CB18-41-3P				0.3333		230	1	2.9		0.6
DX Condenser				nameplate unreadab	compressor							0.0
					fan							0.0
AHU-10	Lennox	CB18-41-3P				0.3333		230	1	2.9		0.6
DX Condenser				nameplate unreadab	compressor							0.0
					fan							0.0
AHU												0.0
DX Condenser		NAC042AKC3	E051005278	R-22	compressor		3.3	230	1	17.1	9.2	3.5
					fan	0.25		230	1	1.4		0.3



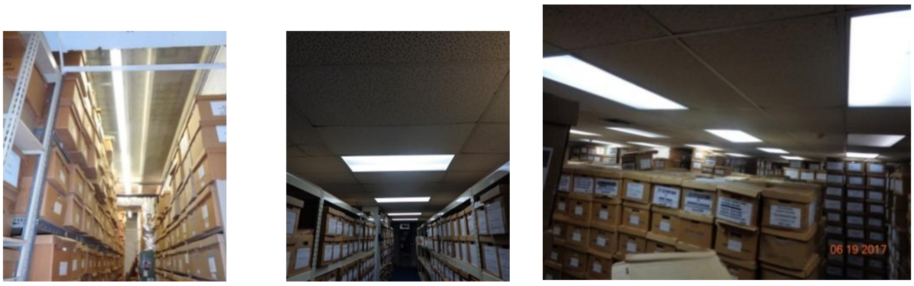

Sate Attorney & Clerk Warehouse HVAC

Observed Issues during Visit:

- Cooling system uses R22 refrigerant and some HVAC equipment is past it's useful life

LIGHTING SYSTEM

Interior lighting primarily consists of 60 Watt and 110 Watt, T8 fluorescent lamp.



Interior Lighting Examples

Exterior Lighting consists of compact florescent lighting on the perimeter of the building.

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms. Fixtures and water closets are all operated manually. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 gpm faucets
- 3.5 gpf toilets

BUILDING CONTROLS SYSTEM

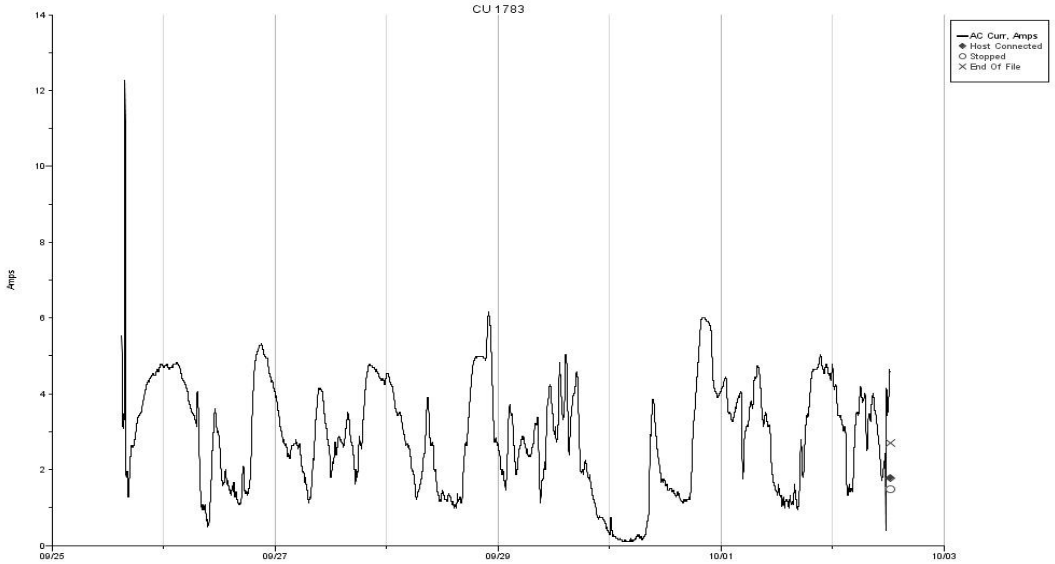
The building is currently not equipped with a building automation system. Each unit has a dedicated thermostat.

Building Controls

TRENDING DATA ACQUISITION

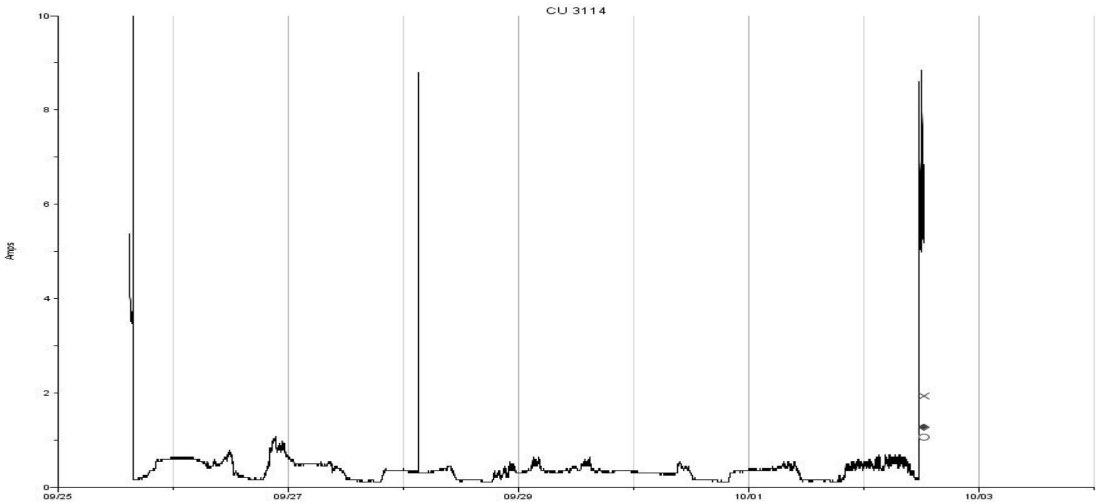
In order to determine the runtime operation of each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data Acquisition – 5 Ton Condensing Unit



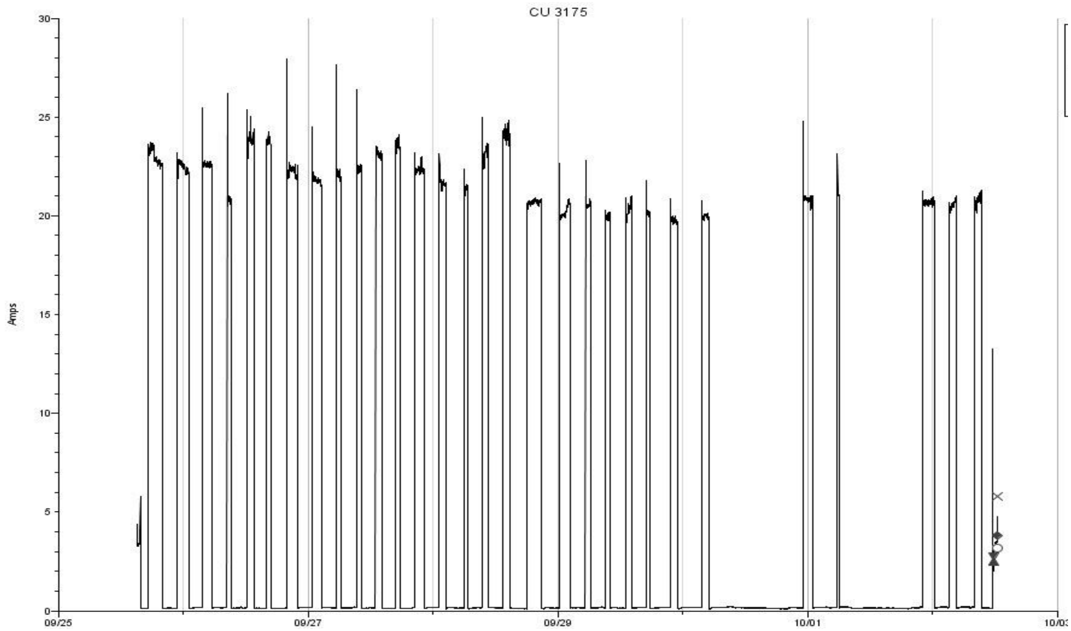
This unit ending in serial number 1783 registered an average of 3.02 amps and was operating for a total of 156.75 hours during a one week period.

Trending Data Acquisition – 10 Ton Condensing Unit



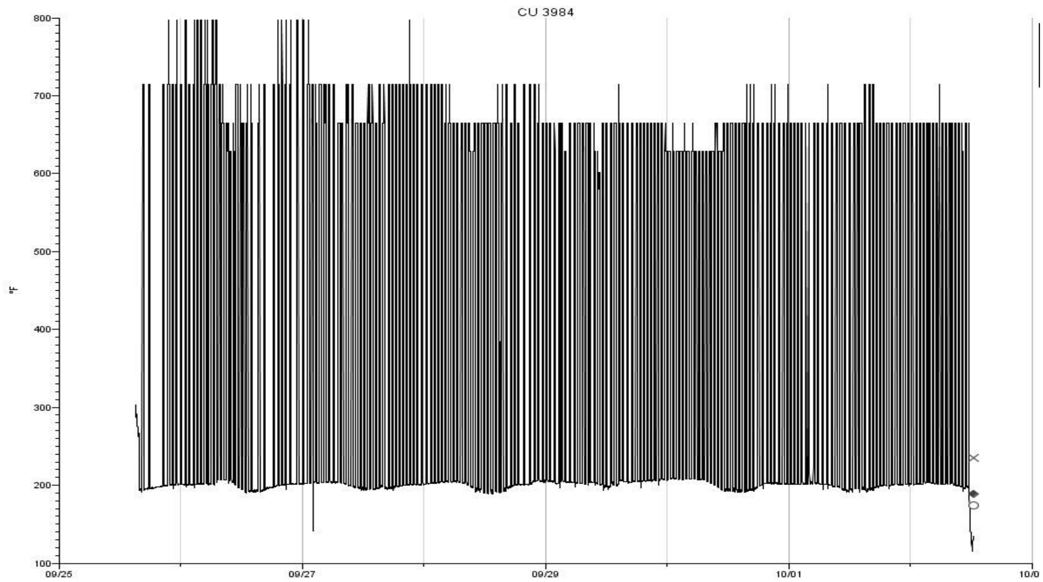
This unit ending in serial number 3114 registered an average of 0.94 amps and was operating for a total of 25.55 hours during a one week period.

Trending Data Acquisition – 10 Ton Condensing Unit



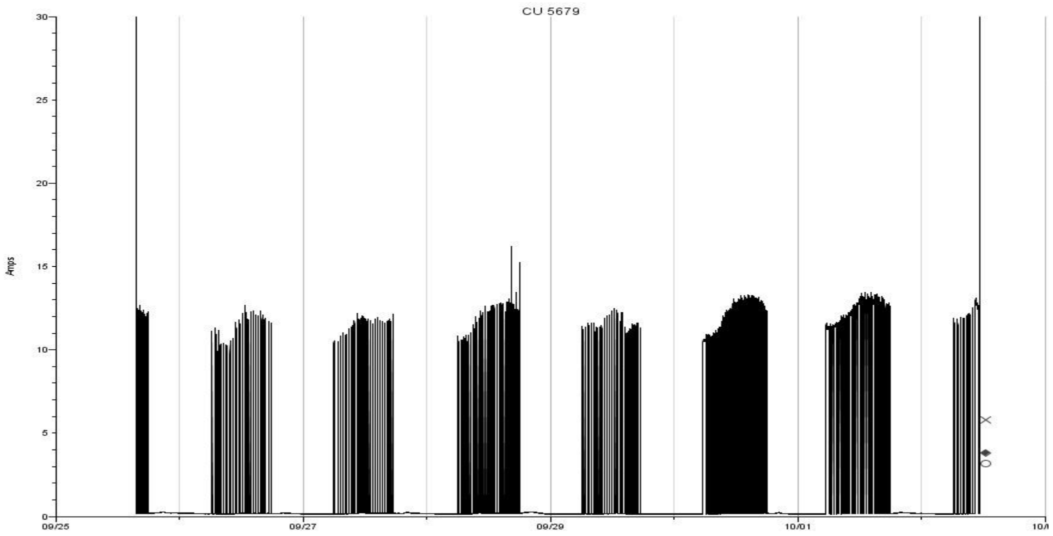
This unit ending in serial number 3175 registered an average of 21.68 amps and was operating for a total of 43.20 hours during a one week period.

Trending Data Acquisition – 5 Ton Condensing Unit



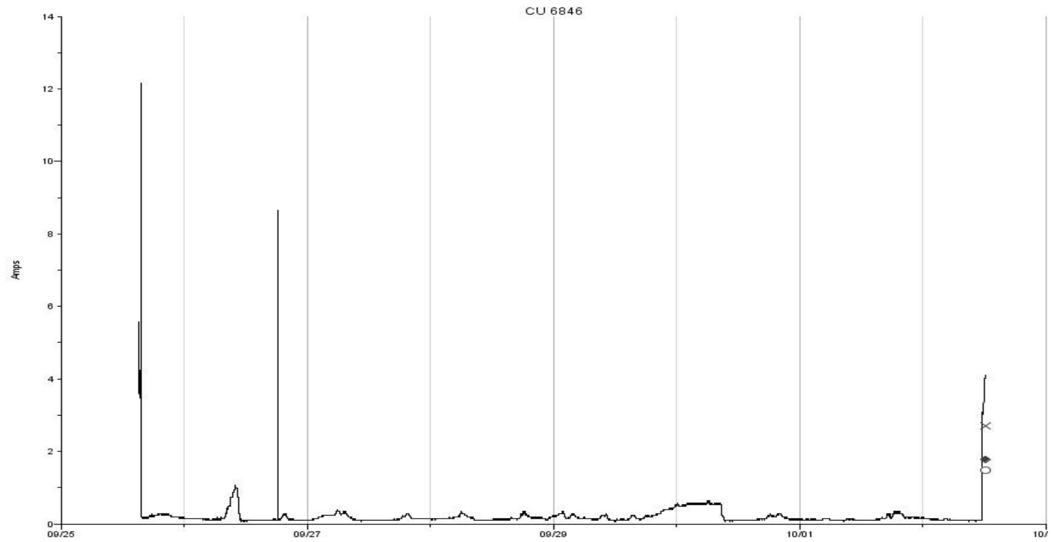
This unit ending in serial number 3984 had corrupt data and no determination could be made from this data.

Trending Data Acquisition – 5 Ton Condensing Unit



This unit ending in serial number 5679 registered an average of 14.85 amps and was operating for a total of 34.12 hours during a one week period.

Trending Data Acquisition – 3.5 Ton Condensing Unit



This unit ending in serial number 6846 registered an average of 3.47 amps and was operating for a total of 1.43 hours during a one week period.

The following table compares the operating hours of each unit with the hours of service for the facility.

Day	Hours of Service	Run Hours CU 1783	Run Hours CU 3114	Run Hours CU 3175
Monday	6:00AM - 5:00PM	12:00AM - 11:59PM	turns	12:00AM - 11:59PM
Tuesday	6:00AM - 5:00PM	12:00AM - 11:59PM	on	12:00AM - 11:59PM
Wednesday	6:00AM - 5:00PM	12:00AM - 11:59PM	sparingly	12:00AM - 11:59PM
Thursday	6:00AM - 5:00PM	12:00AM - 11:59PM	throughout	12:00AM - 11:59PM
Friday	6:00AM - 5:00PM	12:00AM - 11:00PM	the	12:00AM - 11:00PM
Saturday	Closed	8:00AM - 11:59PM	week	off
Sunday	Closed	12:00AM - 11:59PM		off

Day	Hours of Service	Run Hours CU 3984	Run Hours CU 5679	Run Hours CU 6846
Monday	6:00AM - 5:00PM	data	6:00AM - 6:00PM	turns
Tuesday	6:00AM - 5:00PM	error	6:00AM - 6:00PM	on
Wednesday	6:00AM - 5:00PM		6:00AM - 5:30PM	sparingly
Thursday	6:00AM - 5:00PM		6:00AM - 6:00PM	throughout
Friday	6:00AM - 5:00PM		6:00AM - 5:30PM	the
Saturday	Closed		5:30AM - 6:00PM	week
Sunday	Closed		5:30AM - 6:00PM	

Only six out of the twelve units at this facility were data logged. The units chosen for data logging were units that are in poor condition and/or are utilizing R22 refrigerant. The remaining units are higher efficiency units in good condition and running R410a refrigerant and don't present a good opportunity for energy savings. Most of the units that were logged either run continuously or turn on sparingly throughout the week of data collection. Only one unit, the unit ending in serial number 5679, was operating under a schedule control. This unit turns on when the building begins operation and turns off approximately 1 hour after the building ends operation.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by two (2) electric meters; each metering a section of the building. The Clerk's office area is metered under the General Service Demand (GSD-1) rate structure. The warehouse portion of the facility is metered under the Seasonal Demand Time of Use Rider (GSDTR-1A) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

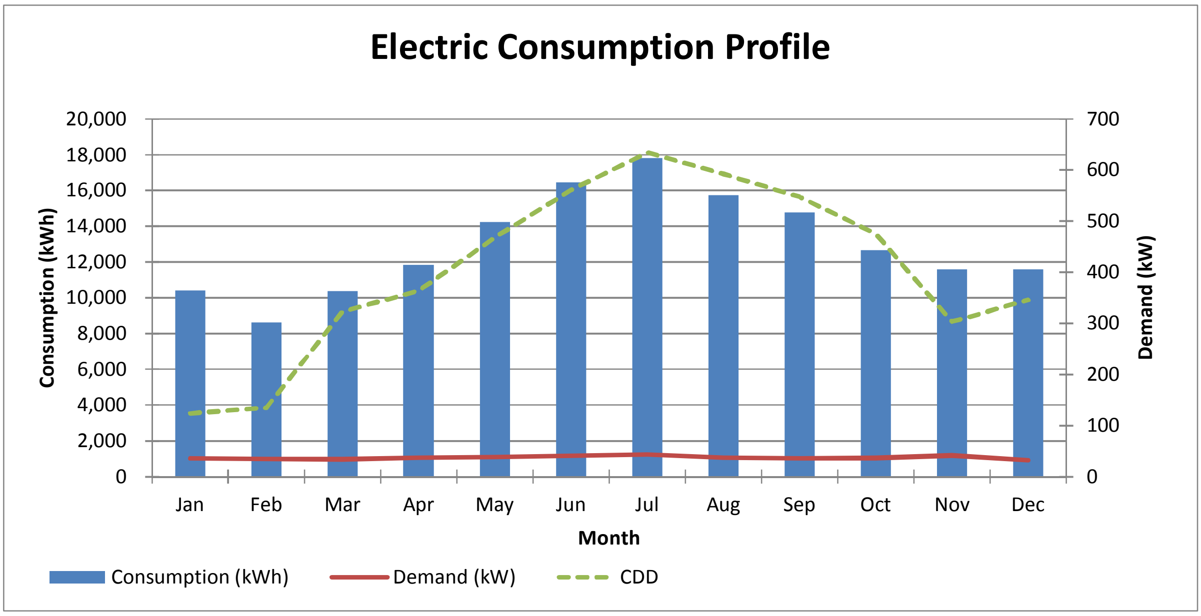
Electric Baseline Summary

Facility	# of Meters	Rate Structure	June - Sept		$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
			on peak	off peak					
State Attorney-Clerks		GSD-1	-	-	$ 0.05810	$ 11.47	156,060	446	44
Warehouse		SDTR-1A	0.129013557	$ 0.04071	$ 0.05631	$ 10.95	127,470	377	40

The data in the table above was generated using the following electric billing data.

Meter KU30320; Account: 3411447331; Address: 515 SW 2ND AVE FORT LAUD (Offices)

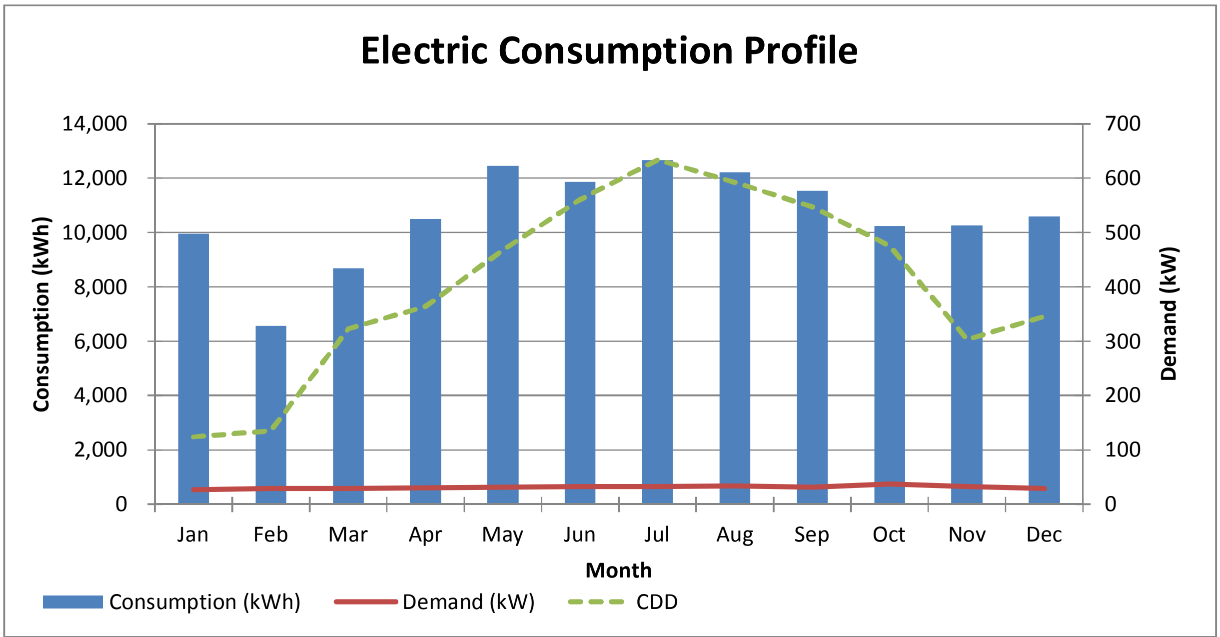
Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	18,360	$ 1,011	44	$ 467	$ 83	$ 1,581
Jul-15	$ 19.48	18,120	$ 998	44	$ 467	$ 82	$ 1,567
Aug-15	$ 19.48	16,080	$ 886	35	$ 371	$ 69	$ 1,346
Sep-15	$ 19.48	15,240	$ 840	34	$ 361	$ 61	$ 1,281
Oct-15	$ 19.48	12,420	$ 684	33	$ 350	$ 55	$ 1,109
Nov-15	$ 19.48	12,540	$ 691	43	$ 456	$ 64	$ 1,231
Dec-15	$ 19.48	11,520	$ 584	32	$ 340	$ 103	$ 1,046
Jan-16	$ 19.48	10,080	$ 511	40	$ 404	$ 82	$ 1,016
Feb-16	$ 19.48	7,740	$ 392	38	$ 384	$ 70	$ 866
Mar-16	$ 19.48	11,040	$ 559	36	$ 364	$ 85	$ 1,028
Apr-16	$ 19.48	11,160	$ 565	40	$ 404	$ 63	$ 1,052
May-16	$ 19.48	12,840	$ 650	40	$ 404	$ 65	$ 1,139
Jun-16	$ 20.24	14,580	$ 694	37	$ 386	$ 96	$ 1,196
Jul-16	$ 20.24	17,460	$ 831	42	$ 438	$ 113	$ 1,402
Aug-16	$ 20.24	15,360	$ 731	40	$ 417	$ 102	$ 1,271
Sep-16	$ 20.24	14,280	$ 680	37	$ 386	$ 93	$ 1,178
Oct-16	$ 20.24	12,900	$ 614	40	$ 417	$ 90	$ 1,141
Nov-16	$ 20.24	10,620	$ 506	40	$ 417	$ 81	$ 1,024
Dec-16	$ 20.24	11,700	$ 557	32	$ 333	$ 78	$ 989
Jan-17	$ 25.00	10,740	$ 553	31	$ 329	$ 80	$ 986
Feb-17	$ 25.00	9,480	$ 488	31	$ 329	$ 74	$ 916
Mar-17	$ 25.00	9,720	$ 522	32	$ 339	$ 79	$ 965
Apr-17	$ 25.00	12,480	$ 670	34	$ 360	$ 94	$ 1,150
May-17	$ 25.00	15,660	$ 841	36	$ 382	$ 111	$ 1,359
Yearly Averages		**156,060**	**$ 8,029**	**446**	**$ 4,652**	**$ 988**	**$ 13,919**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is relatively constant from month to month, indicating a consistent consumption need/usage. The average peak for the 24 month period evaluated occurs in July while the average low occurs in February; further confirming the influence of outdoor weather conditions on building electric consumption. The office area is occupied by one or two individuals; resulting in energy usage limited to office lighting and air conditioning.

Meter MU3679A; Acct: 8950502370; Address: 529 SW 2ND AVE FORT LAUD (warehouse)

Date	Customer Charge	Consumption (kwh)			Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes			Total Charges
		Total Consumption	On Peak	Off Peak				Storm Charge	gross receipts tax	Franchise Fee	
Jun-15	$ 25.96	10,680	780	9,900	$ 449	34	$ 412	$ 6	$ 23	$ 120	$ 1,037
Jul-15	$ 25.96	10,920	1,140	9,780	$ 468	32	$ 388	$ 6	$ 23	$ 146	$ 1,056
Aug-15	$ 25.96	10,680	1,200	9,480	$ 460	33	$ 400	$ 6	$ 23	$ 149	$ 1,064
Sep-15	$ 25.96	10,680	1,020	9,660	$ 455	32	$ 388	$ 6	$ 22	$ 133	$ 1,030
Oct-15	$ 25.96	8,760	360	8,400	$ 353	40	$ 485	$ 5	$ 22	$ 84	$ 974
Nov-15	$ 25.96	8,700	0	8,700	$ 351	34	$ 412	$ 5	$ 20	$ 90	$ 903
Dec-15	$ 25.96	7,560	0	7,560	$ 305	29	$ 351	$ 4	$ 18	$ 79	$ 783
Jan-16	$ 25.96	6,600	0	6,600	$ 330	25	$ 245	$ 4	$ 15	$ 38	$ 658
Feb-16	$ 25.96	5,040	0	5,040	$ 252	28	$ 274	$ 3	$ 14	$ 34	$ 604
Mar-16	$ 25.96	8,340	0	8,340	$ 417	28	$ 274	$ 5	$ 18	$ 47	$ 787
Apr-16	$ 25.96	9,420	0	9,420	$ 471	30	$ 293	$ 6	$ 20	$ 28	$ 845
May-16	$ 25.96	11,160	0	11,160	$ 558	32	$ 313	$ 7	$ 23	$ 30	$ 957
Jun-16	$ 26.97	13,020	840	12,180	$ 568	32	$ 376	$ 12	$ 25	$ 61	$ 1,070
Jul-16	$ 26.97	14,400	1,320	13,080	$ 661	33	$ 388	$ 13	$ 28	$ 68	$ 1,185
Aug-16	$ 26.97	13,740	1,320	12,420	$ 636	35	$ 412	$ 13	$ 28	$ 67	$ 1,182
Sep-16	$ 26.97	12,360	1,200	11,160	$ 573	32	$ 376	$ 11	$ 25	$ 59	$ 1,072
Oct-16	$ 26.97	11,700	360	11,340	$ 546	34	$ 343	$ 11	$ 24	$ 55	$ 1,006
Nov-16	$ 26.97	11,820	0	11,820	$ 552	32	$ 323	$ 11	$ 23	$ 55	$ 990
Dec-16	$ 26.97	13,620	0	13,620	$ 636	28	$ 282	$ 13	$ 25	$ 57	$ 1,039
Jan-17	$ 25.00	13,320	0	13,320	$ 675	29	$ 299	$ 11	$ 26	$ 63	$ 1,098
Feb-17	$ 25.00	8,100	0	8,100	$ 411	29	$ 299	$ 6	$ 19	$ 46	$ 806
Mar-17	$ 25.00	9,000	0	9,000	$ 477	29	$ 299	$ 7	$ 21	$ 51	$ 879
Apr-17	$ 25.00	11,580	0	11,580	$ 613	32	$ 330	$ 9	$ 25	$ 61	$ 1,063
May-17	$ 25.00	13,740	0	13,740	$ 728	31	$ 319	$ 11	$ 28	$ 68	$ 1,179
Yearly Averages		**127,470**	**4,770**	**122,700**	**$ 5,971**	**377**	**$ 4,140**	**$ 96**	**$ 269**	**$ 844**	**$ 11,633**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is relatively constant from month to month, indicating a consistent consumption need/usage. The average peak for the 24 month period evaluated occurs in July while the average low occurs in February; further confirming the influence of outdoor weather conditions on building electric consumption. The warehouse area is not readily occupied and energy usage is limited to lighting and air conditioning of paper records.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Facliity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
State Attorney-Clerks Warehouse	Warehouse Nonrefrigerated	9.37	1.6	3.7	7.3

Overall, this building, as w whole, is operating just above the 75th percentile of comparable facilities. This indicates improvement opportunities in both equipment efficiency as well as building automation with overcooling occurring during winter months.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

State Attorney & Clerks Warehouse

Account #	2032476	**Meter #**	200004312-M
Rate		**Address**	
Meter Size	1.5"	**Meter Type**	W/S

Date	Consumption ()	Total Charges
Mar-17	1	$ 83.87
Feb-17	0	$ 72.47
Jan-17	1	$ 83.87
Dec-16	0	$ 72.47
Nov-16	3	$ 89.76
Oct-16	0	$ 70.97
Sep-16	1	$ 79.88
Aug-16	1	$ 79.88
Jul-16	3	$ 101.60
Jun-16	1	$ 79.88
May-16	0	$ 69.02
Apr-16	1	$ 79.88
Mar-16	1	$ 79.88
Feb-16	9	$ 166.76
Jan-16	17	$ 253.64
Dec-15	17	$ 253.64
Nov-15	25	$ 350.00
Oct-15	2	$ 88.90
Sep-15	1	$ 76.07
Aug-15	0	$ 65.73
Jul-15	1	$ 76.07
Jun-15	1	$ 65.73
May-15	0	$ 76.07
Apr-15		$ 76.07
Mar-15		$ 76.07
TOTALS	**86**	**$ 2,668.18**

This account has a significant amount of the 24 month consumption data set. The average monthly consumption is 4 thousand gallons. The average monthly expense amount is $106.73. The dollar per thousand gallons blended rate comes to $28.54. This rate is not representative of the true rate because it does not take into account any base fees. Possible fees are not known.

SIEMENS

State Attorney & Clerks Warehouse

Account # 2032477	**Meter #**
Rate	**Address**
Meter Size	**Meter Type**

Date	Consumption ()	Total Charges
May-17	1	$ 35.24
Apr-17	1	$ 35.24
Mar-17	1	$ 35.24
Feb-17	0	$ 23.84
Jan-17	1	$ 35.24
Dec-16	0	$ 23.84
Nov-16	1	$ 29.67
Oct-16	0	$ 23.41
Sep-16	1	$ 33.57
Aug-16	1	$ 33.57
Jul-16	2	$ 44.43
Jun-16	1	$ 33.57
May-16	1	$ 33.57
Apr-16	1	$ 33.57
Mar-16	0	
Feb-16	18	
Jan-16	20	
Dec-15	0	
Nov-15	17	end in SS
Oct-15	2	$ 96.09
Sep-15	3	$ 52.65
Aug-15	1	$ 31.97
Jul-15	73	$ 776.45
Jun-15	98	$1,034.95
May-15	1	$ 31.97
TOTALS	**245**	**$ 2,478.08**

This account has a significant amount of the 24 month consumption data set. The average monthly consumption is 10 thousand gallons. The average monthly expense amount is $123.90. The dollar per thousand gallons blended rate comes to $12.64. This rate may be representative of the true rate because it does not take into account any base fees. Possible fees are not known.

RECOMMENDED IMPROVEMENT MEASURES

All recommended FIMs for this facility have been removed from the final scope by Broward County. Please refer to Section G of this report for documentation of these originally proposed opportunities.

SIEMENS

D.14. Facility - West Regional Maintenance

FACILITY DESCRIPTION

The West Regional Maintenance Center is a small, 2,500 square foot maintenance facility located within the West Regional Complex at 300 North Pine Island Road, Plantation, FL. The maintenance center serves as a maintenance and repair shop for the counties work and utility vehicles. The building also serves as a break area for county workers. The hours of operation for this facility are as follows:

Facility Hours:

Monday – Friday:	8AM – 5PM
Saturday:	Closed
Sunday:	Closed

COOLING SYSTEM

The cooling for this building is provided by two DX split systems that utilize R407c refrigerant. The units appear to be in good condition. The table below is a breakdown of the nameplate information of these two units.

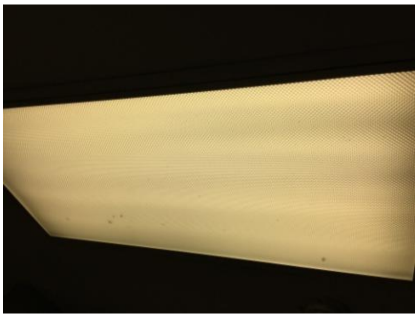
HVAC Controls Equipment

Nameplate data of mechanical equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
West Regional Maintenance												
AHU	Ruud	UBHC-21J11SFE	T M3005 02824			0.3333		240	1	3.2		0.7
DX		GAW14L48C22SA	W1H6902941	compressor	R-407C			230	1	19.8		4.1
				fan		0.25		230	1	1.3		0.3
AHU	Ruud					0.3333		240	1	3.2		0.7
DX		GAW14L48C22SA	W1M6124771	compressor	R-407C			230	1	19.8		4.1
				fan		0.25		230	1	1.3		0.3

LIGHTING SYSTEM

Interior lighting primarily consists of 32 Watt, T8 fluorescent lamps in either 2 or 4-lamp 2x4 fixtures.

Interior Lighting Examples

Exterior lighting consists of metal halide lighting and a compact fluorescent fixture at the entrance.

Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restroom, a kitchen sink, and an ice machine. The following are example of the types of fixture found within the facility:

- 2.2 gpm faucets
- 1.6 gpf toilets
- 2.5 gpm sink

All water fixtures are operated manually.

Sample Water Fixtures

BUILDING CONTROLS SYSTEM:

The building is currently not equipped with a building automation system. Each zone has a dedicated thermostat.

Building Controls

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service (GS-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

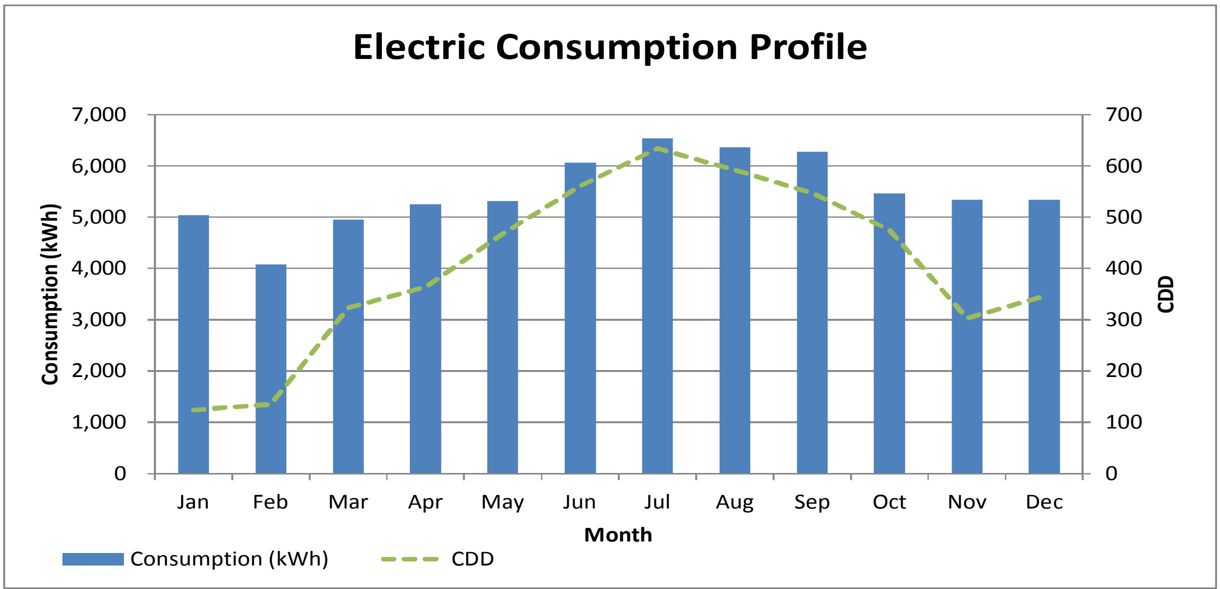
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
West Regional Maintenance Cente	1	GS-1	$ 0.10068	-	66,000	-	-

The data in the table above was generated using the following electric billing data.

Meter KV30383; Account: 6547268406; Address: 8601 W BROWARD BLVD PLANTATION

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 10.00	6,120	$ 589	$ 34	$ 633
Jul-15	$ 10.00	6,660	$ 641	$ 37	$ 688
Aug-15	$ 10.00	5,820	$ 560	$ 32	$ 602
Sep-15	$ 10.00	6,240	$ 600	$ 32	$ 642
Oct-15	$ 10.00	5,460	$ 525	$ 28	$ 563
Nov-15	$ 10.00	6,180	$ 595	$ 31	$ 636
Dec-15	$ 10.00	5,820	$ 560	$ 30	$ 600
Jan-16	$ 10.00	6,000	$ 544	$ 46	$ 600
Feb-16	$ 10.00	4,140	$ 376	$ 31	$ 417
Mar-16	$ 10.00	5,340	$ 485	$ 42	$ 537
Apr-16	$ 10.00	5,040	$ 457	$ 29	$ 496
May-16	$ 10.00	5,040	$ 457	$ 29	$ 496
Jun-16	$ 10.00	6,000	$ 535	$ 45	$ 590
Jul-16	$ 10.00	6,420	$ 572	$ 48	$ 630
Aug-16	$ 10.00	6,900	$ 615	$ 52	$ 677
Sep-16	$ 10.00	6,300	$ 561	$ 46	$ 617
Oct-16	$ 10.00	5,460	$ 486	$ 39	$ 536
Nov-16	$ 10.00	4,500	$ 401	$ 32	$ 443
Dec-16	$ 10.00	4,860	$ 433	$ 35	$ 478
Jan-17	$ 10.00	4,080	$ 368	$ 33	$ 411
Feb-17	$ 10.00	4,020	$ 362	$ 32	$ 405
Mar-17	$ 10.00	4,560	$ 425	$ 38	$ 473
Apr-17	$ 10.00	5,460	$ 508	$ 46	$ 564
May-17	$ 10.00	5,580	$ 520	$ 46	$ 576
Yearly Averages		**66,000**	**$ 6,088**	**$ 446**	**$ 6,654**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). The facility is used as both an office and a workshop for minor mechanical and electric repairs. Which equipment use by the maintenance staff contributes to the usage profile, the main contributor is whether or not air conditioning is needed during occupancy hours. The average peak for the 24 month period evaluated occurs in July while the average low occurs in February; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
West Regional Maintenance Cente	Vehicle service or repair	26.40	4.5	7.5	11.7

Overall, this building is operating well above the 75th percentile of comparable facilities. The main difference between this facility and those comparable ones identified by CBECS, is that the West Regional Maintenance Center is an enclosed facility while other are typically open air garages, like Fleet Services. The cooling requirements of the building skew the metric analysis.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
West Regional Maintenance	Lighting - Interior	$ 185.72	$ -	$ -	$ 22	$ 207.72	$ 1,946.70	9.4
Breakage Fee							$ 425.00	
PA Cost							$ 20.38	
Total		**$ 185.72**	**$ -**	**$ -**	**$ 22**	**$ 207.72**	**$ 2,392.09**	**11.5**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
West Regional Maintenance Center	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	4	4
	Existing T8 Fluorescent - Proposed Retrofit LED	12	12
	Existing T8 Fluorescent - Proposed Retrofit LED With Reflector kit	4	4

FIM SAVINGS SUMMARY

Annual Electric Consumption: 1,845 kWh

Annual Electric Demand: 7.98 kWh

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
West Regional Maintenance	Lighting - Interior	$ 185.72	$ -	$ -	$ 22	$ 207.72	$ 1,946.70	9.4

D.15. Health - Edgar Mill Center

FACILITY DESCRIPTION

The Edgar Mills Multi-purpose Center is a 58,275 square foot 3-story building located at 900 NW 31st Ave, Fort Lauderdale, FL 33351. It was constructed approximately in 2011, and opened in 2012. The building includes medical offices, such as dental clinic, urgent care, Addiction Recovery Center, etc. and governmental program offices, such as Broward County Health Department, Housing Options Program, Elderly and Veterans Services. There are multipurpose rooms, waiting rooms, conference rooms, offices, etc. that are related to the services. The number of occupants swings greatly depending on the office hours. There are general office hours and also different clinic hours. The general office hours are the following:

General Office Hours

Monday-Friday:	8:00AM – 5:00PM
Saturday, Sunday, holidays:	Closed

Occupied Schedule

Floor 1	Monday–Saturday	5:00AM – 9:00PM
Floor 2, Floor 3	Monday–Wednesday:	8:00AM – 9:00PM
	Thursday:	7:30AM – 9:00PM
	Friday:	8:00AM – 9:00PM

COOLING SYSTEM:

Chilled water of the building is supplied by the chiller plant, which is located at the outside of the building. The chiller plant water system consists of 2 air-cooled chiller, and 2 primary chilled water pumps and 2 secondary chilled water pumps with VFDs. One of the secondary pumps is a standby pump.

The design tonnage of each air-cooled chiller is 146.8 Ton. The units were made in 2009 by York. The refrigerant is R-410a. The design chilled water supply and return temperature is 44/56°F.

The chilled water system is a primary and secondary system to supply chilled water to AHUs in the building. The secondary chilled water pumps are equipped with VFDs. Two-way control valves were installed at each AHU.

The following table lists the detailed equipment information.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information					
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Edgar Mills												
Chiller 1	York	YLAA0156HE46X	2MVM004792	compressor	R-410A		145.6	460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				fans (5)				460	3	20		14.3
				fans (5)				460	3	20		14.3
Chiller 2	York	YLAA0156HE46X	2MVM004793	compressor	R-410A		146.6	460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				compressor				460	3	54.5		39.1
				fans (5)				460	3	20		14.3
				fans (5)				460	3	20		14.3
Pump 1	Marathon	HVK 182TTFR16033				3		460	3	4	89.5%	2.5
Pump 2	Marathon	HVK 182TTFR16033				3		460	3	4	89.5%	2.5
Pump 3	Marathon	HVK254TTFNA6026			2009	15		460	3	18.8	92.4%	12.1
Pump 4	Marathon	HVK254TTFNA6026			2009	15		460	3	18.8	92.4%	12.1
AHU-1A	York	XTI-054X075-FALA	CKVM XT0195	with VFD	R-134A	15		460	3	17.7		12.7
AHU-1B	York	XTI-054X075-FALA	CKVM XT0229	with VFD	R-134A	15		460	3	17.7		12.7
AHU-2A	York	XTI-078X060-FAMA	CKVM XT0196	with VFD	R-134A	20		460	3	23.5		16.9
AHU-2B	York	XTI-078X060-FAMA	CKVM XT0230	with VFD	R-134A	20		460	3	23.5		16.9
AHU-3A	York	XTI-084X066-FAMA	CKVM XT0197	with VFD	R-134A	20		460	3	23.5		16.9
AHU-3B	York	XTI-084X066-FAMA	CKVM XT0231	with VFD	R-134A	20		460	3	23.5		16.9
AHU 5		no nameplate										
FCU 2-3		no nameplate										
Exhaust Fan 6		no nameplate		with VFD								

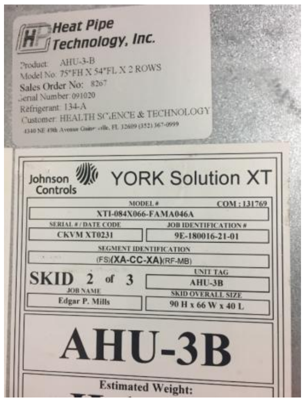
Chilled Water System

The building is primarily served by 6 single duct variable air volume (VAV) air handling systems with VAV terminal boxes. Each floor is served by 2 AHUs located in the same mechanical room on the floor. For example, the first floor is served by AHU-1A and AHU-1B, and the supply air main duct of the two units is connected at the beginning and the end to form a loop. There are also some chilled water fan coil units and air cooled split units serving electrical rooms, elevator rooms, etc.

VAV terminal boxes are controlled to maintain zone space temperature set points. Some boxes have electric heaters. The minimum design airflow for terminal boxes with heaters is about 25%, and is zero for boxes without heaters.

There are two (2) chilled-water, VAV, air handling units (AHU-1, AHU-2) installed onsite; located in the same mechanical room. The 20-horsepower supply fan of each AHU was equipped with a York VFD, Air modular. The VFDs seem 14 years old. The fan speed is controlled to maintain a static pressure setpoint at the main supply duct located in the mechanical room.

A CO2 sensor exists at the main return air duct in each mechanical room. A modulating OA damper and an airflow satiation were installed at each unit. The design OA intake is approximately 40% of the total supply airflow.



Building HVAC

The following is additional information concerning these units.

AHU	Fan HP	VFD?	Hz
AHU-1A	15	Yes	37.7
AHU-1B	15	Yes	37.7
AHU-2A	20	Yes	39.5
AHU-2B	20	Yes	40.9
AHU-3A	20	Yes	
AHU-3B	20	Yes	

Observed Issues with the cooling system

- Uneven room temperature distributions. It is said the north side of the building was warm, and south side was always cold at Women Infant and Children (WIC) area on the 1st Floor. Offices on the 3rd Floor were also cold.

LIGHTING SYSTEM

Interior lighting primarily consists of 28 Watt, T5 fluorescent lamps in 2-lamp 2x4 recessed or suspended fixtures, and 14 Watt, T5 fluorescent in 2-lamp 2x2 recessed fixtures.

Interior Lighting Examples

Exterior Lighting primarily consists of metal halide wall-mounted lamps in 70, 150, or 250 Watt.

Occupancy sensors were installed in some areas of the building, but not in conference rooms

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms. Fixtures and water closets are all operated manually. The following are example of the types of fixture found within the restroom of the facility:

- 0.5 gpm faucets
- waterless urinals
- 1.28 water closets

BUILDING CONTROLS SYSTEM

The building is equipped with a Johnson Controls DDC building automation system. Any changes to the controls operation is handled from the Government Center

HVAC Controls Equipment

Available trending data was downloaded from the BAU. The following lists the available points being trended:

Chiller Plant

- GPM
- Tonnage

Chillers 1 and 2

- Supply and return temperatures
- GPM

Primary and Secondary Pumps

- Supply and return temperatures
- Differential pressures

VAV Terminals

- Zone Temperatures

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

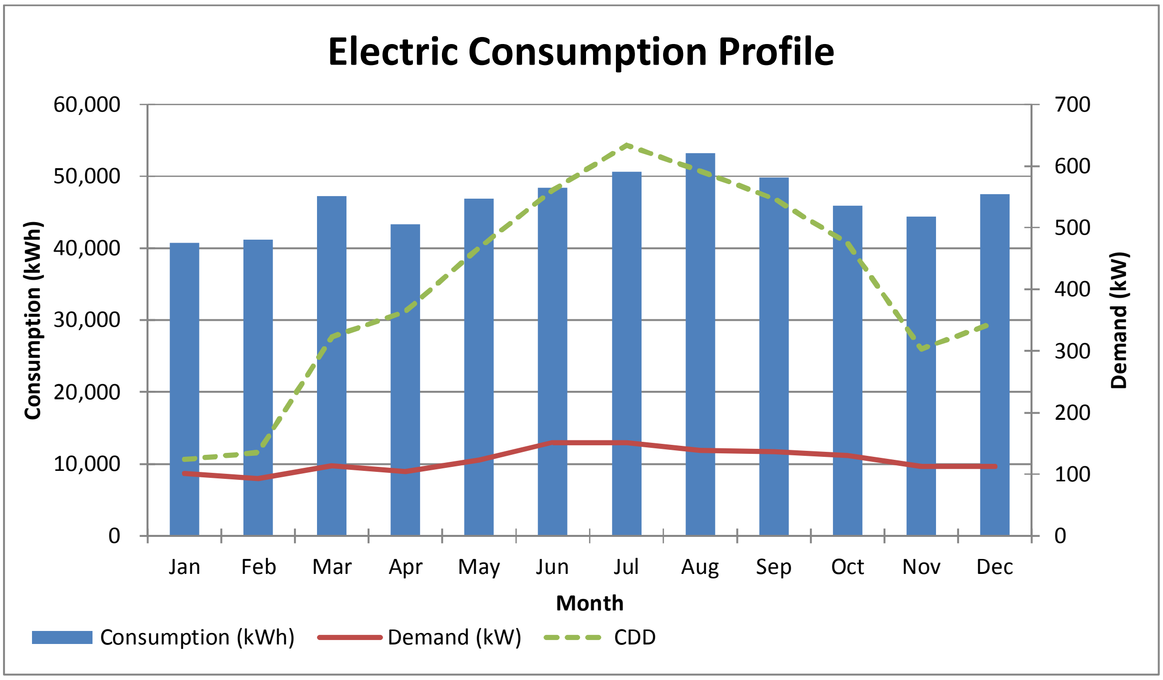
The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Edgar Mills	2	GSD-1	$ 0.05702	$ 11.25	1,168,860	2,959	274

Meter KV39570; Account: 7966552569; Address: 900 NW 31ST AVE # GARAGE

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	47,340	$ 2,608	158	$ 1,676	$ 162	$ 4,466
Jul-15	$ 19.48	51,660	$ 2,846	149	$ 1,581	$ 160	$ 4,607
Aug-15	$ 19.48	50,280	$ 2,770	137	$ 1,454	$ 150	$ 4,393
Sep-15	$ 19.48	52,080	$ 2,869	125	$ 1,326	$ 127	$ 4,341
Oct-15	$ 19.48	48,120	$ 2,651	136	$ 1,443	$ 132	$ 4,245
Nov-15	$ 19.48	44,220	$ 2,436	116	$ 1,231	$ 111	$ 3,797
Dec-15	$ 19.48	51,240	$ 2,596	122	$ 1,294	$ 347	$ 4,256
Jan-16	$ 19.48	40,920	$ 2,073	106	$ 1,072	$ 208	$ 3,372
Feb-16	$ 19.48	39,900	$ 2,021	100	$ 1,011	$ 200	$ 3,252
Mar-16	$ 19.48	44,160	$ 2,237	131	$ 1,324	$ 244	$ 3,826
Apr-16	$ 19.48	39,780	$ 2,015	107	$ 1,082	$ 108	$ 3,225
May-16	$ 19.48	42,660	$ 2,161	149	$ 1,506	$ 150	$ 3,837
Jun-16	$ 20.24	49,560	$ 2,359	145	$ 1,511	$ 255	$ 4,146
Jul-16	$ 20.24	49,620	$ 2,362	154	$ 1,605	$ 262	$ 4,249
Aug-16	$ 20.24	56,040	$ 2,668	141	$ 1,469	$ 273	$ 4,430
Sep-16	$ 20.24	47,640	$ 2,268	147	$ 1,532	$ 242	$ 4,062
Oct-16	$ 20.24	43,740	$ 2,082	125	$ 1,303	$ 216	$ 3,620
Nov-16	$ 20.24	44,580	$ 2,122	109	$ 1,136	$ 207	$ 3,485
Dec-16	$ 20.24	43,800	$ 2,085	103	$ 1,073	$ 201	$ 3,379
Jan-17	$ 25.00	40,620	$ 2,090	97	$ 1,028	$ 206	$ 3,349
Feb-17	$ 25.00	42,540	$ 2,189	86	$ 912	$ 204	$ 3,329
Mar-17	$ 25.00	50,400	$ 2,706	96	$ 1,018	$ 247	$ 3,996
Apr-17	$ 25.00	46,920	$ 2,520	102	$ 1,081	$ 239	$ 3,864
May-17	$ 25.00	51,180	$ 2,748	97	$ 1,028	$ 250	$ 4,052
AVERAGE TOTALS		**559,500**	**$ 28,741**	**1,469**	**$15,348**	**2,450**	**$46,789**



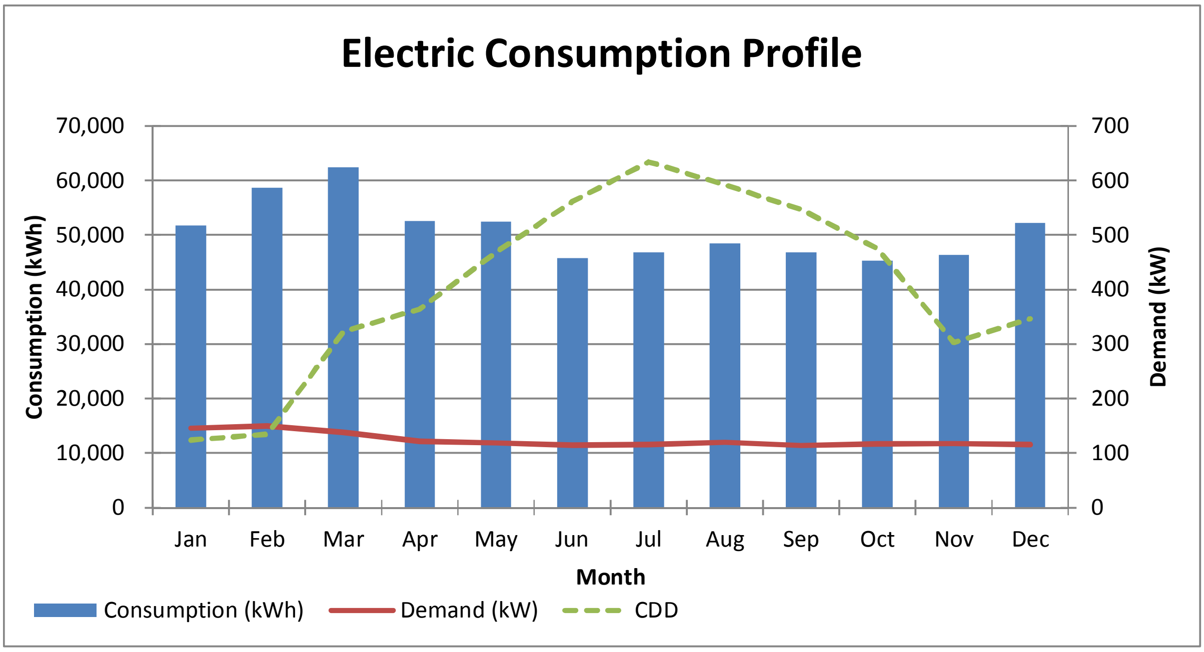
The resulting energy usage profile, illustrated above, for this account is not influenced by cooling needs as this mostly a garage. Instead, the usage is based lighting requirements for the parking structure. Electric demand usage is relatively constant from month to month, indicating a consistent consumption need/usage. The average peak for the 24 month period evaluated occurs in August while the average low occurs in January.

BROWARD COUNTY FLORIDA

SIEMENS

Meter KV54060; Account: 9603203044; Address: 900 NW 31ST AVE # EMMPC

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	44,520	$ 2,453	112	$ 1,188	$ 127	$ 3,787
Jul-15	$ 19.48	47,400	$ 2,611	112	$ 1,188	$ 130	$ 3,949
Aug-15	$ 19.48	46,560	$ 2,565	119	$ 1,263	$ 134	$ 3,981
Sep-15	$ 19.48	48,360	$ 2,664	114	$ 1,210	$ 116	$ 4,009
Oct-15	$ 19.48	46,680	$ 2,572	116	$ 1,231	$ 116	$ 3,938
Nov-15	$ 19.48	44,760	$ 2,466	115	$ 1,220	$ 111	$ 3,816
Dec-15	$ 19.48	58,440	$ 2,961	119	$ 1,263	$ 381	$ 4,624
Jan-16	$ 19.48	55,200	$ 2,796	155	$ 1,567	$ 288	$ 4,671
Feb-16	$ 19.48	54,720	$ 2,772	145	$ 1,466	$ 279	$ 4,537
Mar-16	$ 19.48	52,560	$ 2,663	124	$ 1,254	$ 270	$ 4,205
Apr-16	$ 19.48	43,440	$ 2,201	112	$ 1,132	$ 113	$ 3,465
May-16	$ 19.48	42,960	$ 2,176	112	$ 1,132	$ 113	$ 3,441
Jun-16	$ 20.24	47,040	$ 2,239	118	$ 1,230	$ 229	$ 3,718
Jul-16	$ 20.24	46,200	$ 2,199	120	$ 1,250	$ 228	$ 3,698
Aug-16	$ 20.24	50,400	$ 2,399	121	$ 1,261	$ 242	$ 3,922
Sep-16	$ 20.24	45,240	$ 2,153	114	$ 1,188	$ 212	$ 3,574
Oct-16	$ 20.24	43,800	$ 2,085	118	$ 1,230	$ 211	$ 3,546
Nov-16	$ 20.24	48,000	$ 2,285	120	$ 1,250	$ 225	$ 3,780
Dec-16	$ 20.24	45,960	$ 2,188	113	$ 1,177	$ 214	$ 3,599
Jan-17	$ 25.00	48,240	$ 2,482	136	$ 1,442	$ 259	$ 4,208
Feb-17	$ 25.00	62,520	$ 3,217	155	$ 1,643	$ 318	$ 5,203
Mar-17	$ 25.00	72,240	$ 3,879	152	$ 1,611	$ 363	$ 5,879
Apr-17	$ 25.00	61,680	$ 3,312	132	$ 1,399	$ 312	$ 5,048
May-17	$ 25.00	61,800	$ 3,319	126	$ 1,336	$ 308	$ 4,987
AVERAGE TOTALS		**609,360**	**$ 31,328**	**1,490**	**$15,565**	**2,649**	**$49,792**



The resulting energy usage profile, illustrated above, for this account is not influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Energy usage at this facility is governed by visitor traffic as citizens require medical/healthcare needs. Electric demand usage is relatively constant from month to month, indicating a consistent consumption need/usage. The average peak for the 24 month period evaluated occurs in March (typically flu season as the winter months end) while the average low occurs during the summer.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Edgar Mills	Outpatient	20.06	6.3	12.8	19

Overall, this building is operating just above the 75th percentile of comparable facilities. This indicates improvement opportunities beyond the HVAC scheduling currently implemented by library staff.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Edgar Mills Multipurpose Center

Account # 2065645	**Meter #** 200801357-M
Rate	**Address**
Meter Siz 1"	**Meter Type** W/S

Date	Total Charges
Mar-17	$ 47.19
Feb-17	$ 89.95
Jan-17	$ 47.19
Dec-16	$ 61.45
Nov-16	$ 40.90
Oct-16	$ 45.91
Sep-16	$ 44.94
Aug-16	$ 44.94
Jul-16	$ 58.51
Jun-16	$ 44.94
May-16	$ 89.88
Apr-16	$ 44.94
Mar-16	$ 44.94
Feb-16	
Jan-16	$ 148.39
Dec-15	
Nov-15	$ 31.02
Oct-15	
Sep-15	
Aug-15	$ 42.80
Jul-15	$ 68.63
Jun-15	$ 85.60
May-15	
Apr-15	$ 42.80
Mar-15	$ 42.80
TOTALS	**$ 1,167.72**

Edgar Mills Multipurpose Center

Account # 2065646	**Meter #** 200803313-M
Rate	**Address**
Meter Siz 2"	**Meter Type** W/S

Date	Total Charges
Mar-17	$ 556.04
Feb-17	$ 527.54
Jan-17	$ 556.04
Dec-16	$ 556.04
Nov-16	$ 508.51
Oct-16	$ 541.01
Sep-16	$ 556.62
Aug-16	$ 570.19
Jul-16	$ 556.62
Jun-16	$ 543.05
May-16	$ 475.20
Apr-16	$ 583.76
Mar-16	$ 543.05
Feb-16	$ 529.48
Jan-16	$ 488.76
Dec-15	$ 556.62
Nov-15	$ 488.76
Oct-15	$ 540.70
Sep-15	$ 503.98
Aug-15	$ 542.72
Jul-15	$ 516.89
Jun-15	$ 516.89
May-15	$ 478.15
Apr-15	$ 491.07
Mar-15	$ 516.89
TOTALS	**$13,244.58**

These accounts only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

Edgar Mills Multipurpose Center

Account # 2065647	**Meter #**
Rate	**Address**
Meter Size	**Meter Type** FLS

Date	Total Charges
Mar-17	$ 335.36
Feb-17	$ 268.29
Jan-17	$ 335.36
Dec-16	$ 335.36
Nov-16	$ 257.11
Oct-16	$ 327.61
Sep-16	$ 319.38
Aug-16	$ 319.38
Jul-16	$ 319.38
Jun-16	$ 319.38
May-16	$ 319.38
Apr-16	$ 319.38
Mar-16	$ 319.38
Feb-16	$ 319.38
Jan-16	$ 319.38
Dec-15	$ 596.18
Nov-15	$ 601.21
Oct-15	
Sep-15	$ 304.17
Aug-15	$ 304.17
Jul-15	$ 304.17
Jun-15	$ 304.17
May-15	$ 304.17
Apr-15	$ 304.17
Mar-15	$ 304.17
TOTALS	**$ 8,060.09**

Edgar Mills Multipurpose Center

Account # 2026198	**Meter #** 200900908
Rate	**Address**
Meter Siz 2"	**Meter Type** W/S

Date	Total Charges
Mar-17	$ 598.81
Feb-17	$ 109.40
Jan-17	$ 142.69
Dec-16	$ 969.40
Nov-16	$ 864.85
Oct-16	$ 970.88
Sep-16	$ 1,533.76
Aug-16	$ 1,913.75
Jul-16	$ 2,035.90
Jun-16	$ 1,710.18
May-16	$ 2,144.46
Apr-16	$ 1,873.03
Mar-16	$ 1,845.89
Feb-16	$ 1,764.47
Jan-16	$ 1,764.47
Dec-15	$ 2,049.47
Nov-15	$ 2,035.90
Oct-15	$ 1,655.89
Sep-15	$ 1,808.40
Aug-15	$ 1,743.83
Jul-15	$ 1,898.81
Jun-15	$ 1,821.32
May-15	$ 1,705.08
Apr-15	$ 2,777.04
Mar-15	$ 1,278.89
TOTALS	**$39,016.57**

These accounts only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Edgar Mills Center	Water - Retrofits	$ 151.03	$ -	$ 513.99	$ 31	$ 696.37	$ 5,689.82	8.2
Breakage Fee							$ 9,906.75	
PA Cost							$ 1,035.71	
Total		**$ 151.03**	**$ -**	**$ 513.99**	**$ 31**	**$ 696.37**	**$ 16,632.29**	**23.9**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

WATER CONSERVATION

This FIM addresses the reduction of water consumption, wastewater production, and hot water energy usage through the installation of highly efficient, plumbing products and controls. The use of these devices and others are detailed below and were selected not only for their efficiency, but also to provide for durable, long-term use with minimal maintenance and improved hygiene.

PROJECT SCOPE

Bathroom Faucets/Aerators: Most faucets utilize aerators to restrict the volume of water at the mouth of a faucet and to generate a more comfortable flow. High efficiency aerators can greatly reduce flow rates from faucets and create a comfortable flow for hand washing and cleaning. Restricting faucet flow rates enables a facility to conserve water and reduce energy usage associated with heating water. Faucets without the threading necessary to accept an aerator can be replaced with threaded faucets. Installation of 0.5 GPM aerator or faucet retrofit will replace existing equipment that currently consumes 2.2 GPM.

Showers: High efficiency pressure compensating showerheads can greatly reduce shower flow rates and create a comfortable flow. Restricting shower flow rates enables a facility to conserve water and reduce energy usage associated with heating water. The existing 2.5 to 5.0 GPM showerheads will be replaced with 1.5 GPM heads and the shower valves will be repaired and/or replaced as necessary to eliminate leaks.

SAVINGS

The energy and cost savings were developed using spreadsheet modeling. Based on site interviews, facility type, square footage, and standard factors for allocation of business in square foot per person and visitors per day the total population and occupancy days for this facility were determined. Total water closet, urinal, faucet and shower use figures were determined for the facility using standard factors for equipment use based on industry research and case studies coupled together with the total population of the facility and the occupancy days. The current water usage minus the proposed water usage leads to the total water savings in gallons.

The savings value take the water savings and multiply them by the rate detailed in the Utility Data Analysis Section H, Appendices or water of this report. Energy savings were only taken in the form of hot water savings for any equipment that utilize hot water.

Deferred maintenance savings were considered and calculated by a percentage of reduction in replacement cost for any new fixtures that will be installed. These savings are referred to as Savings O&M on the financial summary table below.

FIM SAVINGS SUMMARY

Annual Water savings: 45,087 gallons

Annual Energy savings: 2,649 kWh

All analysis for water savings, energy savings, deferred maintenance savings, and financial details is provided in Section H, Appendices of this Report.

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Edgar Mills Center	Water - Retrofits	$ 151.03	$ -	$ 513.99	$ 31	$ 696.37	$ 5,689.82	8.2

D.16. Health - Family Success

FACILITY DESCRIPTION

The Northwest Family Success Center is a 1 story, 14,269 square foot facility located at 10077 NW 29th St, Coral Springs, FL 33065. The facility features space for offices and classes. The mission of this facility is to provide assistance to individuals and families in achieving economic and social success. The hours of operation for this facility are as follows:

Monday:	8AM – 5PM
Tuesday:	8AM – 6:30PM
Wednesday:	8AM – 5PM
Thursday:	8AM – 6:30PM
Friday:	8AM – 5PM
Saturday:	Closed
Sunday:	Closed

COOLING SYSTEM:

Cooling for the building is provided by two (2) 17.5 ton DX roof top units and two (2) DX condensing units. The condensing units are 6 and 7.5 tons, respectively. One of the RTUs is on a modified roof curve. The air handlers inside the building do not currently have outdoor air intake. The following table documents nameplate data acquired both onsite and from online Product Data Sheets.

Nameplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	**Mfctr**	**Model**	**Serial**	**Description**	**Notes**	**HP**	**Tons/ MBTU**	**V**	**Ph**	**Amps**	**Eff /EER**	**Cal kW**
Family Success Center												
RTU-1	Trane	TCD211C300BA		compressor			17.5	208	3	37	9.8	10.7
				compressor				208	3	20.7		6.0
				fan				208	1	5.5		0.9
				fan				208	1	5.5		0.9
RTU-2	Trane	TCD211C300BA	217101092D	compressor	2002		17.5	208	3	37	9.8	12.0
				compressor	R-22			208	3	20.7		6.7
				fan		1		208	1	5.5		1.0
				fan		1		208	1	5.5		1.0
AHU	Trane	TWE090A300EA	3321K415H		2003	1.5	6	460	3	3.2		2.3
DX		2TTA0072A3000AA	4042KKR2F	compressor	R-22			230	3	19.8	10 SEER	7.1
				fan	2004	0.2		230	1	1.4		0.3
AHU	Trane	TWE090A300EA	3321LNN5H		2003	1.5		460	3	3.2		2.3
DX	Trane	TTA090A300FA	4032MMBAD	compressor	2004		7.5	230	3	25.1	11.6	9.0
				fan				230	1	3.1		0.6

HVAC Controls Equipment

LIGHTING SYSTEM:

Interior lighting primarily consists of T8 and T12 fluorescent lighting of varying wattages. The building also holds compact fluorescent lighting and LED lights for the exit signs.

Interior Lighting Examples

Exterior lighting consist of compact fluorescent lighting at the entrance of the building, incandescent lighting for the outside walkways surrounding the building, and metal halide lighting for the parking lot.

Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restrooms and a sink in the break room. The following are example of the types of fixture found within the restroom of the facility:

- 0.5 and 2.2 gpm faucets
- 1.6 gpf toilets
- 1.0 gpf urinals

All water fixtures are operated manually.

Restroom Fixtures Example

BUILDING CONTROLS SYSTEM:

The building is currently not equipped with a building automation system. Each zone has a dedicated thermostat.

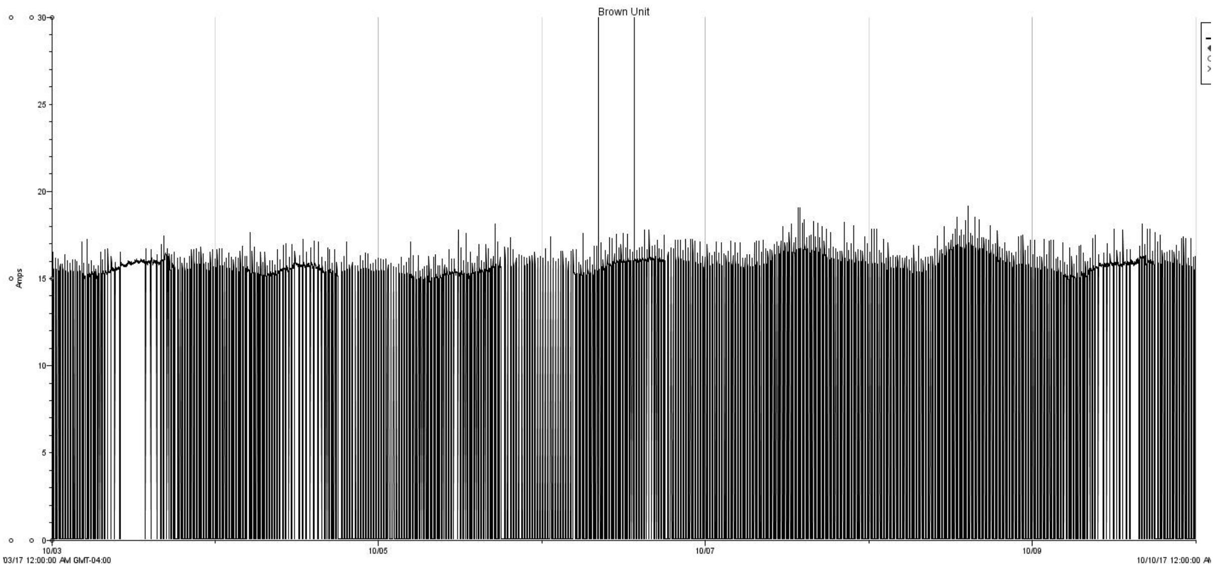
Building Controls

There is no type of lighting control that was found in the building.

TRENDING DATA AQUISITION:

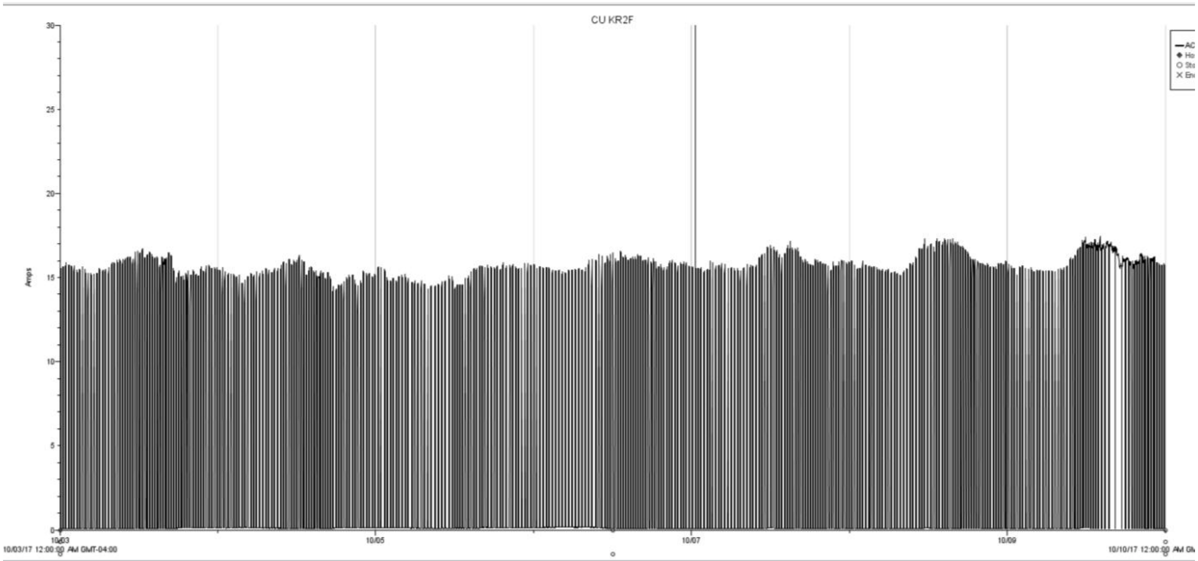
In order to determine the runtime operation of each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – 7.5 Ton Condensing Unit



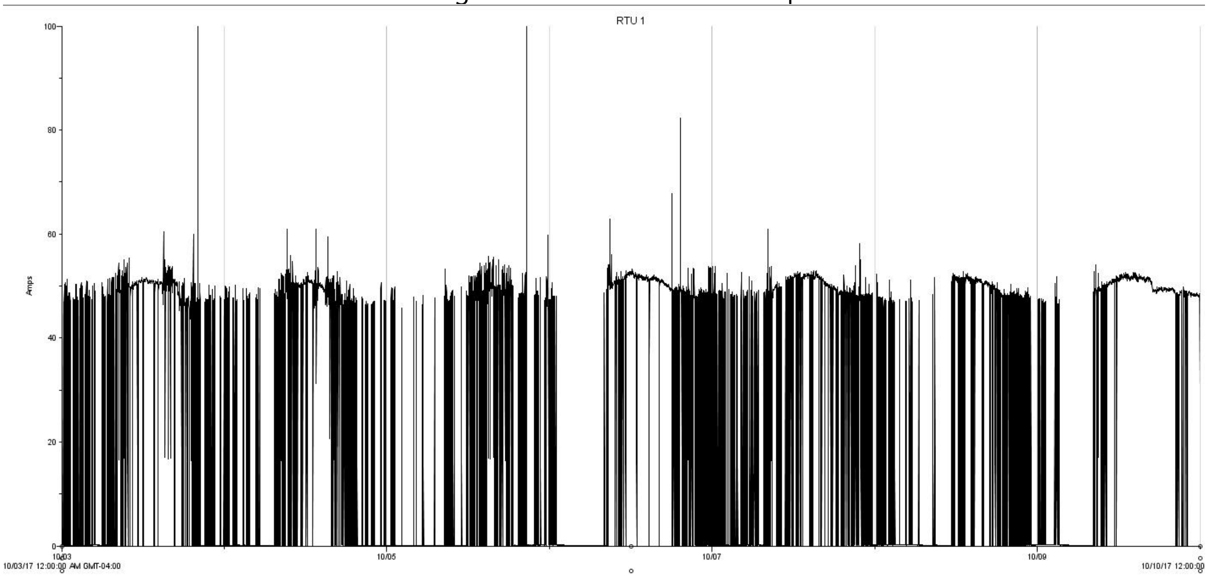
This unit registered an average of 15.86 amps and was operating for a total of 85.35 hours during a one week period.

Trending Data – 6 Ton Condensing Unit



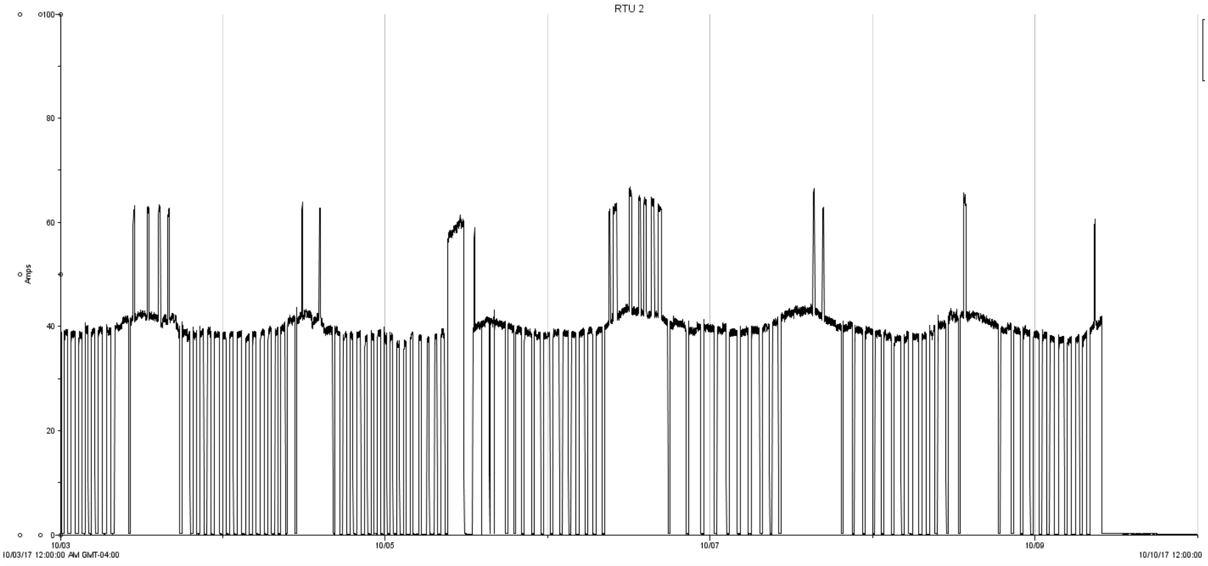
This unit registered an average of 15.67 amps and was operating for a total of 58.68 hours during a one week period.

Trending Data – 17.5 Ton Roof-top Unit



This unit registered an average of 49.73 amps and was operating for a total of 83.12 hours during a one week period.

Trending Data – 17.5 Ton Roof-top Unit



This unit registered an average of 41.40 amps and was operating for a total of 110.88 hours during a one week period.

The following table compares the operating hours of each unit with the hours of service for the facility.

Day	Hours of Service	Run Hours 7.5 Ton Unit	Run Hours 6 Ton Unit	Run Hours RTU 1	Run Hours RTU 2
Monday:	8:00AM - 5:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM
Tuesday:	8:00AM - 6:30PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM
Wednesday:	8:00AM - 5:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM
Thursday:	8:00AM - 6:30PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM
Friday:	8:00AM - 5:00PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM
Saturday:	Closed	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM
Sunday:	Closed	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM	12:00AM - 11:59PM

All units at this building were running continuously during the logging period and show no sign of scheduling controls.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

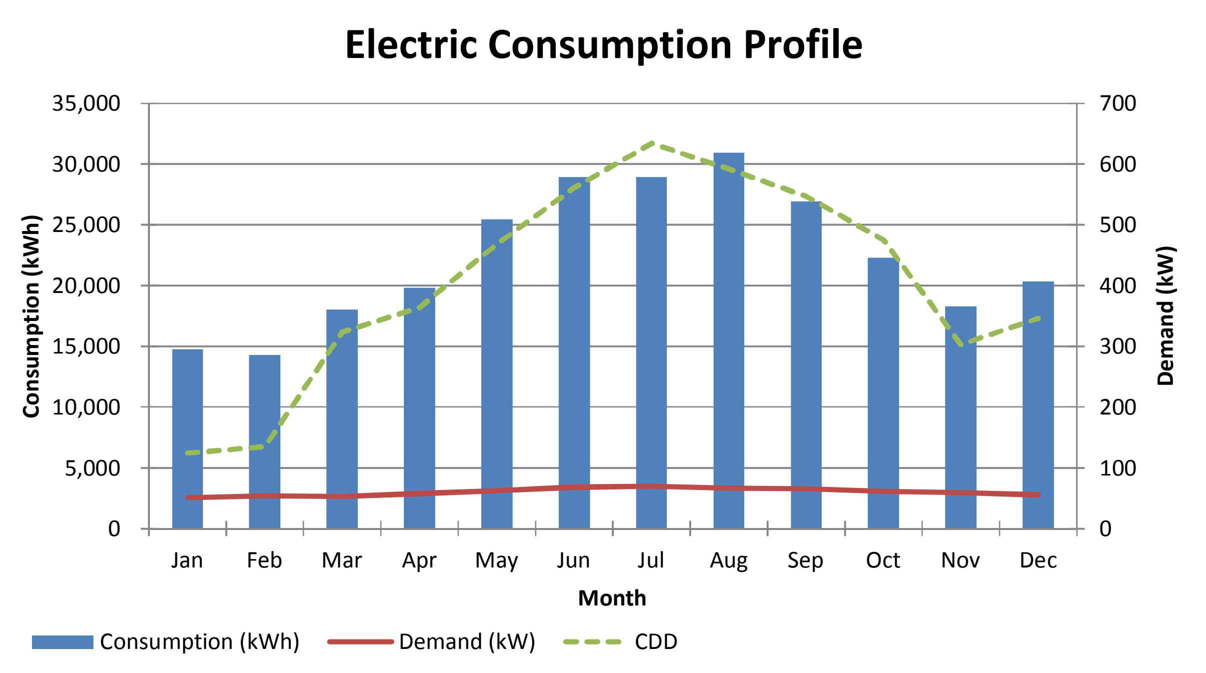
The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Family Success Center	1	GSD-1	$ 0.05558	$ 11.45	268,980	723	72

Meter KU30136; Account: 35256403; Address: 10077 NW 29TH ST CORAL SPRINGS

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	27,840	$ 1,534	72	$ 764	$ 127	$ 2,444
Jul-15	$ 19.48	27,000	$ 1,487	71	$ 753	$ 125	$ 2,385
Aug-15	$ 19.48	27,780	$ 1,530	70	$ 743	$ 125	$ 2,418
Sep-15	$ 19.48	26,220	$ 1,444	68	$ 721	$ 111	$ 2,297
Oct-15	$ 19.48	19,980	$ 1,101	65	$ 690	$ 97	$ 1,907
Nov-15	$ 19.48	18,120	$ 998	66	$ 700	$ 95	$ 1,813
Dec-15	$ 19.48	20,460	$ 1,037	58	$ 615	$ 182	$ 1,854
Jan-16	$ 19.48	12,660	$ 641	48	$ 485	$ 100	$ 1,246
Feb-16	$ 19.48	12,300	$ 623	46	$ 465	$ 97	$ 1,204
Mar-16	$ 19.48	17,700	$ 897	51	$ 516	$ 129	$ 1,560
Apr-16	$ 19.48	18,660	$ 945	58	$ 586	$ 92	$ 1,643
May-16	$ 19.48	21,300	$ 1,079	67	$ 677	$ 106	$ 1,882
Jun-16	$ 20.24	30,060	$ 1,431	64	$ 667	$ 185	$ 2,303
Jul-16	$ 20.24	30,840	$ 1,468	69	$ 719	$ 192	$ 2,400
Aug-16	$ 20.24	34,080	$ 1,622	62	$ 646	$ 200	$ 2,488
Sep-16	$ 20.24	27,600	$ 1,314	62	$ 646	$ 168	$ 2,148
Oct-16	$ 20.24	24,600	$ 1,171	58	$ 604	$ 152	$ 1,948
Nov-16	$ 20.24	18,480	$ 880	53	$ 552	$ 123	$ 1,575
Dec-16	$ 20.24	20,220	$ 962	53	$ 552	$ 130	$ 1,665
Jan-17	$ 25.00	16,860	$ 867	53	$ 562	$ 127	$ 1,581
Feb-17	$ 25.00	16,260	$ 837	62	$ 657	$ 132	$ 1,651
Mar-17	$ 25.00	18,360	$ 986	55	$ 583	$ 140	$ 1,734
Apr-17	$ 25.00	21,000	$ 1,128	57	$ 604	$ 153	$ 1,910
May-17	$ 25.00	29,580	$ 1,588	58	$ 615	$ 195	$ 2,423
AVERAGE TOTALS		**268,980**	**$ 13,785**	**723**	**$7,562**	**$ 1,641**	**$23,239**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Although labeled a health center, the facility operations are closer to that of an office; therefore, air conditioning is the influence on energy consumption. Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in summer months while the average low occurs in mid-winter; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Family Success Center	Health care	18.85	7	13.1	19.2

Overall, this building is operating just below the 75th percentile of comparable facilities. This indicates improvement opportunities can include both equipment and systems efficiency enhancements as well as building automation upgrades.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Northwest Family Success Center

Account # 7742-6411		**Meter #**	N60080149
Rate		**Address**	
Meter Size		**Meter Type**	W/S

Date	Total Charges
Feb-17	$ 299.69
Jan-17	$ 319.37
Dec-16	$ 306.25
Nov-16	$ 319.37
Oct-16	$ 306.25
Sep-16	$ 302.25
Aug-16	$ 295.91
Jul-16	$ 308.59
Jun-16	$ 295.91
May-16	$ 289.57
Apr-16	$ 298.93
Mar-16	$ 302.25
Feb-16	$ 295.91
Jan-16	$ 295.91
Dec-15	$ 298.90
Nov-15	
Oct-15	$ 597.54
Sep-15	$ 285.87
Aug-15	$ 285.87
Jul-15	$ 291.59
Jun-15	$ 285.90
May-15	$ 307.15
Apr-15	$ 285.87
Mar-15	$ 298.14
Feb-15	$ 285.87
TOTALS	**$ 7,458.86**

This account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
NW Family Success Center	Lighting - Interior	$ 1,329.02	$ 1,110.73	$ -	$ 319	$ 2,758.75	$ 52,766.40	19.1
NW Family Success Center	HVAC work - COMBINE	$ 8,510.43	$ 859.32	$ -	$ -	$ 9,369.75	$ 160,153.36	17.1
Breakage Fee							$ 2,425.73	
PA Cost							$ 2,225.10	
Total		**$ 9,839.45**	**$ 1,970.05**	**$ -**	**$ 319**	**$12,128.50**	**$ 217,570.59**	**17.9**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps: The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures: In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Pin-Based Compact Fluorescent Fixtures: In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, our design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps and remove the existing fluorescent ballasts. In some cases, it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

Emergency Lighting: Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

SIEMENS

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
Family Success Center, NW	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	19	19
	Existing T8 Fluorescent - Proposed Retrofit LED	10	10
	Existing T8 Fluorescent - Proposed New LED Fixture	153	153
	Existing T8 Fluorescent - Proposed Retrofit LED Reduce Lamp Qty	2	2
	Existing Exit Sign - Proposed New LED Fixture	3	3
	Existing Compact Fluorescent - Proposed Retrofit LED	12	12
	Existing T8 Fluorescent U Tube - Proposed New LED Fixture	3	3
	Existing T12 Fluorescent - Proposed Retrofit LED	10	10

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 23,910 kWh

Annual Electric Demand: 96.9 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
NW Family Success Center	Lighting - Interior	$ 1,329.02	$ 1,110.73	$ -	$ 319	$ 2,758.75	$ 52,766.40	19.1

NOTE: This facility had a capital project listed to be completed within the next five years: retrofitting all lights. Therefore, the financials incorporated some capital cost in order to improve the payback within requested parameters.

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

Cooling for this building is provided by two (2) roof-top units and two (2) DX systems.

PROJECT SCOPE

This FIM addresses the replacement of two (2) roof top units and two (2) split DX systems. The new equipment will be of equal capacity and include, as part of the installation, package new programmable thermostats provided by Siemens. The thermostats will be able to communicated, via their own IP address, to remote BAUs for additional access. The units will be placed on a time of day schedule. The new schedule will command the units to turn on 1.5 hours before the facility opens and 1.5 hours after it closes.

Scope of Work

Building	Equipment	Make	Model	Tons	Existing EER	New EER
NW Family Success Center	RTU	Trane	TCD211C300BA	17.5	9.8	11.8
NW Family Success Center	RTU	Trane	TCD211C300BA	17.5	9.8	11.8
NW Family Success Center	AHU	Trane	TWE090A300EA	6	10	11.8
NW Family Success Center	AHU	Trane	TWE090A300EA	7.5	11.6	12.4
NW Family Success Center	Condenser		2TTA0072A3000AA			
NW Family Success Center	Condenser	Trane	TTA090A300FA			

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.

SIEMENS

FIM SAVINGS SUMMARY

Annual Electric Consumption: 153,098 kWh

Annual Electric Demand: 75.33 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
NW Family Success Center	HVAC work - COMBINE	$ 8,510.43	$ 859.32	$ -	$ -	$ 9,369.75	$ 160,153.36	17.1

a. Health - Hunter and Hughes Building

FACILITY DESCRIPTION – HUNTER BUILDING

Hunter and Hudges buildings are two buildings next to each other separated by a common park lot. The total square footage for both buildings is 44,434. They are two independent building with dedicated HVAC systems. The two buildings host medical offices including urgent care offices and clinics, and Florida Health Department offices.

Hunter is building located at 601 W Atlantic Blvd, Pompano Beach, FL 33060. It is the North Regional Health Center of Florida Department of Health in Broward County. It features children's dental, and WIC offices.

<u>General Office Hours</u>

Monday - Friday:	8:00AM – 5:00PM
Saturday, Sunday, holidays:	Closed

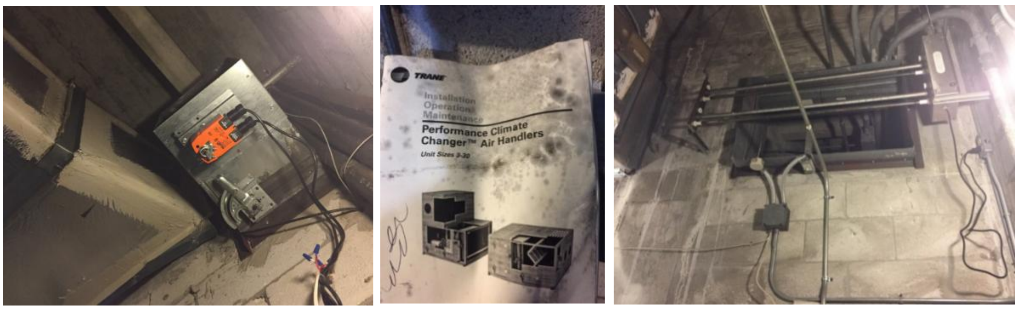
<u>Children's Dental Hours</u>

Tuesday, Wednesday, Friday:	8:00AM – 5:00PM
Monday, Thursday Saturday, Sunday, holidays:	Closed

COOLING SYSTEM:

The building is served by five (5) DX air conditioners. The 1^{st} floor is served by one (1) 12.5 ton unit. Both the 2^{nd} and 3^{rd} floors are served by two (2) 15-ton units. Air handlers manufactured by TRANE are located in mechanical rooms located on the floors where the air handlers are serving. Thermostats used to control the ACs were installed in mechanical rooms. All five condensing units, CU-1 to CU-5, are located on the roof.

Outdoor air is supplied to each mechanical room through duct. According to the building technician, the amount of outdoor air controlled based on room relative humidity. Humidity sensors were observed in the 1^{st} and 2^{nd} floor mechanical rooms, not in the 3^{rd} floor mechanical room.



Examples of air handling systems

Following issues were observed during the audit:

- The coil fins on CU-1 and CU-4 were rusted.
- The power switch box of CU-1 was rusted.
- Long refrigerant pipeline running on the roof, and insulation was damaged.
- The 1st floor mechanical room is cooled by air directly drawn from supply air main duct, and the room is used a door with louvers, which causes energy waste.

Examples of observed issues

The table of the next page provided a detailed equipment inventory for this facility.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Hunter bldg												
AHU-1	Trane		K10C20222			5		200	3	17.5		5.5
CU-1	Trane	TTA150B300FA	8281411AD	compressor	compressor		12.5	230	3	22	11	7.9
				compressor	2008			230	3	22		7.9
				fan				230	1	6		1.2
				fan				230	1	6		1.2
AHU-2	Trane		K10C20210			7.5		200	3	25.3		7.9
CU-2	Trane	TTA180B300FA	831504RAD	compressor	R-22		15	230	3	25.1	11.1	9.0
				compressor	2008			230	3	25.1		9.0
				fan				230	1	3.1		0.6
				fan				230	1	3.1		0.6
AHU-3												0.0
CU-3	Trane	TTA180E300AA	10092Y5YTD	compressor	R-410A		15	230	3	25	11.1	8.3
				compressor	2010			230	3	25		9.0
				fan		1		230	1	5		1.0
				fan		1		230	1	5		1.0
AHU-4	Trane		K10C20234		R-22	7.5	15	200	3	25.3	11.1	7.9
CU-4	Trane	TTA180E300AA	10091Y	compressor	R-410A			230	3	25		9.0
				compressor	2010			230	3	25		9.0
				fan				230	1	5		1.0
				fan				230	1	5		1.0
AHU-5	Trane		K10C20228			7.5		200	3	25.3		7.9
CU-5	Trane	TTA180B300FA	7421UPSAD	compressor	R-22		15	230	3	25.1	11.1	9.0
				compressor	2007			230	3	25.1		9.0
				fan				230	1	3.1		0.6
				fan				230	1	3.1		0.6
Water Heater		CSB526SFEX 100	1146M000702	element				208				
				element				208				
				element				208				

LIGHTING SYSTEM

Interior lighting primarily consists of 32 Watt, T8 fluorescent lamps in either 2 or 3-lamp 2x4 fixtures.

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms and a sink in the break room. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 gpm faucets
- 1.6 gpf toilets
- 1.0 gpf urinals

All water fixtures are operated manually.

BUILDING CONTROLS SYSTEM

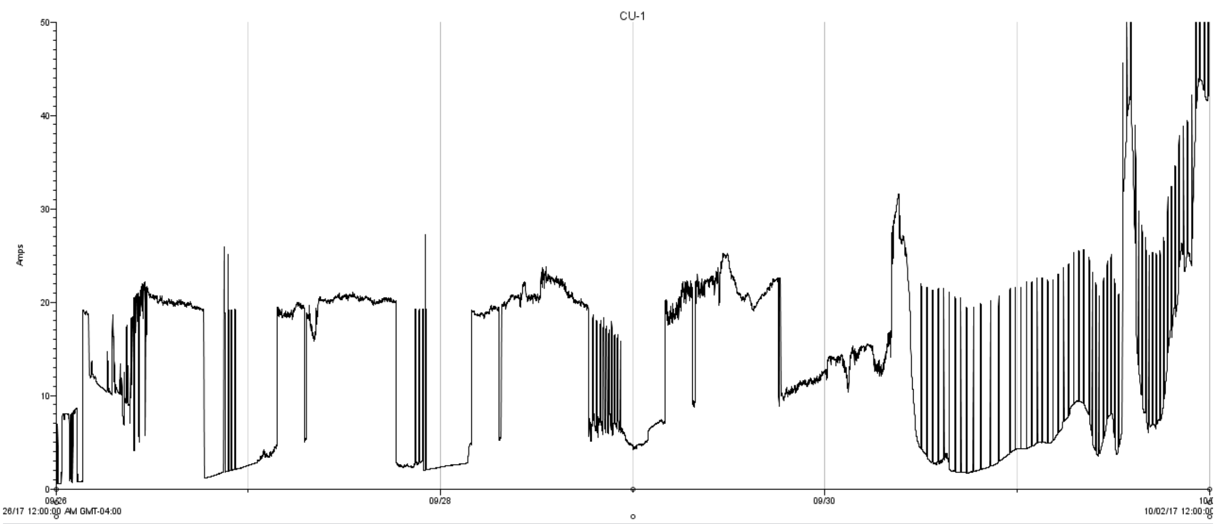
Currently, the facility is not equipped with a central building automation system. The DX equipment is controlled by individual thermostat; some programmable and others not.

HVAC Controls Equipment

TRENDING ADAT ANALYSIS

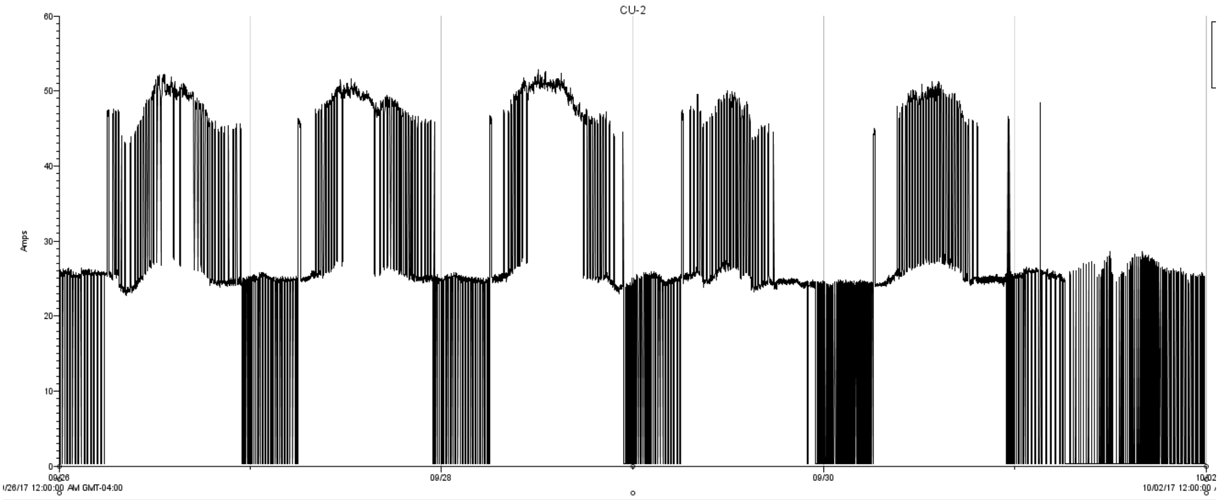
In order to determine the runtime operation of each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – 12.5 Ton Condensing Unit



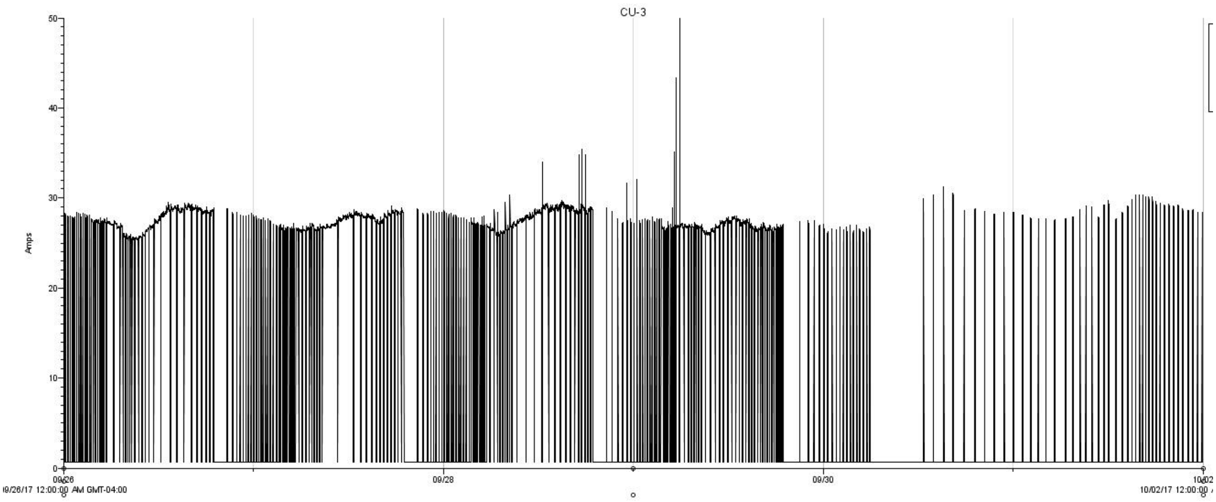
This unit registered an average of 50 amps when two compressors are running and an average of 20.5 amps when only one compressor was running. The operating hours totaled 88 and 23 when one and two compressors were running, respectively, during a one week period.

Trending Data – 15 Ton Condensing Unit



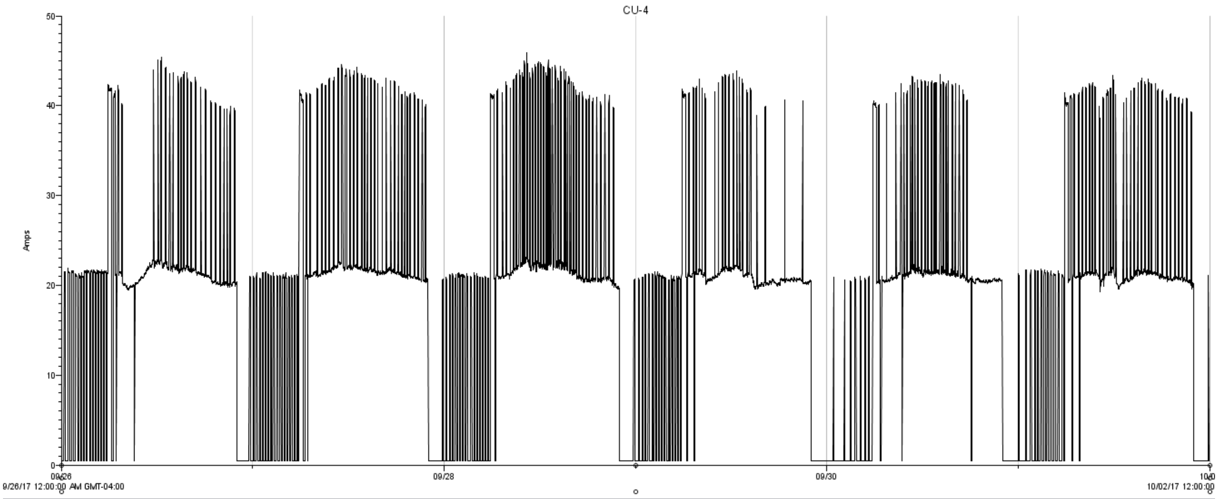
This unit registered an average of 48 amps when two compressors are running and an average of 26 amps when only one compressor was running. The operating hours totaled 82.07 and 45.48 when one and two compressors were running, respectively, during a one week period.

Trending Data – 15 Ton Condensing Unit



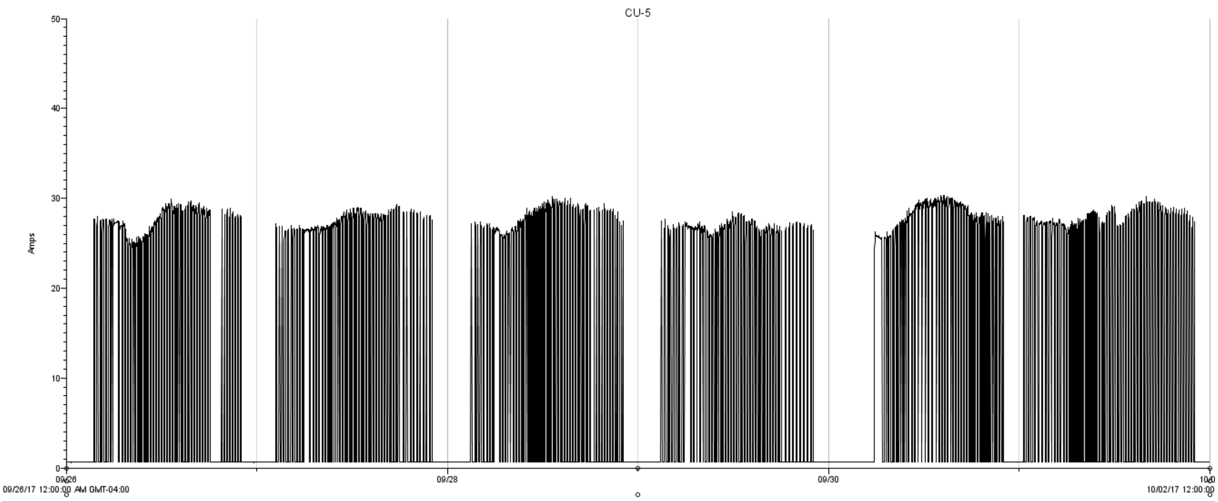
This unit registered an average of 28.17 amps and was operating for a total of 79.2 hours during a one week period.

Trending Data – 15 Ton Condensing Unit



This unit registered an average of 42 amps when two compressors are running and an average of 22 amps when only one compressor was running. The operating hours totaled 94.58 and 23.15 when one and two compressors were running, respectively, during a one week period.

Trending Data – 15 Ton Condensing Unit



This unit registered an average of 27.55 amps and was operating for a total of 66.58 hours during a one week period.

FACILITY DESCRIPTION – HUGHES BUILDING

Hughes Building is a 2-story building located at 205 NW 6th Ave, Pompano Beach, FL 33060. It was open in 1997.

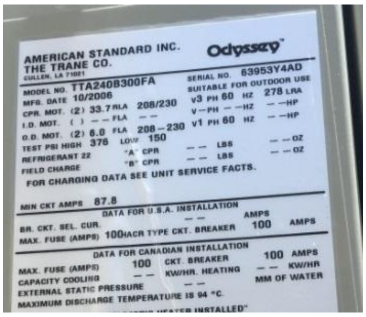
The building includes medical offices, such as dental clinic, immunization clinic, Pharmacy, and offices. There are multipurpose rooms, waiting rooms, conference rooms, offices, etc. that are related to the services. The number of occupants swings greatly depending on the office hours. During the site visit, it was observed that multiple spaces were not occupied. There are different clinic hours as shown below.

<u>General Office Hours</u>

Monday:	8:00AM – 5:00PM
Tuesday:	11:00AM – 8:00PM
Wednesday - Friday	8:00AM – 5:00PM
2nd & 4th Fridays:	1:00PM – 5:00PM
Saturday, Sunday, holidays:	Closed

COOLING SYSTEM:

The building is served by 4 DX air conditioners. Each floor is served by 2 units. The 1st floor is served by two 15-Ton unit, and the 2nd floor is served by two 20-ton units. Air handlers manufactured by TRANE are located in mechanical rooms located on the floors where the air handlers are serving. All 4 condensing units are located on the roof. The following table lists information of each CU. Each floor has several thermostats, and the air handlers are controlled by those thermostats. Outdoor air is supplied to each mechanical room through duct. Air is taken under the roof.



Examples of air handling systems and Outdoor Air Intake

Following issues were observed:

- Observed mold at supply and return diffusers on the second floor
- Water damaged ceiling with mold
- Damaged envelope.
- It was said that the 2nd floor is always cold.
- Refrigerant pipe in a mechanical room was not well insulated.

Examples of observed issues

The following table documents nameplate data acquired both onsite and from online Product Data Sheets. It is a detailed equipment inventory for this facility.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Hughes bldg												
AHU-1	Trane	TWE048C140B3	L414UPH2V		1996	0.5		230	1	4.2		0.9
CU-1	Trane	TTH060C10042	L412TPNBF	compressor	1996		5	230	1	29.1		6.0
				fan	R-22	0.25		230	1	1.9		0.4
AHU-2	Trane	TWE180B300BC	L3811M76H	1996	R-22	3		230	3	10.6		3.8
CU-2	Trane	TTA180B300CB	L433YG1AH	compressor	1996		15	230	3	25.7	11.1	9.2
				compressor	R-22			230	3	25.7		9.2
				fan				230	1	3.1		0.6
				fan				230	1	3.1		0.6
AHU-3												
CU	Trane	TTA240B300FA	63953Y4AD	compressor	2006		20	230	3	33.7	11.1	12.1
				compressor	R-22			230	3	33.7		12.1
				fan				230	1	6		1.2
				fan				230	1	6		1.2
AHU-4	Trane	TWE240B300BC	L415JK26H	1997	R-22	5		230	3	16.7		6.0
CU-4	Trane	TTA240E300AA	13051S7LTA	compressor	2013		20	230	3	39.1	11.1	14.0
				compressor	R-410A			230	3	39.1		14.0
				fan		1		230	1	5		1.0
				fan		1		230	1	5		1.0

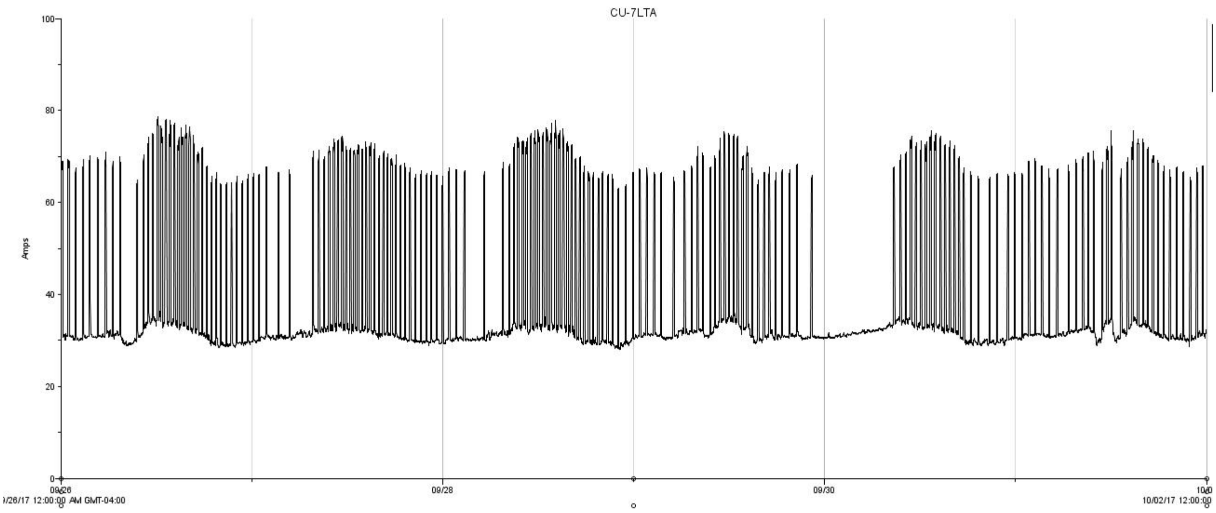
BUILDING CONTROLS SYSTEM

Currently, the facility is not equipped with a central building automation system. The DX equipment is controlled by individual thermostat; most of which are not programmable.

TRENDING ADAT ANALYSIS

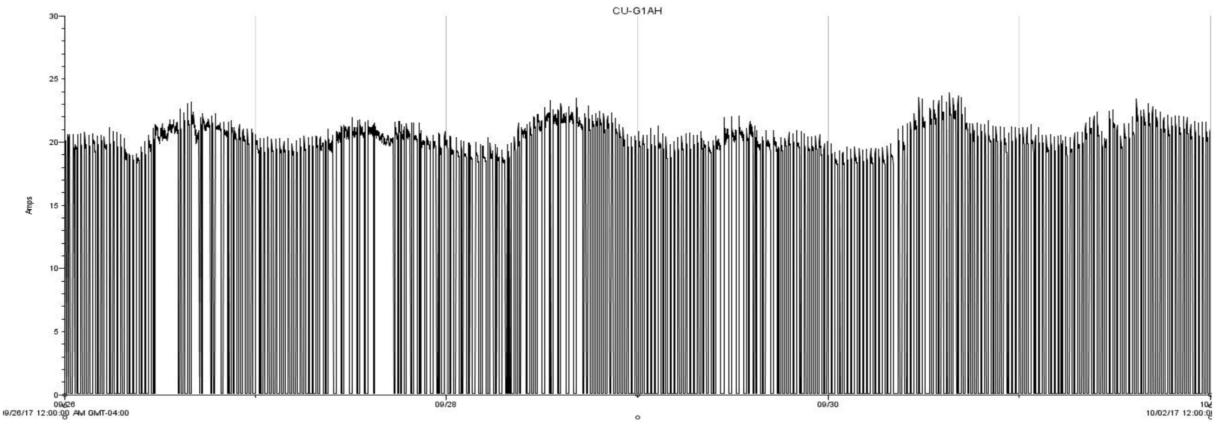
In order to determine the runtime operation of each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – 20 Ton Condensing Unit



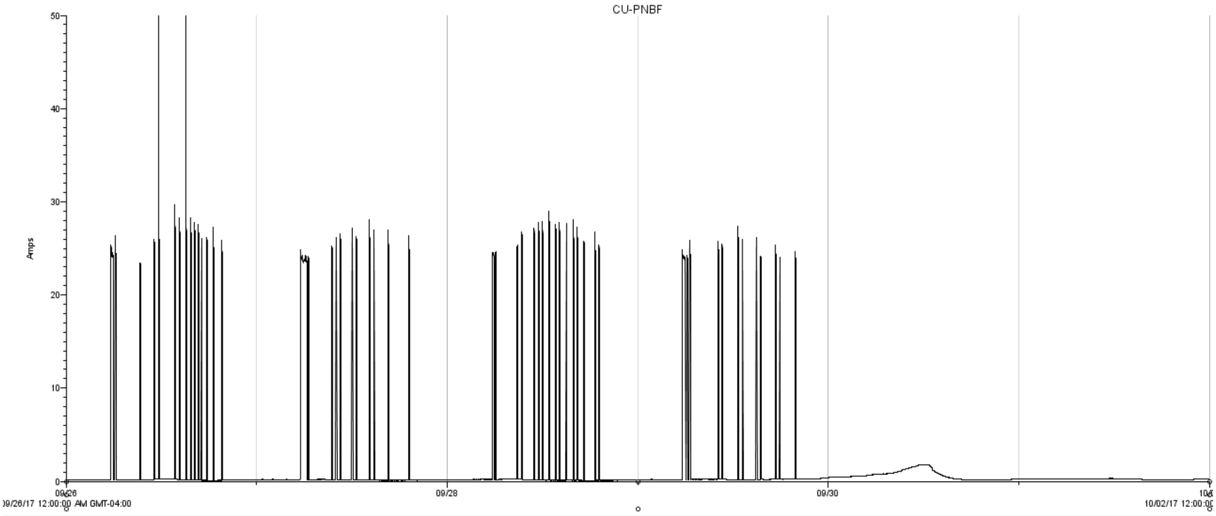
This unit registered an average of 38.89 amps and was operating for a total of 168 hours during a one week period.

Trending Data – 15 Ton Condensing Unit



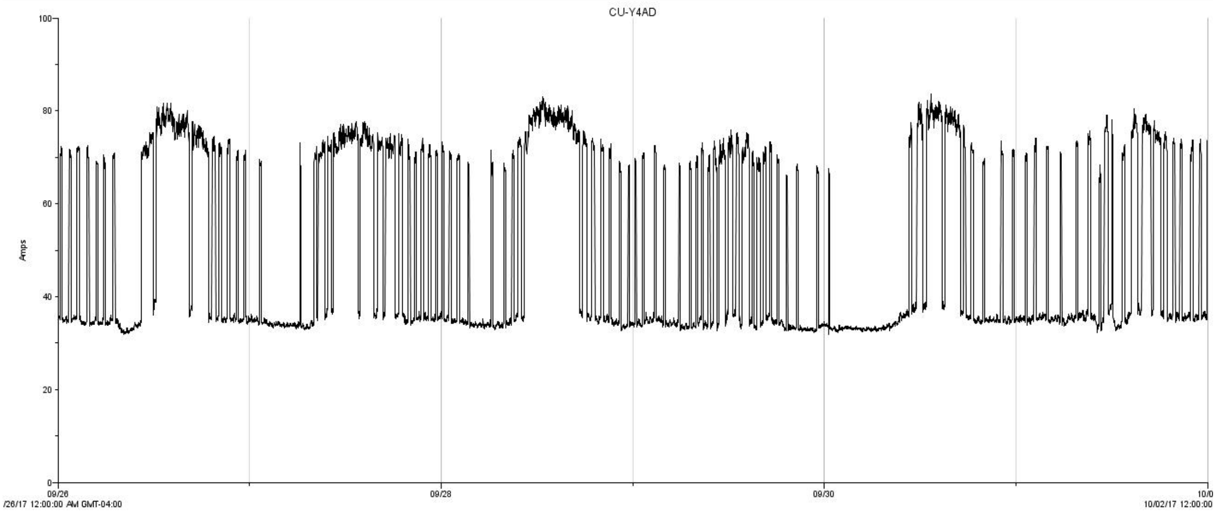
This unit registered an average of 20.36 amps and was operating for a total of 77.38 hours during a one week period.

Trending Data – 5 Ton Condensing Unit



This unit registered an average of 20.36 amps and was operating for a total of 77.38 hours during a one week period.

Trending Data – 20 Ton Condensing Unit



This unit registered an average of 74.5 amps when two compressors are running and an average of 35 amps when only one compressor was running. The operating hours totaled 101.8 and 59.63 when one and two compressors were running, respectively, during a one week period.

UTILITY DATA ANALYSIS- ELECTRIC

The electric usage at this facility is assumed to be monitored by one (1) electric meter. Since this building is leased by the County to the current occupant, the County is not account holder with Florida Power and Light. Attempts were made to obtain billing data from the building occupant with no success. Therefore, for the purposes of this audit, it is assumed that this facility is served by the General Service Demand (GSD-1) rate structure as the other health facilities.

Without historical billing data, Siemens was not able to create/verify a baseline from utility bills. Instead, Siemens utilized the trended data of both HVAC and lighting systems to create the baseline without a means of calibration.

UTILITY DATA ANALYSIS- WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Hunter & Hughes	Lighting - Interior	$ 11,468.06	$ 5,044.97	$ -	$ 2,049	$ 18,562.02	$ 106,698.44	5.7
Hunter & Hughes	Hunter Code Compliace	$ -	$ -	$ -	$ -	$ -	$ 38,853.07	-
Hunter & Hughes	Hughes Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 14,323.71	-
Hunter & Hughes	Hunter and Hughes	$ 23,769.95	$ 8,567.10	$ -	$ -	$ 32,337.05	$ 447,051.67	13.8
Breakage Fee							$ 7,553.70	
PA Cost							$ 6,342.89	
Total		**$ 35,238.01**	**$ 13,612.07**	**$ -**	**$ 2,049**	**$50,899.07**	**$ 620,823.48**	**12.2**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Screw Based Incandescent and Compact fluorescent fixtures

Our design strategy for the replacement of screw based incandescent and compact fluorescent lamps is to replace them with screw based LED where the application permits. LED has become an attractive replacement option when incandescent fixtures are controlled by dimmers due to its excellent dimming capability.

LED Replacement for Pin-Based Compact Fluorescent Fixtures

In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, our design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps and remove the existing fluorescent ballasts. In some cases, it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
hunter & hughes bldg	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	4	4
	Existing T8 Fluorescent - Proposed Retrofit LED	360	360
	Existing T8 Fluorescent - Proposed Retrofit LED With Reflector kit	312	312
	Existing Incandescent - Proposed Relamp LED	3	3
	Existing Compact Fluorescent - Proposed Relamp LED	4	4
	Existing T12 Fluorescent - Proposed Retrofit LED	5	5
	Existing T8 Fluorescent U Tube - Proposed New LED Fixture	11	11
	Existing T5 Fluorescent - Proposed RETROFIT LED	11	11

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 206,316 kWh

Annual Electric Demand: 440.04 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Hunter & Hughes	Lighting - Interior	$ 11,468.06	$ 5,044.97	$ -	$ 2,049	$ 18,562.02	$ 106,698.44	5.7

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

HUNTER: The building is served by five (5) DX air conditioners. The 1st floor is served by one (1) 12.5 ton unit. Both the 2nd and 3rd floors are served by two (2) 15-ton units. Air handlers manufactured by TRANE are located in mechanical rooms located on the floors where the air handlers are serving. Thermostats used to control the ACs were installed in mechanical rooms. All five condensing units, CU-1 to CU-5, are located on the roof.

HUGHES: The building is served by 4 DX air conditioners. Each floor is served by 2 units. The 1st floor is served by two 15-Ton unit, and the 2nd floor is served by two 20-ton units. Air handlers manufactured by TRANE are located in mechanical rooms located on the floors where the air handlers are serving. All 4 condensing units are located on the roof.

PROJECT SCOPE

Hughes: This FIM addresses the replacement of the air handler and condensing units of four (4) DX systems. The new units will see a change from R-22 to R-410A refrigerant.

Hunter: This FIM addresses the replacement of the air handlers and condensing units of five (5) DX systems. The new units will see a change from R-22 to R-410A refrigerant.

The new equipment will be of equal capacity and include, as part of the installation, package new programmable thermostats provided by Siemens. The thermostats will be able to communicated, via their own IP address, to remote BAUs for additional access. The units will be placed on a time of day schedule. The new schedule will command the units to turn on 1.5 hours before the facility opens and 1.5 hours after it closes.

Scope of Work

Building	Equipment	Make	Model	Tons	Existing EER	New EER
Hunter & Hughes	Condenser	Trane	TTH060C10042	5		11.7
Hunter & Hughes	Condenser	Trane	TTA180B300CB	15	11.1	12.8
Hunter & Hughes	Condenser	Trane	TTA240B300FA	20	11.1	12
Hunter & Hughes	Condenser	Trane	TTA240E300AA	20	11.1	12
Hunter & Hughes	Condenser	Trane	TTA150B300FA	12.5	11.1	11.7
Hunter & Hughes	Condenser	Trane	TTA180B300FA	15	11.1	12.8
Hunter & Hughes	Condenser	Trane	TTA180E300AA	15	11.1	12.8
Hunter & Hughes	Condenser	Trane	TTA180E300AA	15	11.1	12.8
Hunter & Hughes	Condenser	Trane	TTA180B300FA	15	11.1	12.8
Hunter & Hughes	AHU	Trane	TWE048C140B3			
Hunter & Hughes	AHU	Trane	TWE180B300BC			
Hunter & Hughes	AHU	Trane	TWE240B300BC			
Hunter & Hughes	AHU	Trane	TWE240B300BC			
Hunter & Hughes	AHU	Trane	CSAA010UAA00			
Hunter & Hughes	AHU	Trane	CSAA010UAA00			
Hunter & Hughes	AHU	Trane	CSAA010UAA00			
Hunter & Hughes	AHU	Trane	CSAA010UAA00			
Hunter & Hughes	AHU	Trane	CSAA010UAA00			

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.

SIEMENS

FIM SAVINGS SUMMARY

Annual Electric Consumption: 427,631 kWh

Annual Electric Demand: 748.6 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Hunter & Hughes	Hunter and Hughes	$ 23,769.95	$ 8,567.10	$ -	$ -	$ 32,337.05	$ 447,051.67	13.8

Code Compliance: Associated with the scope of work summarized above are code compliance issued uncovered by contracted MEPs (mechanical, electrical, and plumbing vendor). This cost was requested to be listed separately. For this facility, the code compliance cost is:

- Hunter Building: $38,853.07
- Hughes Building: $14,323.71

The identified issue at Hunter and Hughes concerns the metail frame upon which the roof-mounted condensing unit sits. The elevation is not to current code. The structure needs to be raised.

D.17. Health - Northwest Health Center

FACILITY DESCRIPTION

The Northwest Health Center is a one story, 4,920 square foot facility located at 624 Northwest 15th Way, Ft Lauderdale, FL 33311. This facility serves as a local health center for the surrounding community and has recently undergone interior renovations that have updated the paint and furnishings of the facility. The operation hours for this facility are as follows:

Monday – Friday: 8:30AM – 5PM

Saturday – Sunday: Closed

COOLING SYSTEM:

Cooling for the building is provided by two (2) DX systems that each contain one air handler connected to two condensing units. Both the systems utilize R410a refrigerant. At the time of the site visit, one of the condensing units was missing its fan and was not in functioning condition. The two cooling systems are laid out on opposite ends of the building and presumably each cool approximately half the building.

Namplate Data of Mechanical eEquipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Northwest Heath Center												
AHU	Carrier	39THA–C--G-LH1	5000F50327		2001	5		460	3	6.2	85.5%	4.3
DX	Carrier	24ABB336A510	3716E06847	compressor	R-410A			230	3	10.5		3.3
				fan		0.25		230	1	1.4		0.3
DX	Carrier	24ABB342A500	3916E01941	compressor	R-410A			230	3	13.5		4.3
				fan		0.2		230	1	1.1		0.2
AHU	Carrier	39THA–C--G-LH1	5100F52590			5		460	3	6.17	88.5%	4.2
DX	Carrier	24ABB342005	4415E11282	compressor	R-410A			230	3	13.5		4.3
				fan		0.2		230	1	1.1		0.2
DX	Carrier	24ACA360A005	4906E08441	compressor	R-410A			230	3	17.7		5.6
				fan	DEMO'D	0.25		230	1	1.2		0.2
Water Heater	Lochinvar	ESA040KK	WK2173387		40 Gal			240				



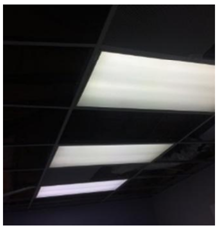
Cooling System Examples

The following images are of the condensing unit found to be non-operational at the time of the site visit. On site personnel did not know if there were plans to change out this unit.

Non-functional Condensing Unit

LIGHTING SYSTEM:

Interior lighting primarily consists of 2x4 T8 lighting fixtures throughout the building and compact fluorescent lighting in the storage and janitorial rooms.



Interior Lighting Example

Exterior lighting primarily includes compact fluorescent and incandescent lighting for the surrounding area of the exterior of the building. The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 faucets
- 1.0 gpf urinals
- 1.6 gpf toilets

All water fixtures are operated manually.



Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM:

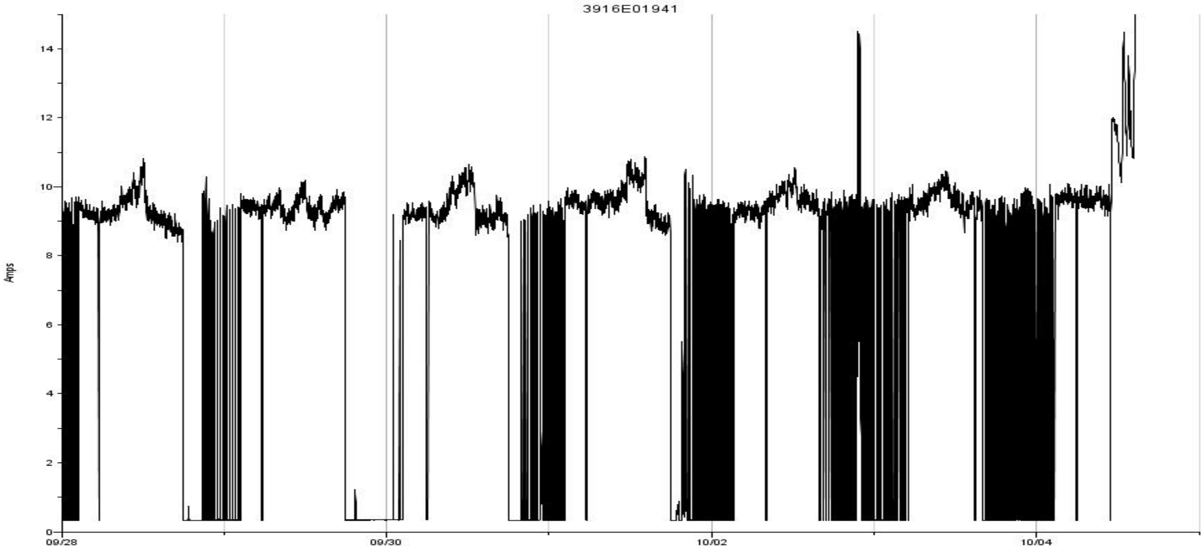
The building is currently not equipped with a building automation system. Each zone has a dedicated thermostat.


Building Controls

TRENDING DATA AQUISITION:

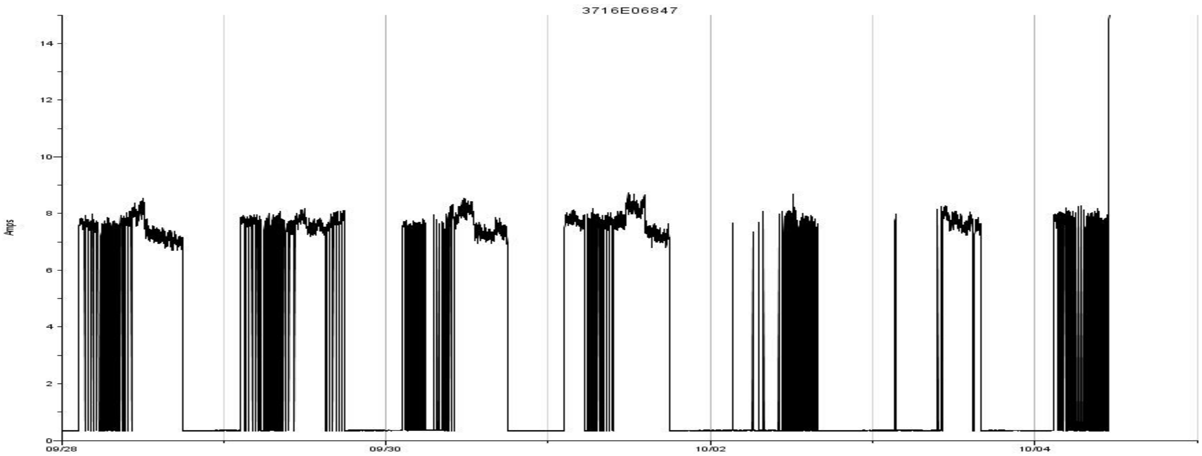
In order to determine the runtime operation of each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – Condensing Unit Serial # 3916E01941



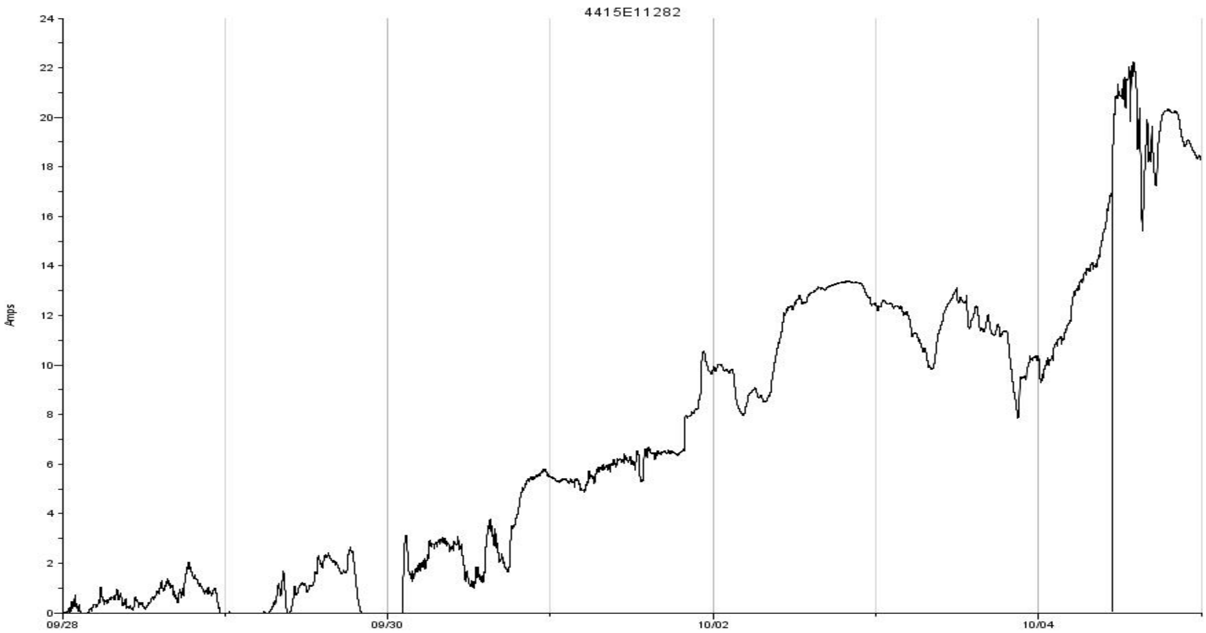
This unit registered an average of 10.45 amps and was operating for a total of 121.87 hours during a one week period.

Trending Data – Condensing Unit Serial # 3716E06847



This unit registered an average of 7.64 amps and was operating for a total of 63.48 hours during a one week period.

Trending Data – Condensing Unit Serial # 4415E11282



This unit did not log properly and no relevant conclusions can be drawn from this data.

The following table compares the operating hours of each unit with the hours of service for the facility.

Day	Hours of Service	Run Hours Unit 1941	Run Hours Unit 6847
Monday	8:30AM - 5:00PM	12:00AM - 11:59PM	3:30AM - 4:00PM
Tuesday	8:30AM - 5:00PM	12:00AM - 11:59PM	3:30AM - 4:00PM
Wednesday	8:30AM - 5:00PM	12:00AM - 11:59PM	2:30AM -6:00PM
Thursday	8:30AM - 5:00PM	12:00AM - 6:00PM	2:30AM -6:00PM
Friday	8:30AM - 5:00PM	2:30AM - 6:00PM	2:30AM -6:00PM
Saturday	Closed	2:30AM - 6:00PM	2:30AM -6:00PM
Sunday	Closed	2:30AM - 6:00PM	2:30AM -6:00PM

The unit ending in serial number 1941 was running continuously the first three days of logging but then showed signed of being on a schedule by consistently turning on and off at the same time the last days of logging. The unit ending in serial number 6847 showed signs of scheduling but the unit was not running at the optimal schedule.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

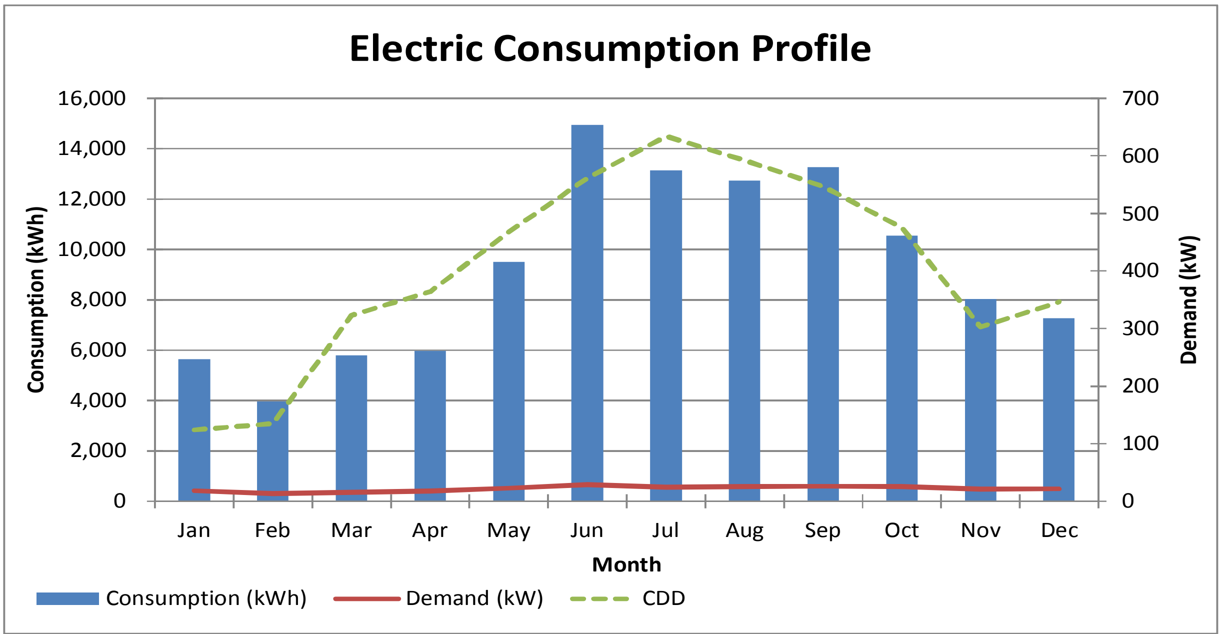
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Northwest Health Center	1	GSD-1	$ 0.05566	$ 11.47	110,789	260	37

The data in the table above was generated using the following electric billing data.

Meter KH47250; Account: 6958706563; Address: 624 NW 15TH WAY FT LAUDERDALE

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	19,268	$ 1,061	37	$ 393	$ 78	$ 1,552
Jul-15	$ 19.48	14,897	$ 821	28	$ 297	$ 60	$ 1,198
Aug-15	$ 19.48	12,255	$ 675	28	$ 297	$ 55	$ 1,046
Sep-15	$ 19.48	14,357	$ 791	28	$ 297	$ 54	$ 1,162
Oct-15	$ 19.48	10,086	$ 556	28	$ 297	$ 46	$ 919
Nov-15	$ 19.48	11,435	$ 630	27	$ 286	$ 48	$ 983
Dec-15	$ 19.48	9,589	$ 486	26	$ 276	$ 86	$ 867
Jan-16	$ 19.48	7,435	$ 377	22	$ 222	$ 54	$ 673
Feb-16	$ 19.48	4,959	$ 251	13	$ 131	$ 35	$ 437
Mar-16	$ 19.48	6,637	$ 336	17	$ 172	$ 48	$ 575
Apr-16	$ 19.48	7,133	$ 361	18	$ 182	$ 32	$ 595
May-16	$ 19.48	7,878	$ 399	20	$ 202	$ 35	$ 656
Jun-16	$ 20.24	10,618	$ 505	20	$ 208	$ 64	$ 798
Jul-16	$ 20.24	11,379	$ 542	21	$ 219	$ 68	$ 849
Aug-16	$ 20.24	13,195	$ 628	22	$ 229	$ 77	$ 955
Sep-16	$ 20.24	12,149	$ 578	24	$ 250	$ 72	$ 921
Oct-16	$ 20.24	11,022	$ 525	22	$ 229	$ 66	$ 840
Nov-16	$ 20.24	4,605	$ 219	15	$ 156	$ 34	$ 430
Dec-16	$ 20.24	4,933	$ 235	17	$ 177	$ 37	$ 469
Jan-17	$ 25.00	3,877	$ 199	14	$ 148	$ 33	$ 406
Feb-17	$ 25.00	2,999	$ 154	14	$ 148	$ 29	$ 357
Mar-17	$ 25.00	4,929	$ 265	15	$ 159	$ 40	$ 489
Apr-17	$ 25.00	4,818	$ 259	17	$ 180	$ 41	$ 505
May-17	$ 25.00	11,124	$ 597	26	$ 276	$ 80	$ 978
AVERAGE TOTALS		**110,789**	**$ 5,725**	**260**	**$ 2,717**	**$ 637**	**$ 9,329**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Although labeled a health center, the facility operations are closer to that of an office; therefore, air conditioning is the influence on energy consumption. Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in June while the average low occurs in February; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Northwest Health Center	Outpatient	22.52	6.3	12.8	19

Overall, this building is operating above the 75th percentile of comparable facilities. The historical data used to create the above metric does not take into consideration the new HVAC equipment that was recently installed onsite. More recent billing data would results in a much lower metric value.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Northwest Health Center	Lighting - Interior	$ 391.29	$ 699.54	$ -	$ 62	$ 1,152.83	$ 12,827.62	11.1
Northwest Health Center	Lighting - Exterior	$ 110.50	$ 63.54	$ -	$ 32	$ 206.04	$ 298.85	1.5
Northwest Health Center	Split System Scheduling	$ 825.55	$ -	$ -	$ -	$ 825.55	$ 5,741.86	7.0
Breakage Fee							$ 836.40	
PA Cost							$ 197.40	
Total		**$ 1,327.34**	**$ 763.08**	**$ -**	**$ 94**	**$ 2,184.42**	**$ 19,902.13**	**9.1**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps: The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures: In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Pin-Based Compact Fluorescent Fixtures: In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, our design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps and remove the existing fluorescent ballasts. In some cases, it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
Northwest Health Center	Existing T8 Fluorescent - Proposed Retrofit LED	20	20
	Existing T8 Fluorescent - Proposed Retrofit LED With Reflector kit	59	59
	Existing Compact Fluorescent - Proposed Relamp LED	2	2

PROJECT SCOPE – EXTERIOR LIGHTING

LED Replacement for High Intensity Discharge Exterior

The replacement of HID (high intensity discharge), including metal halide or high-pressure sodium n exterior applications provides significant energy reduction opportunities when changing over to LED. For exterior pole mounted applications, often the number of fixtures can be reduce based on the improved photometric and light distribution of the new LED fixtures that wasn't previously available in HID fixtures. All proposed LED fixtures are from recognized manufacturers that have met the required standards for light quality, efficiency and longevity. In our design effort and fixture selection process, consideration is given to the maintenance benefits of the prescribed solution resulting in less future costs to maintain exterior fixtures in difficult to reach applications. The proposed LED fixture replacement has been specified to furnish light levels that are in compliance with recommended light levels and support the existing site condition requirements. Where time clocks or automated lighting controls are not in place, proposed LED building and site lighting will incorporate an integral photocell to maximize energy savings.

In general, the design approach is to replace existing HID luminaires with new LED luminaires of like type, ie: shoeboxes, wallpacks, floodlights. Some fixture types are replaced with new LED fixtures of a different type, ie: recessed canopy lights replaced with low profile LED canopy lights.

Where deemed appropriate in parks and office buildings, integral occupancy sensors have been used on pole mounted shoebox luminaires in parking lots to automatically dim the lighting during hours of inactivity.

Decorative post top luminaires, recessed step lights, and bollards typically use low wattage HID lamps in architectural form factors. Replacement luminaires of this type are relatively high in cost, with relatively low energy savings potential. As a result, the proposed design typically calls for removing the HID lamp and ballast, and installing a new screw based LED lamp.

LED Replacement for Fluorescent Exterior

Luminaires with pin based compact fluorescent lamps will generally be retrofit by removing the existing fluorescent lamps and ballast, and installing new line voltage, pin based LED lamps. Existing screw based incandescent and fluorescent lamps will be replaced with new screw based LED lamps.

Exterior fixtures with existing linear fluorescent lamps, such as surface mounted enclosed and gasketed fixtures in park pavilions are evaluated for fixture condition, and either retrofit with new LED T8, UL Type B lamps, or replaced with new luminaires utilizing dedicated LED boards and drivers.

Exterior Lighting Retrofit Scope

BUILDING	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
Northwest Health Center	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	1	1
	Existing Incandescent - Proposed Relamp LED	3	3
	Existing Compact Fluorescent - Proposed Relamp LED	3	3

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 9,016 kWh

Annual Electric Demand: 67.26 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Northwest Health Center	Lighting - Interior	$ 391.29	$ 699.54	$ -	$ 62	$ 1,152.83	$ 12,827.62	11.1
Northwest Health Center	Lighting - Exterior	$ 110.50	$ 63.54	$ -	$ 32	$ 206.04	$ 298.85	1.5

AUTOMATION – SCHEDULES

Standard thermostats control an HVAC unit by measuring the ambient temperature at the thermostat and either turning the unit on if the ambient temperature is above the temperature setpoint or turning the unit off when the ambient temperature reaches the setpoint. Most commercial facilities have set hours of operation where the facility is occupied and there is a need for conditioned space. Outside of hours of operation a facility will usually not have occupancy and won't have a need for air conditioning. Advanced Siemens thermostats allow for the utilization of this fact to translate into energy savings by changing the setpoint temperatures of a building automatically depending on the hours of operation. In addition, these thermostats have the capability to be wirelessly connected to a BAS system for remote monitoring and control.

PROJECT SCOPE

This FIM address the turn-key replacement and installation of two (2) thermostats with scheduling capabilities.

SAVINGS

The energy cost and savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical consumption of the equipment to be controlled by the thermostat was determined. A run time analysis was completed by logging the use of the equipment for a 7 day period. The equipment run time was compared to an optimal run time to meet the needs of that facility. Optimal run times were determined by taking the daily hours of operation of the facility plus 1.5 hours before and after. The difference between the existing run time and the optimal run time are equal to the unnecessary amount of time the unit is running. This time then was multiplied by the electrical consumption for each unit to acquire the calculated energy savings per HVAC unit. Full calculations are provided in Section H, Appendices this Report.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 14,826 kWh

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Northwest Health Center	Split System Scheduling	$ 825.55	$ -	$ -	$ -	$ 825.55	$ 5,741.86	7.0

D.18. Health - South Regional

FACILITY DESCRIPTION

The South Regional Health Center is a 38,237 square foot 1-story building (North Wing has locker rooms on the 2nd Floor) located at 4105 Pembroke Road, Hollywood, FL 33021. It was constructed approximately in 1971. Renovation was conducted in 1989. The building includes WIC offices, Vital Statistics, Children's Dental, Adult Dental, etc. The number of occupants swings depending on the office hours. There are general office hours and also different clinic and office hours, for example, Children's Dental only opens Monday and Thursday from 8:00AM to 5:00PM. The general office hours are the following:

General Office Hours

Monday – Friday:	8:00AM – 5:00PM
Saturday, Sunday, holidays:	Closed

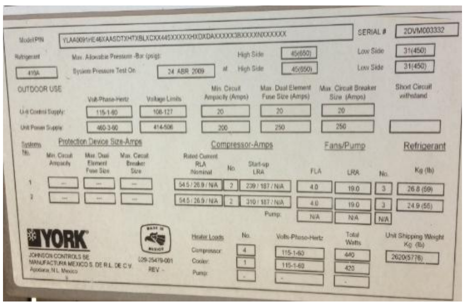
COOLING SYSTEM:

Cooling of the building is supplied by the chiller plant, which is located at the outside of the building. The chilled water system consists of 2 air-cooled chillers, and two 7.5-HP primary chilled water pumps.

The design tonnage of each air-cooled chiller is 90 Ton. The units were made in 2009 by York. The refrigerant is R-410a. The design chilled water supply and return temperature is 42/54°F.

The primary only chilled water system supplies chilled water to AHUs distributed in the building. Two-way control valves were installed on chilled water pipes at 9 out of the 10 AHUs. A 3-way control valve was installed on AHU6 chilled water pipe.





Chilled Water System

The building is primarily served by 10 single duct single zone air handling units. Some units with higher motor horsepower, such as AHU-6 and AHU-10, were installed with VFDs. Two-position OA dampers were installed on AHUs. The following table lists the detailed equipment information.

Building HVAC

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
South Regional Health Center												
Chiller 1	York	YLAA0091HE46X	2DVM003333	compressor	R-410A	varries around		460	3	26.9	varries	
				compressor	2009			460	3	26.9		
				compressor				460	3	26.9		
				compressor				460	3	26.9		
				fan (3)				460	3	12		
				fan (3)				460	3	12		
Chiller 2	York	YLAA0091HE46X	2DVM003332	compressor	R-410A	varries around		460	3	26.9	varries	
				compressor	2009			460	3	26.9		
				compressor				460	3	26.9		
				compressor				460	3	26.9		
				fan (3)				460	3	12		
				fan (3)				460	3	12		
Cir Pump 1	Baldor	M3219T	36B101T849H1			7.5		460	3	8.7	87.5%	
Cir Pump 2	Baldor	M3219T	36B101T849H1			7.5		460	3	8.7	87.5%	
RTU	Aon	RQ-006-3-V-FB19	201510-AYEF023	compressor			6	460	3	9.7		7.0
				motor		0.3333		230	1	2.8		0.6
				fan		2		460	3	3.4		2.4
AHU												
AHU-7	McQuay	LSL108CV	3VF00512-06		with VFD							
EF-1	Greenheck	TCB-2-9-10-X	14262326									
Water Heater		CSB1206SFEX 100	1335M000292	element	119 Gal			480				
				element				480				
				element				480				
Water Heater	AO Smith	DRE 120 917	ME02-1692876	element	119 Gal							
				element				480	3	18.04		
				element								

Air Handling Unit data

Location / Service Area	AHU	Fan HP	VFD?
C113	AHU-1	10	
C108	AHU-2	7.5	
B106	AHU-3	5.0	
A121	AHU-4	2.0	
A109	AHU-5	1.5	
A102	AHU-6	5.0	Yes
E129	AHU-7	3.0	
D101	AHU-8	1.0	
J109	AHU-9	3.0	
D100	AHU-10	5.0	Yes

LIGHTING SYSTEM

Interior lighting primarily consists of T8 fluorescent lamps in 2x4 recessed or suspended fixtures, and compact fluorescent in suspended fixtures.

Interior Lighting Examples

DOMESTIC WATER

Domestic water usage is limited to restrooms and kitchen sinks. The following are example of the types of fixture found within the facility:

- 2.2 faucets
- 3.5 gpf toilets
- 1.0 gpf urinals
- 2.5 gpm kitchen sink

BUILDING CONTROLS SYSTEM

The building is equipped with a Johnson Controls pneumatic and DDC mixed building automation system.

Control System Examples

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is assumed to be monitored by one (1) electric meter. Since this building is leased by the County to the current occupant, the County is not account holder with Florida Power and Light. Attempts were made to obtain billing data from the building occupant with no success. Therefore, for the purposes of this audit, it is assumed that this facility is served by the General Service Demand (GSD-1) rate structure as the other health facilities.

Without historical billing data, Siemens was not able to create/verify a baseline from utility bills. Instead, Siemens utilized the trended data of both HVAC and lighting systems to create the baseline without a means of calibration.

UTILITY DATA ANALYSIS - WATER

Water consumption data could also not be acquired for this facility

RECOMMENDED IMPROVEMENT MEASURES

All recommended FIMs for this facility have been removed from the final scope by Broward County. Please refer to Section G of this report for documentation of these originally proposed opportunities.

D.19. Library - Collier City

FACILITY DESCRIPTION

The Collier City Library is a 1 story, 10,000 square foot facility located at 2800 Northwest 9th Court, Pompano Beach, FL 33069. The library features large open spaces for book storage and reading, a computer room, and offices. The library is used for many community events for adults, teens, and children. The hours of operation are as follows:

Monday:	12AM – 8PM
Tuesday:	10AM – 6PM
Wednesday:	12AM – 8PM
Thursday:	10AM – 6PM
Friday:	10AM – 6PM
Saturday:	10AM – 6PM
Sunday:	Closed

COOLING SYSTEM:

Cooling for the building is provided by seven (7) DX roof top units. Some of the units utilize R22 refrigerant and some utilize R410a refrigerant. The detail on the size, make, model, and various other pieces of data for each of the units can be seen in the table below. The units utilizing R22 refrigerant were in poor condition.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Collier City Library												
RTU 1	Trane	THC060E3ROA	100811534L	compressor	R-410A		5	208	3	32.1	11	10.4
				fan				208	1	2.5		0.5
				fan				230	1	7.6		1.6
RTU 2	Trane			compressor	R-410A		5	208	3	32.1	11	10.4
				fan				208	1	2.5		0.5
				fan				230	1	7.6		1.6
RTU 3	Trane	THC092E3R0A	100810870L	compressor	R-410A		7.5	208	3	50.3	11	15.4
				fan								
				fan								
RTU 4	Trane	TDC181E300BA	100810128D	compressor	R-410A		15	208	3	29.5	11	8.5
				compressor	2010			208	3	17.6		5.1
				fan		0.5		208	1	3.2		0.5
				fan		0.5		208	1	3.2		0.5
RTU 5		DS-03C00AFDAA	nfmm065842	compressor	R-22		3	230	1	19.2		3.5
				blower		0.5		230	1	4.4		0.8
				fan		0.5		230	1	2.3		0.4
RTU 6		DU-08C00ATDAA3A	NFMM063451	compressor	R-22		7.5	230	3	12.8		4.1
				compressor				230	3	12.8		4.1
				blower		2		230	3	8.2		2.6
				fan		0.3333		230	1	1.5		0.3
				fan		0.3333		230	1	1.5		0.3
RTU 7		DU-07C00ATDAA3A	NFMM063455	compressor	R-22		7.5	230	3	14.1		4.8
				compressor				230	3	14.1		4.8
				blower		1.5		230	3	6.2		2.1
				fan		0.3333		230	1	1.5		0.3
				fan		0.3333		230	1	1.5		0.3

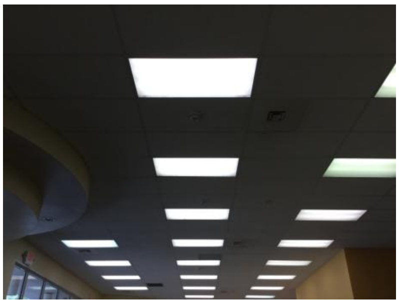
Cooling System Examples

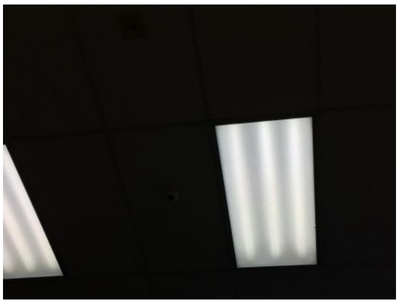
The following images are examples of the poor condition of the units that utilize R22 refrigerant.

RTU Condition Issues

LIGHTING SYSTEM:

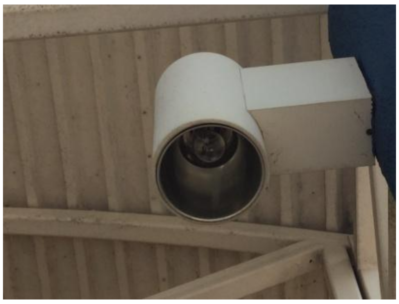
Interior lighting primarily consists of T8 fluorescent lamps in either 3-lamp 2x4 fixtures. The building also contains a few U-bend fixtures consisting of 2-lamp T8 fluorescents and compact lighting fixtures.





Interior Lighting Examples

Exterior lighting primarily consists of high intensity discharge canned lighting in the entranceway canopy and metal halide lighting for the surrounding area of the building and the parking lot.



Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 faucets
- 1.6 gpf toilets
- 1.0 gpf urinals

BUILDING CONTROLS SYSTEM:

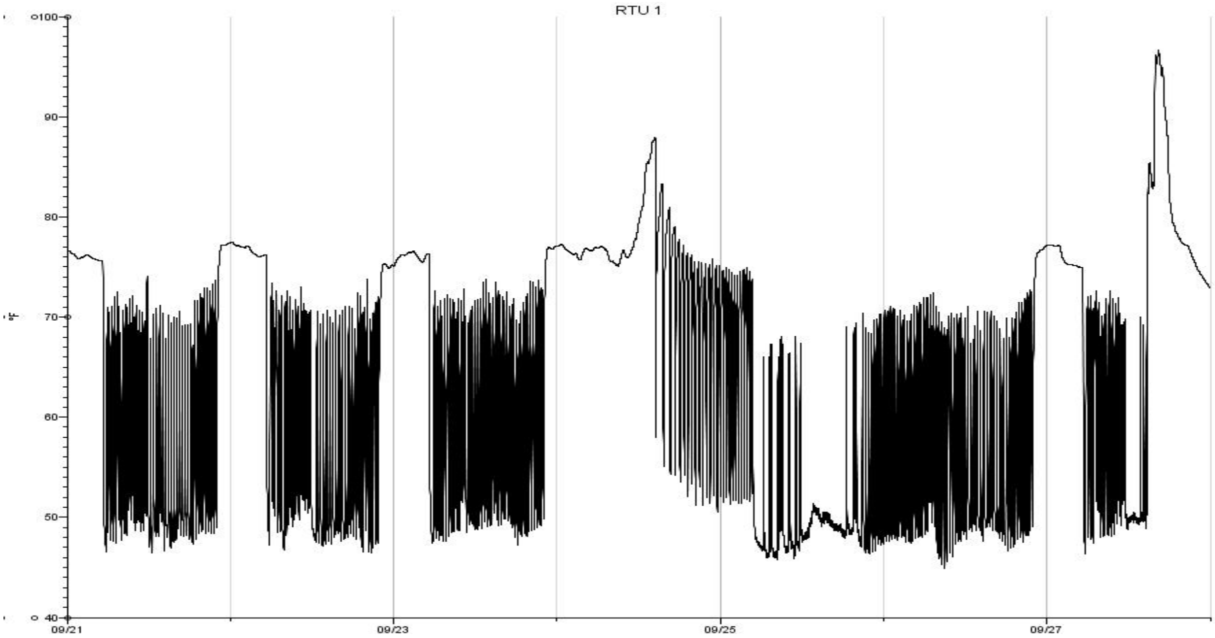
The building is currently not equipped with a building automation system. Each zone has a dedicated thermostat.

Building Controls

TRENDING DATA AQUISITION:

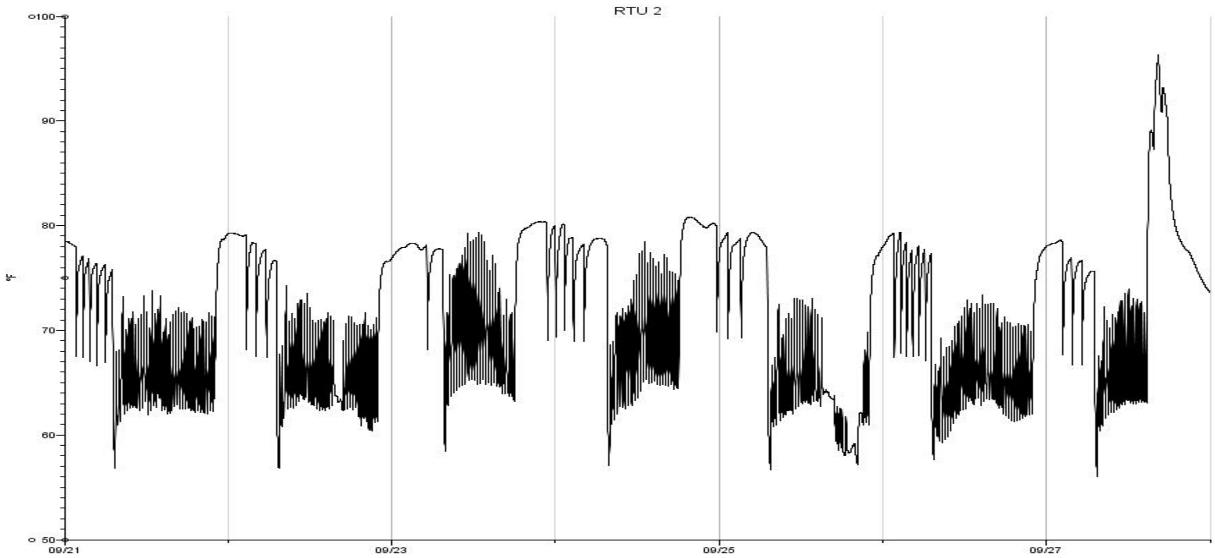
In order to determine the runtime operation of 5 of the 7 units, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – RTU 1



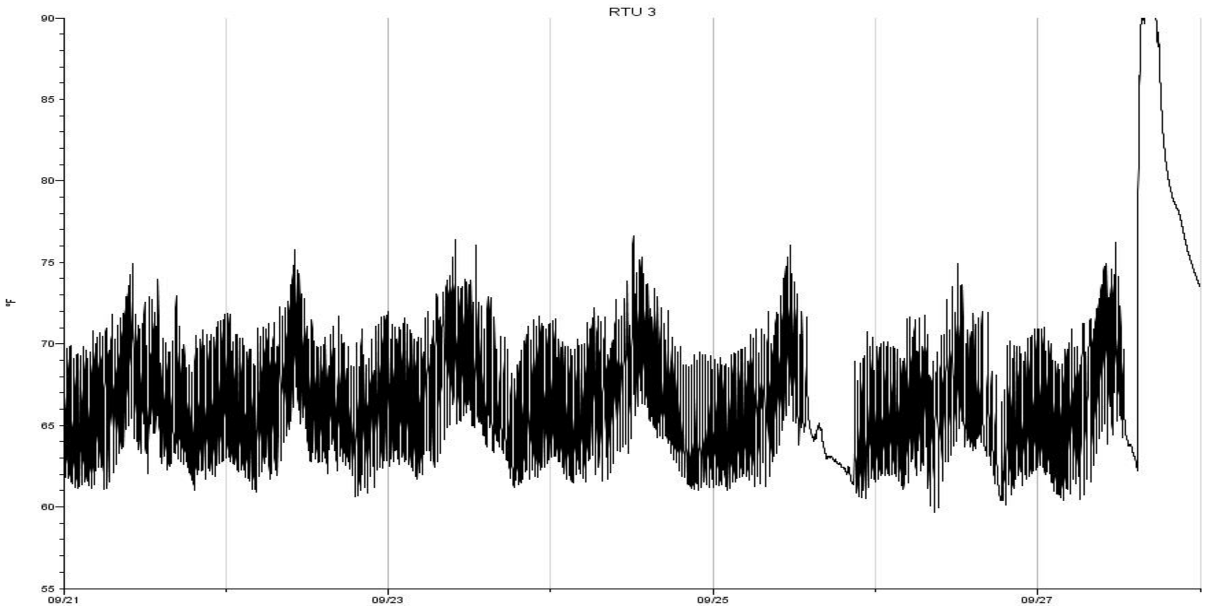
This unit was logged by tracking the supply air temperature. If the supply air temperature was below 60F then the unit was considered to be on. The unit was operating a total of 67.45 hours during a one week period.

Trending Data – RTU 2



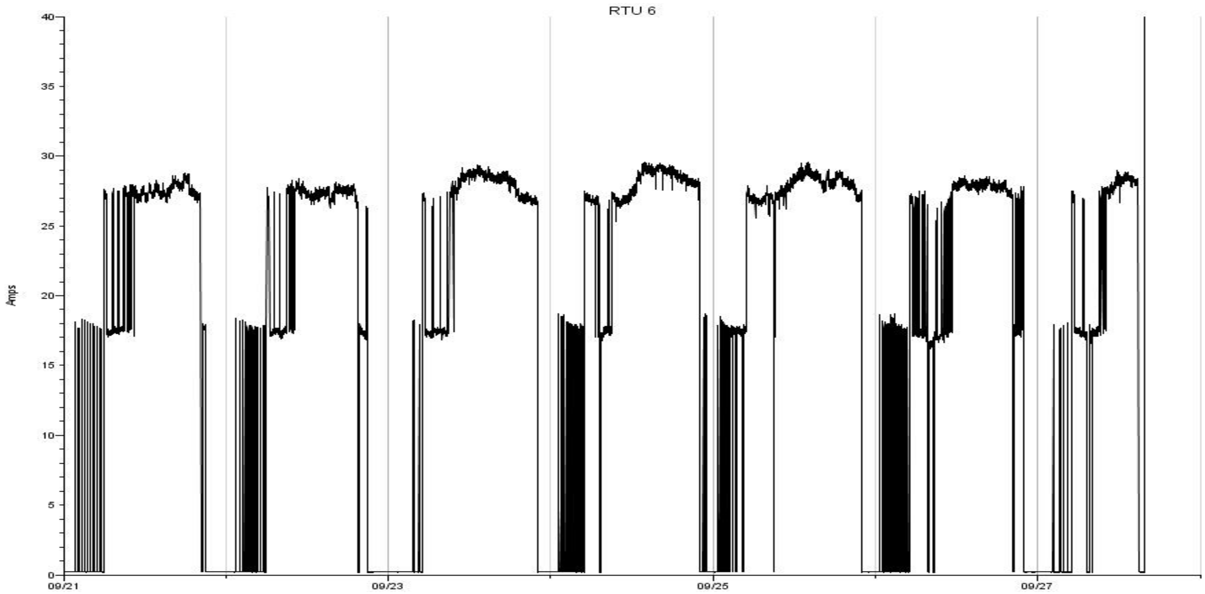
This unit was logged by tracking the supply air temperature. If the supply air temperature was below 62F then the unit was considered to be on. The unit was operating a total of 10.53 hours during a one week period.

Trending Data – RTU 3



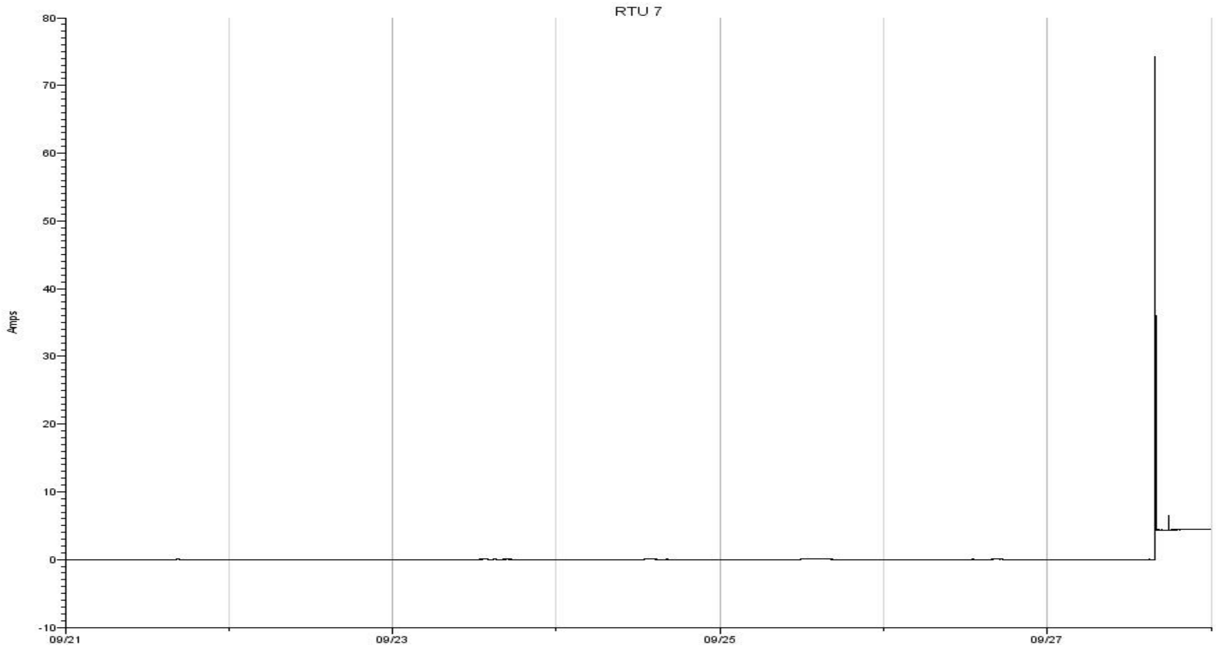
This unit was logged by tracking the supply air temperature. If the supply air temperature was below 65F then the unit was considered to be on. The unit was operating a total of 65.08 hours during a one week period.

Trending Data – RTU 6



This unit is a two compressor unit. When the unit was operating with one compressor, energy consumption averaged 18 amps. When the unit was operating with both compressors, energy consumption averaged 28 amps. The unit ran for a total of 30.55 hours in a one week period using one compressor. The unit ran for a total of 93.58 hours in a one week period using two compressors.

Trending Data – RTU 7



This unit did not run during the logging period.

The following table compares the operating hours of each unit with the hours of service for the facility.

Day	Hours of Service	Run Hours RTU 1	Run Hours RTU 2	Run Hours RTU 3	Run Hours RTU 6	Run Hours RTU 7
Monday:	12:00PM - 8:00PM	12:00AM - 11:59PM	7:00AM - 10:00PM	12:00AM - 11:59PM	1:00AM - 10:00PM	Off
Tuesday:	10:00PM - 6:00PM	12:00AM - 10:00PM	7:00AM - 10:00PM	12:00AM - 11:59PM	2:00AM - 10:00PM	Off
Wednesday:	12:00PM - 8:00PM	5:00AM - 10:00PM	7:00AM - 10:00PM	12:00AM - 11:59PM	2:00AM - 10:00PM	Off
Thursday:	10:00PM - 6:00PM	5:00AM - 10:00PM	7:00AM - 10:00PM	12:00AM - 11:59PM	2:00AM - 9:00PM	Off
Friday:	10:00PM - 6:00PM	5:00AM - 10:00PM	7:00AM - 10:00PM	12:00AM - 11:59PM	2:00AM - 9:00PM	Off
Saturday:	10:00PM - 6:00PM	5:00AM - 10:00PM	7:30AM - 6:00PM	12:00AM - 11:59PM	4:00AM - 10:00PM	Off
Sunday:	Closed	2:00PM - 11:59PM	7:30AM - 6:00PM	12:00AM - 11:59PM	1:30AM - 11:00PM	Off

Unit 2 had the most consistent schedule of the units that were logged at this building. Unit 3 ran continuously. Unit 1 and unit 6 shut down for some period at nights but this was not consistent throughout the week. Unit 7 was off for the entirety of the logging period. Logging was not able to be completed for units 4 and 5.

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

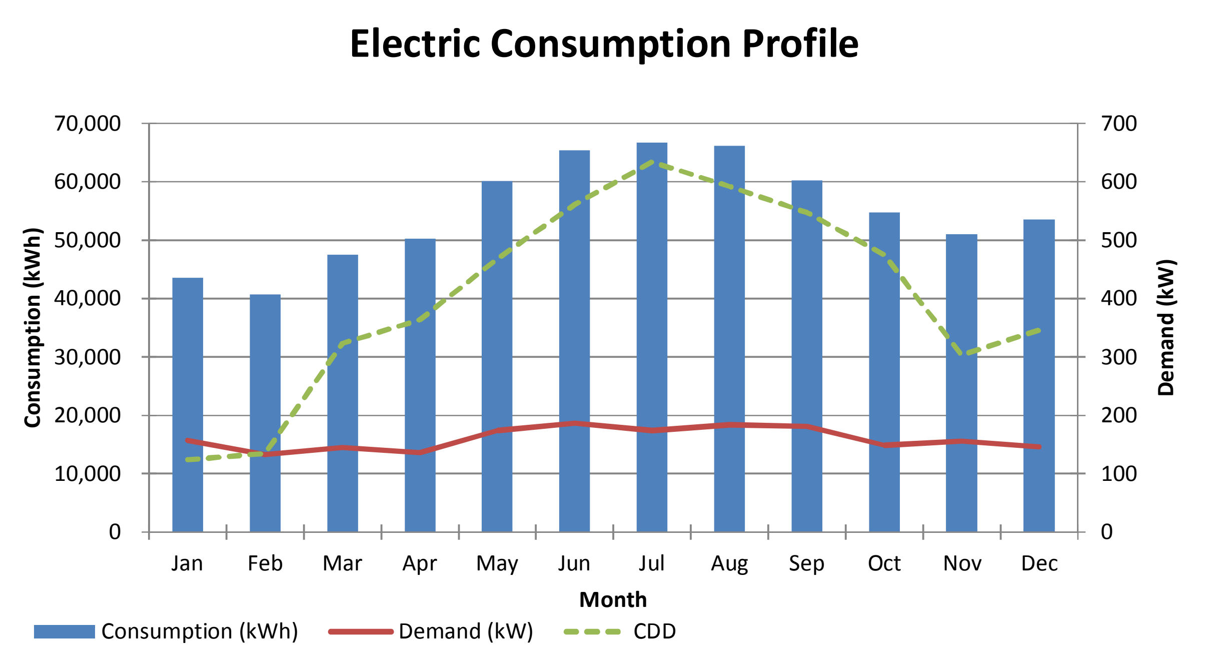
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Collier City Library	1	GSD-1	$ 0.05801	$ 11.45	659,820	1,922	198

The data in the table above was generated using the following electric billing data.

Meter KV50102; Account: 934620352; Address: 2501 CORAL SPRINGS DR

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	63,000	$ 3,471	175	$ 1,857	$ 297	$ 5,644
Jul-15	$ 19.48	65,400	$ 3,603	163	$ 1,729	$ 291	$ 5,643
Aug-15	$ 19.48	62,880	$ 3,464	182	$ 1,931	$ 303	$ 5,718
Sep-15	$ 19.48	61,320	$ 3,378	182	$ 1,931	$ 279	$ 5,608
Oct-15	$ 19.48	55,800	$ 3,074	166	$ 1,761	$ 255	$ 5,109
Nov-15	$ 19.48	50,280	$ 2,770	190	$ 2,016	$ 267	$ 5,072
Dec-15	$ 19.48	56,760	$ 2,875	166	$ 1,761	$ 508	$ 5,164
Jan-16	$ 19.48	38,160	$ 1,933	168	$ 1,698	$ 318	$ 3,969
Feb-16	$ 19.48	38,040	$ 1,927	126	$ 1,274	$ 281	$ 3,501
Mar-16	$ 19.48	50,640	$ 2,565	149	$ 1,506	$ 368	$ 4,459
Apr-16	$ 19.48	50,640	$ 2,565	132	$ 1,335	$ 215	$ 4,134
May-16	$ 19.48	54,720	$ 2,772	175	$ 1,769	$ 271	$ 4,832
Jun-16	$ 20.24	67,800	$ 3,227	198	$ 2,063	$ 463	$ 5,774
Jul-16	$ 20.24	67,920	$ 3,233	185	$ 1,928	$ 452	$ 5,633
Aug-16	$ 20.24	69,480	$ 3,307	186	$ 1,938	$ 459	$ 5,725
Sep-16	$ 20.24	59,160	$ 2,816	181	$ 1,886	$ 401	$ 5,123
Oct-16	$ 20.24	53,640	$ 2,553	132	$ 1,375	$ 334	$ 4,283
Nov-16	$ 20.24	51,840	$ 2,468	121	$ 1,261	$ 317	$ 4,066
Dec-16	$ 20.24	50,400	$ 2,399	126	$ 1,313	$ 316	$ 4,048
Jan-17	$ 25.00	48,840	$ 2,513	146	$ 1,548	$ 356	$ 4,442
Feb-17	$ 25.00	43,440	$ 2,235	139	$ 1,473	$ 325	$ 4,059
Mar-17	$ 25.00	44,280	$ 2,378	142	$ 1,505	$ 343	$ 4,251
Apr-17	$ 25.00	49,800	$ 2,674	140	$ 1,484	$ 365	$ 4,549
May-17	$ 25.00	65,400	$ 3,512	173	$ 1,834	$ 469	$ 5,840
Yearly Averages		**659,820**	**$ 33,857**	**1,922**	**$20,089**	**$ 4,127**	**$58,322**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in summer months while the average low occurs in February; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Collier City Library	Library	65.98	10.7	14.3	15.6

Overall, this building is operating far above the 75th percentile of comparable facilities. This indicates improvement opportunities within equipment and system efficiencies as well as building automation. However, the library also consists of an attached auditorium area, which behaves differently than library facilities and, therefore, has different metric comparison values. The inclusion of auditorium functions and operations skew the expected kWh/sq ft value higher than what would be anticipated.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Finanical Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Collier City Library	RTU COMBINED	$ 8,096.85	$ 1,967.45	$ -	$ -	$ 10,064.30	$ 102,720.43	10.2
Breakage Fee							$ 1,700.00	
PA Cost							$ 1,075.44	
Total		**$ 8,096.85**	**$ 1,967.45**	**$ -**	**$ -**	**$10,064.30**	**$ 105,495.88**	**10.5**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

Cooling for this building is provided by a total of seven (5) roof-top units (RTUs) of varying tonnages. The ages of these units average seven years with some more recently installed. This FIM focuses on the older, less efficient units remaining.

PROJECT SCOPE

This FIM addresses the replacement of three (3) roof top. The new equipment will be of equal capacity and include, as part of the installation, package new programmable thermostats provided by Siemens. The thermostats will be able to communicated, via their own IP address, to remote BAUs for additional access. The units will be placed on a time of day schedule. The new schedule will command the units to turn on 1.5 hours before the facility opens and 1.5 hours after it closes.

Scope of Work

Building	Equipment	Make	Model	Tons	Existing EER	New EER
Collier City Library	RTU		DS-03C00AFDAA	3	11	11.2
Collier City Library	RTU		DU-08C00ATDAA3A	7.5	11	12.6
Collier City Library	RTU		DU-07C00ATDAA3A	7.5	11	12.6

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 139,571 kWh

Annual Electric Demand: 171.95 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Collier City Library	RTU COMBINED	$ 8,096.85	$ 1,967.45	$ -	$ -	$ 10,064.30	$ 102,720.43	10.2

D.20. Library - Deerfield Beach

FACILITY DESCRIPTION

The Deerfield Beach Library is a one-story, 16,562 square foot building located at 837 East Hillsboro Blvd. The original library was constructed in 1969, then almost completely torn down and rebuilt in 1993. The space consists of offices, book stocks, reading spaces, the children's/youth area, and a large meeting space that doubles as a classroom and/or auditorium for events. The hours of operations are as follows:

Sunday:	closed
Monday:	10AM – 6PM
Tuesday:	12 noon – 8PM
Wednesday:	10AM – 6PM
Thursday:	12 noon – 8PM
Friday:	10AM – 6PM
Saturday:	10AM – 6PM

Observed Issues during the site visit

- Water infiltration issues
- Significant heat gain through various windows. Two specific areas, with thermometers, registering 78 and 85F

Water Leaks

Solar Heat Gain

BROWARD COUNTY FLORIDA

SIEMENS

COOLING SYSTEM:

Cooling for the building is provided three direct expansion (DX) package unit consisting of out air-cooled condensers and interior air handling units (AHUs). The following table documents nameplate data acquired both onsite and from online Product Data Sheets.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	**Mfctr**	**Model**	**Serial**	**Description**	**Notes**	**HP**	**Tons/ MBTU**	**V**	**Ph**	**Amps**	**Eff /EER**	**Cal kW**
Deerfield Beach Library												
AHU 2	Carrier	39ED08	2192T37126									
Condenser	Carrier	38AKS014--K521	1208G40045	compressor	R-22		10.3	208	3	49.3	10.1	13.0
				fan		0.6		208	1	3.7		0.6
				fan		0.74		208	1	4.3		0.7
AHU 3	Carrier		1892T23526									
Condenser 3	Carrier	38KC060	4204E28652	compressor	R-22		5	230	3	16	10.1	5.1
				fan				230	1	1.4		0.3
AHU 1	Carrier	39EB3637125	2192T37125	multi-zone								
CU1	Carrier	38AKS044	2007Q06731	compressor			40	230	3	147	10.1	46.8
				fan				230	1	6.4		0.0
Elec Water Heater	AO Smith	ENL 30 100	1531A035558	28 Gal				240	1			

AHU 1 serves the main library area. It consists of a 40 ton, roof-mounted condensing unit and a multi-zone air handling unit. The AHU serves a total of six (6) zones; each with its own dedicated electric heating element and zone damper control. The unit is also equipped with an air purification system as the intake.

AHU #1

The following is the breakdown of the different zones serves by AHU1:

- Zone 1: Library entrance and restrooms
- Zone 2: Book stacks and reading areas
- Zone 3: Book stacks and reading areas
- Zone 4: Study Rooms
- Zone 5: Study Rooms
- Zone 6: Office spaces in the back and break room

AHU 2 serves the auditorium/meeting room area. It consists of a 12.5 ton condensing unit with a single circuit semi-hermetic compressor and an air handler of size "08". AHU 3 serves the youth area of the library. It consists of a 5 ton condensing unit with a single circuit semi-hermetic compressor and an air handler of size "06". Both AHUs are equipped with electric reheat and a Zone Master AC Surge Protection. The library reported experiences frequent power surges.


AHU #2


AHU #3

LIGHTING SYSTEM:

Interior lighting primarily consists of 32 Watt, T8 fluorescent lamps in either 2-lamp 2x4 fixtures or single lamp runners. The building also contains a few U-bend fixtures consisting of 2-lamp, 32 watt, and T8 fluorescents.



Interior Lighting Examples

Exterior Lighting consists of HPS parking lights, walkway bollards, and wall packs.

Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM:

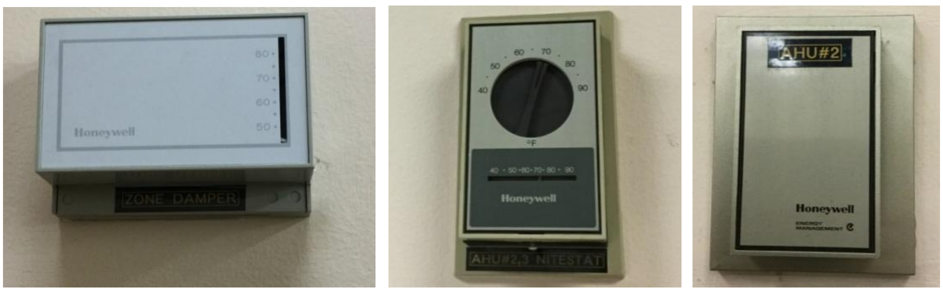
Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.0 faucets
- 3.5 and 1.6 gpf toilets

All water fixtures are operated manually.

BUILDING CONTROLS SYSTEM:

The building is currently not equipped with a building automation system. Each zone has a dedicated thermostat. Each AHU has an additional night thermostat to regulate night setback temperatures.



Building Controls

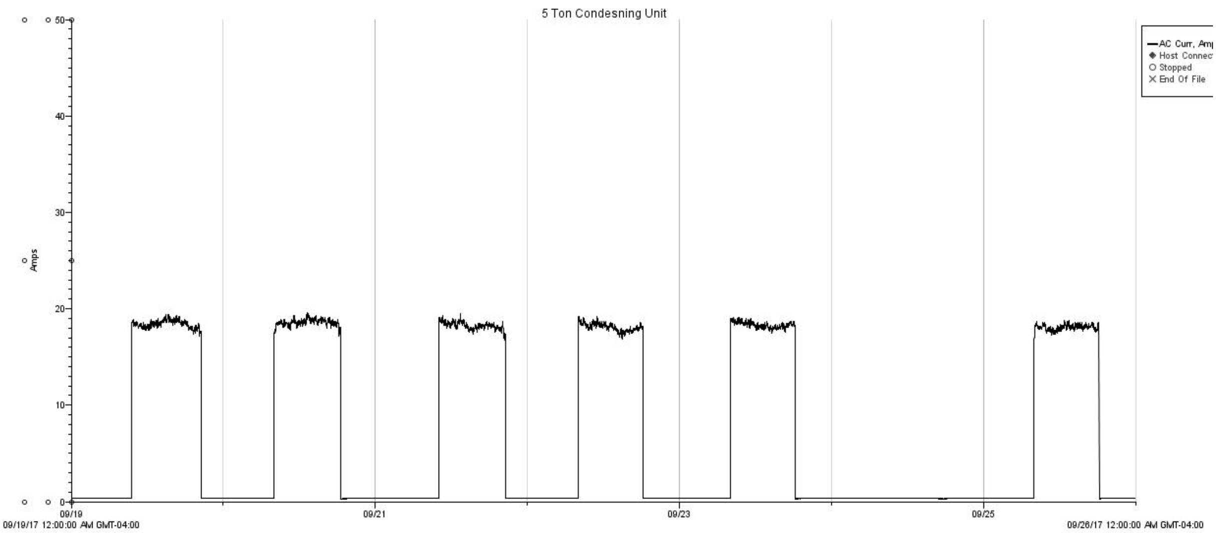
The exterior lighting of the building is controlled via time clocks.

Exterior Lighting Controls

TRENDING DATA AQUISITION:

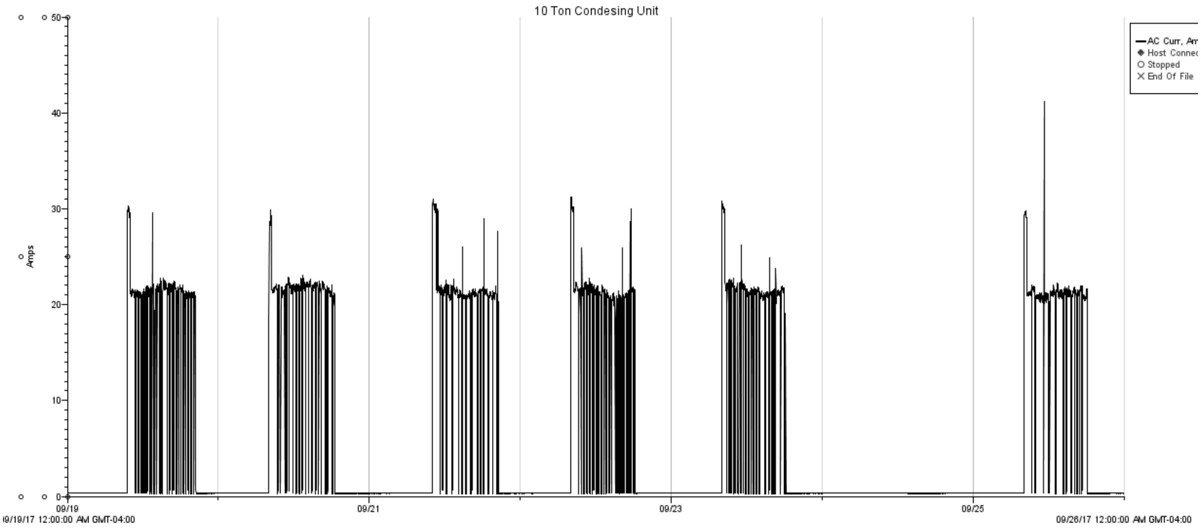
In order to determine the runtime operation of each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

Trending Data – 5 Ton Condensing Unit



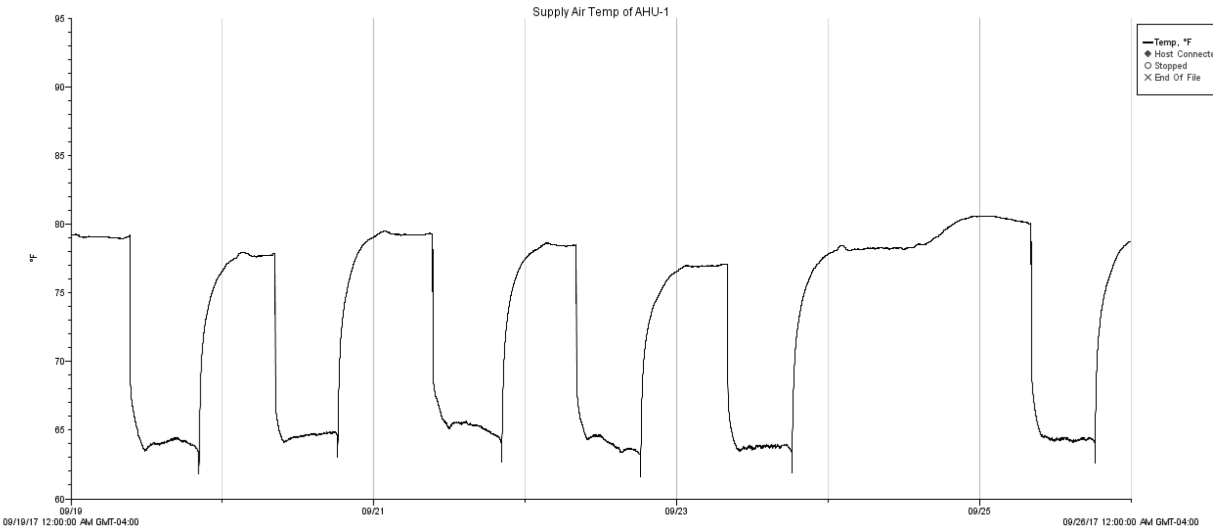
This unit registered an average of 18.29 amps and was operating for a total of 69 hours during a one week period.

Trending Data – 10 Ton Condensing Unit



This unit registered an average of 21.9 amps and was operating for a total of 50 hours during a one week period.

Trending Data – AHU-1



This unit was operating for a total of 73 hours during a one week period. Amperage data could not be attained due to phase imbalance issues at the disconnect panel of the condensing unit.

SIEMENS

The following table compares the operating hours of each unit with the hours of service for the facility.

Day	Hours of Service	Run hours AHU-1 / 127 ton	Run hours AHU-2 / 10-Ton	Run hours AHU3 / 5-Ton
Sunday:	closed	off	off	off
Monday:	10:00AM – 6:00PM	8:00AM - 6:15PM	8:00AM - 6:15PM	8:00AM - 6:15PM
Tuesday:	12:00PM – 8:00PM	9:30AM - 8:30PM	9:30AM - 8:30PM	9:30AM - 8:30PM
Wednesday:	10:00AM – 6:00PM	8:00AM - 6:30PM	8:00AM - 6:30PM	8:00AM - 6:30PM
Thursday:	12:00PM – 8:00PM	9:30AM - 8:30PM	10:00AM - 8:30PM	10:00AM - 8:30PM
Friday:	10:00AM – 6:00PM	8:00AM - 6:15PM	8:00AM - 6:15PM	8:00AM - 6:15PM
Saturday:	10:00AM – 6:00PM	8:00AM - 6:15PM	8:00AM - 6:15PM	8:00AM - 6:15PM

The units are currently scheduled to turn on approximately 2 hours before the facility opens. The units then run continuously until approximately 30 minutes after the facility closes. The absence of a building automation system suggests that the schedules maintained by these units are directly related to operator use.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by two (2) electric meters. Both billing accounts utilize the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

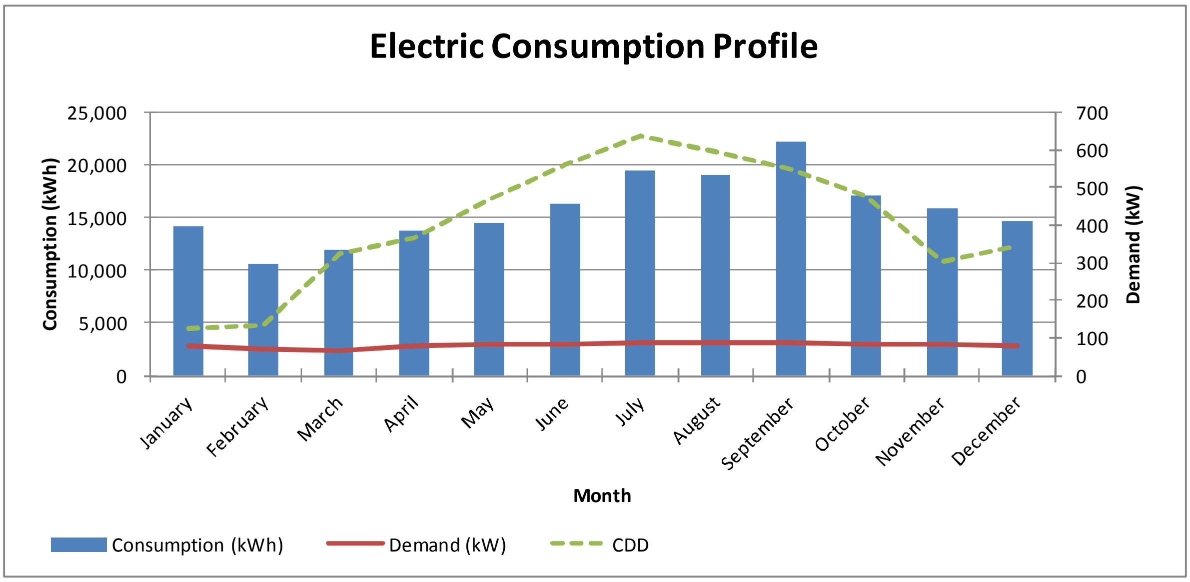
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Deerfield Beach Library	2	GSD-1	$ 0.05802	$ 11.45	281,778	1,283	113

The data in the table above was generated using the following electric billing data.

Meter KT33141; Account: 4853858100; Address: 829 E HILLSBORO BLVD # A

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jul-15	$ 19.48	18,540	$ 1,021	86	$ 912	$ 121	$ 2,074
Aug-15	$ 19.48	19,260	$ 1,061	86	$ 912	$ 122	$ 2,115
Sep-15	$ 19.48	25,320	$ 1,395	86	$ 912	$ 126	$ 2,453
Oct-15	$ 19.48	16,620	$ 916	84	$ 891	$ 109	$ 1,935
Nov-15	$ 19.48	16,380	$ 902	83	$ 881	$ 108	$ 1,910
Dec-15	$ 19.48	14,760	$ 748	83	$ 881	$ 170	$ 1,818
Jan-16	$ 19.48	14,400	$ 730	80	$ 849	$ 96	$ 1,694
Feb-16	$ 19.48	9,480	$ 480	68	$ 687	$ 103	$ 1,291
Mar-16	$ 19.48	10,680	$ 541	64	$ 647	$ 108	$ 1,315
Apr-16	$ 19.48	13,860	$ 702	81	$ 819	$ 115	$ 1,656
May-16	$ 19.48	13,860	$ 702	85	$ 859	$ 120	$ 1,701
Jun-16	$ 19.48	16,380	$ 780	85	$ 859	$ 174	$ 1,833
Jul-16	$ 20.24	20,340	$ 968	87	$ 907	$ 165	$ 2,060
Aug-16	$ 20.24	18,780	$ 894	87	$ 907	$ 159	$ 1,979
Sep-16	$ 20.24	19,020	$ 905	86	$ 896	$ 155	$ 1,977
Oct-16	$ 20.24	17,460	$ 831	85	$ 886	$ 148	$ 1,885
Nov-16	$ 20.24	15,300	$ 728	82	$ 854	$ 137	$ 1,740
Dec-16	$ 20.24	14,520	$ 691	71	$ 740	$ 124	$ 1,575
Jan-17	$ 25.00	14,100	$ 725	78	$ 813	$ 152	$ 1,715
Feb-17	$ 25.00	11,700	$ 602	73	$ 774	$ 122	$ 1,523
Mar-17	$ 25.00	13,080	$ 673	69	$ 731	$ 157	$ 1,587
Apr-17	$ 25.00	13,740	$ 738	79	$ 837	$ 139	$ 1,740
May-17	$ 25.00	15,180	$ 815	77	$ 816	$ 144	$ 1,801
Jun-17	$ 25.00	16,140	$ 867	80	$ 848	$ 152	$ 1,892
TOTALS		**189,450**	**$ 9,707.94**		**$10,059.77**		**$21,633.99**

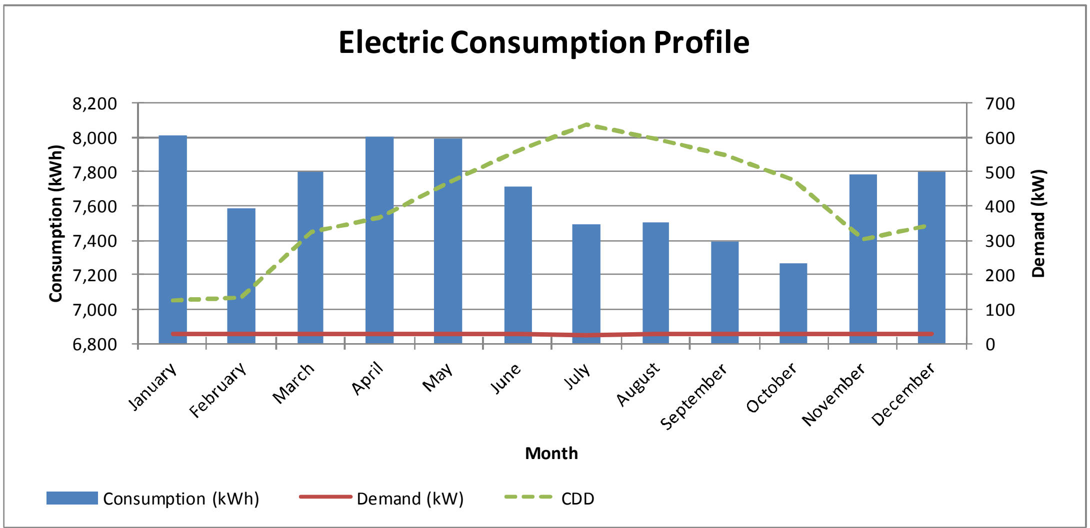


The resulting energy usage profile illustrated above for this account is primarily influenced by cooling needs throughout the year. The facility increases consumption (kWh) usage during the warmer weather months of the year while the demand (kW) remains relatively steady. The average peak for the 24 month period evaluated occurs in September, considered in South Florida to be the design month due to weather conditions that month.

SIEMENS

Meter KEL4849; Account: 4854856137; Address: 829 E HILLSBORO BLVD # B

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jul-15	$ 19.48	6,610	$ 364	25	$ 265	$ 39	$ 688
Aug-15	$ 19.48	7,084	$ 390	26	$ 276	$ 41	$ 726
Sep-15	$ 19.48	6,380	$ 351	25	$ 265	$ 36	$ 672
Oct-15	$ 19.48	6,808	$ 375	26	$ 276	$ 38	$ 708
Nov-15	$ 19.48	7,628	$ 420	29	$ 308	$ 42	$ 790
Dec-15	$ 19.48	7,511	$ 381	29	$ 308	$ 75	$ 783
Jan-16	$ 19.48	7,827	$ 397	28	$ 297	$ 47	$ 760
Feb-16	$ 19.48	7,238	$ 367	28	$ 283	$ 58	$ 728
Mar-16	$ 19.48	7,683	$ 389	28	$ 283	$ 62	$ 754
Apr-16	$ 19.48	7,802	$ 395	28	$ 283	$ 45	$ 742
May-16	$ 19.48	7,427	$ 376	25	$ 253	$ 41	$ 689
Jun-16	$ 19.48	7,356	$ 350	26	$ 263	$ 65	$ 697
Jul-16	$ 20.24	8,380	$ 399	25	$ 261	$ 59	$ 739
Aug-16	$ 20.24	7,916	$ 377	26	$ 271	$ 58	$ 726
Sep-16	$ 20.24	8,407	$ 400	27	$ 281	$ 60	$ 761
Oct-16	$ 20.24	7,730	$ 368	27	$ 281	$ 57	$ 726
Nov-16	$ 20.24	7,927	$ 377	27	$ 281	$ 58	$ 737
Dec-16	$ 20.24	8,091	$ 385	28	$ 292	$ 59	$ 756
Jan-17	$ 25.00	8,187	$ 421	27	$ 281	$ 69	$ 796
Feb-17	$ 25.00	7,939	$ 408	27	$ 286	$ 63	$ 782
Mar-17	$ 25.00	7,907	$ 425	26	$ 276	$ 64	$ 789
Apr-17	$ 25.00	8,197	$ 440	27	$ 286	$ 66	$ 817
May-17	$ 25.00	8,551	$ 459	26	$ 276	$ 66	$ 826
Jun-17	$ 25.00	8,070	$ 433	25	$ 265	$ 63	$ 787
TOTALS		**92,328**	**$ 4,724.50**		**$ 3,348.34**		**$ 8,990.17**



This account represents 30% of the total electric consumption for the facility and does not follow the same usage profile as the previous account. The facility increases consumption (kWh) usage during the cooler weather months of the year while the demand (kW) remains relatively steady. The average peak for the 24 month period evaluated occurs in January, April, and May. The usage on this bill coincides with after school care programs and events occurring in the Youth Area of the library.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Deerfield Beach Library	Library	18.64	10.7	14.3	15.6

Overall, this building is operating above the 75th percentile of comparable facilities. This indicates improvement opportunities beyond the HVAC scheduling currently implemented by library staff.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Deerfield Beach Branch Library

Account # 30540-54965	**Meter #**
Rate	**Address**
Meter Size	**Meter Type**

Date	Consumption ()	Total Charges
Jun-17	0	$ 120.02
May-17	0	$ 120.02
Apr-17	0	$ 120.02
Mar-17	0	$ 120.02
Feb-17	0	$ 120.02
Jan-17	17	$ 194.21
Dec-16	16	$ 180.18
Nov-16		
Oct-16	17	$ 184.21
Sep-16		$ 192.27
Aug-16		$ 168.09
Jul-16	18	$ 188.24
Jun-16	18	$ 188.24
May-16		$ 186.15
Apr-16		$ 180.18
Mar-16		$ 184.21
Feb-16		
Jan-16		$ 176.15
Dec-15		$ 194.21
Nov-15		$ 172.12
Oct-15		$ 192.27
Sep-15		$ 230.18
Aug-15		$ 180.18
Jul-15		$ 180.18
Jun-15		$ 182.12
TOTALS	**86**	**$ 3,953.49**

Although there is consumption an expense data for this account, the consumption data is too sporadic to be able to draw any conclusions from this data.

Deerfield Beach Branch Library

Account # 30550-54985	**Meter #**
Rate	**Address**
Meter Size	**Meter Type**

Date	Consumption ()	Total Charges
Jun-17		$ 581.54
May-17	13	$ 587.92
Apr-17		$ 607.06
Mar-17		$ 594.30
Feb-17		$ 600.68
Jan-17		$ 617.06
Dec-16	29	$ 690.00
Nov-16		$ 638.96
Oct-16		$ 594.30
Sep-16	15	$ 600.68
Aug-16		$ 568.78
Jul-16	15	$ 600.68
Jun-16		$ 638.96
May-16		$ 591.54
Apr-16		$ 607.06
Mar-16		$ 543.26
Feb-16		
Jan-16		$ 504.98
Dec-15		$ 514.98
Nov-15		$ 504.98
Oct-15		$ 504.98
Sep-15		$ 504.98
Aug-15		$ 504.98
Jul-15		$ 514.98
Jun-15		$ 514.98
TOTALS	**72**	**$13,732.62**

Although there is consumption an expense data for this account, the consumption data is too sporadic to be able to draw any conclusions from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Deerfield Beach Library	Lighting - Interior	$ 1,621.21	$ 1,560.33	$ -	$ 404	$ 3,585.54	$ 37,434.04	10.4
Deerfield Beach Library	Split System	$ 1,169.45	$ 927.20	$ -	$ -	$ 2,096.65	$ 143,368.68	68.4
Deerfield Beach Library	Split System Code	$ -	$ -	$ -	$ -	$ -	$ 12,144.60	-
Breakage Fee							$ 2,570.40	
PA Cost							$ 2,016.43	
Total		**$ 2,790.66**	**$ 2,487.53**	**$ -**	**$ 404**	**$ 5,682.19**	**$ 197,534.15**	**34.8**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps: The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures: In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Pin-Based Compact Fluorescent Fixtures: In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, our design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps and remove the existing fluorescent ballasts. In some cases, it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

Emergency Lighting: Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
LIBRARY, DB, Deerfield Beach	Existing T8 Fluorescent - Proposed Retrofit LED	333	333
	Existing Compact Fluorescent - Proposed Relamp LED	36	36
	Existing Compact Fluorescent - Proposed Retrofit LED	1	1
	Existing T8 Fluorescent U Tube - Proposed New LED Fixture	3	3
	Existing T5 Fluorescent - Proposed RETROFIT LED	4	4

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 27,940 kWh

Annual Electric Demand: 136.8 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Deerfield Beach Library	Lighting - Interior	$ 1,621.21	$ 1,560.33	$ -	$ 404	$ 3,585.54	$ 37,434.04	10.4

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

Cooling for the building is provided three direct expansion (DX) package unit consisting of out air-cooled condensers and interior air handling units (AHUs). AHU 1 serves the main library area. It consists of a 40 ton, roof-mounted condensing unit and a multi-zone air handling unit. AHU 2 serves the auditorium/meeting room area. It consists of a 12.5 ton condensing unit with a single circuit semi-hermetic compressor and an air handler of size "08". AHU 3 serves the youth area of the library. It consists of a 5 ton condensing unit with a single circuit semi-hermetic compressor and an air handler of size "06".

PROJECT SCOPE

This FIM addresses the replacement of three (3) DX systems. For the 40 ton system, the AHUs are in good physical condition; therefore, the coils will be replaced in order to accommodate the change from R-22 to R-410A. For the two remaining systems, both the air handler and condensing unit will be changed out.

Scope of Work

Building	Equipment	Make	Model	Tons	Existing EER	New EER
Deerfield Beach Library	AHU-1	AHU-1	39EB3637125			
Deerfield Beach Library	Condenser	Condenser	38AKS044	40	10.1	11.7
Deerfield Beach Library	AHU-2	AHU-2	39ED08			
Deerfield Beach Library	Condenser	Condenser	38AKS014--K521	10.3	10.1	11.7
Deerfield Beach Library	AHU-3	AHU-3	391E1062AB1122-1			
Deerfield Beach Library	Condenser	Condenser	38KC060	5	10.1	11.7

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 20,150 kWh

Annual Electric Demand: 80.75 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Deerfield Beach Library	Split System	$ 1,169.45	$ 927.20	$ -	$ -	$ 2,096.65	$ 143,368.68	68.4

Savings Capital: Capital budget dollars were used in order to improve the payback to the requested limitation values. These dollars represent unused amounts left over from the Capital Project Plan total. Funds were first applied to their respective capital project until the required payback was achieved. All remaining amounts were distributed to FIM opportunites such as the one above.

Code Compliance: Associated with the scope of work summarized above are code compliance issued uncovered by contracted MEPs (mechanical, electrical, and plumbing vendor). This cost was requested to be listed separately. For this facility, the code compliance cost is:

- $12,144.60

The identified issue at Deerfield Beach Library concerns the metail frame upon which the roof-mounted condensing unit sits. The elevation is not to current code. The structure needs to be raised.

D.21. Library - East Regional

FACILITY DESCRIPTION

The East Regional Library is a one-story, 44,284 square foot building constructed in 1980 and located at 1300 E Sunrise Blvd. Since its inception, the building has been remodeled to include two other entities within the same original space. These entities, as well as the remaining library space, and their hours of operations are as follows:

Art Serve:

Monday – Fridays: 9AM – 8PM
Saturdays: 10AM – 6PM
Sundays: By Appointment

Library / Reading Center:

Monday: 10AM – 6PM
Tuesday: 12 noon – 8PM
Wednesday – Friday: 10AM – 6PM
Saturday and Sunday: closed

Stonewall Library and Archives:

Monday – Friday: 11AM – 6PM
Saturday: 10AM – 5PM
Sunday: closed

The Library and Stonewall Library and Archives each consists of book stacks and reading spaces. Stonewall has additional spaces for meeting and archive research. The Art Serve consists of an art gallery, enclosed offices spaces, large area meeting rooms, classroom spaces, a gift shop, and open cubicle areas. It also houses an auditorium and dance class space by various groups/organizations.

COOLING SYSTEM:

Cooling for the building is primarily provided by an air-cooled, York chiller situated within a fenced cage on the exterior of the building. The plant also includes abandoned piping for what may have been a second chiller. Chilled water is distributed by one (1) chilled-water pump.

Chiller Plant

Observed Issues at the chiller plant

- Damaged chiller coils
- Pump and pipe insulated degraded
- Chilled-water valve scheduled for replacement on June 15, 2017

Chiller Plant Observed Issues

RECENT CHANGES: During the investment grade audit phase of work, Broward County replaced the compressors and coils of the above mentioned air-cooled chiller.

A 4-ton, Rheem, Split DX unit is dedicated to cooling the archive section of the Stonewall Library and Archives. It is controlled via a digital thermostat and operates 24 hours a day to maintain a 68F setpoint for the preservation of items and documents in the archives.

Dedicated Split System

AIR DISTRIBUTION SYSTEM

Chilled-water is pumped to a total of 6 air handling units (AHUs) located in mechanical rooms throughout the building.

- AHU 1 serves the Auditorium
- AHU 2 serves the Auditorium
- AHU 3 serves the Lobby and Break Room
- AHU 4 serves the Stonewall Library and Archives
- AHU 5 serves the Art Serve and Library central area
- AHU 6 serves the Art Serve west

AHUs 1 – 3 were recently replaced as a capital improvement project. The original project included replacing all units but funding was limited. All units reside in mechanical rooms used as plenums.

Air Handing Units

Observed Issues:

- AHU 1-3 electric heat strips appear to be off at the disconnect
- AHU 1-3 outside air damper fixed at 50% open
- Dirty / clogged filters
- Warm areas of the building on both extreme ends of the Art Serve (east and west side). This includes offices number 126-129.
- Building has reports of air leaks in ductwork
- Ductwork has reports of excess condensation
- Library experiences temperature rises in the afternoons; occupant complaints

Examples of Observed Issues

SIEMENS

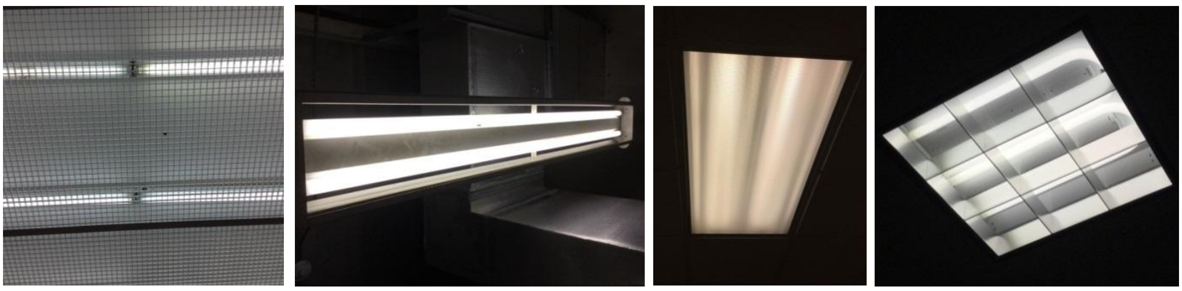
The following is the complete equipment inventory for this facility.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
East Regional Library												
Chiller	York	YCAL0094EC17X	RMSM020904	compressor	R-22		97	220	3	87.2		29.9
				compressor				220	3	87.2		29.9
Pump		EM3770T-8	07H02W50			7.5		200	3	22.5	91.00%	7.0
DX Unit	Rheem	RANL-048JAZ	7389 M23 08258	compressor	R-410A		4	230	1	21.8	11	4.5
				fan		0.2		230	1	1.2		0.2
DX AHU	Rheem	RHSL-HM4821JA	M2408 04977		2008	0.75		240	1	5.2		1.1
AHU -1	York	XTI-030X051-BAGA	CHCM XT023			3		208	3	9.51		3.1
AHU -2	York	XTI-030X051-BAGA	CHCM XT024			3		208	3	9.51		3.1
AHU -3	York	XTI-030X051-BAGA	CHCM XT025			3		208	3	9.51		3.1
AHU -4	York	CP24FC50208	AFGM005110			5		208	3	14.2		4.6
AHU -5	Carrier	39ED32	804018844									
AHU -6	Carrier	39ED08	803918845									

LIGHTING SYSTEM:

Interior lighting primarily consists of 32 Watt, T8 fluorescent lamps in either 2-lamp 2x4 fixtures or single lamp runners. The gallery utilizes 65 watt flood lamps on a track-lighting system for exhibition purposes. These track lights can add significant heat into the space causing occupant discomfort in the afternoons. The Stonewall area of the building also utilizes T8 fluorescent U-bend lamps.



Interior Lighting Examples

Exterior Lighting consists of HPS wall packs, acorn post-top decorative poles, China-hat decorative poles, and compact fluorescent lamps in recess cans.

Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restroom and the chiller plant. The following are example of the types of fixture found within the restroom of the facility:

- 2.0 and 1.5 gpm faucets
- 3.5 and 1.6 gpf toilets

Some faucets are operated manually while other have been equipped with sensors. All toilets and urinal are operated manually.



Sample Restroom Fixtures

Irrigation for the site uses city water. Sprinkler heads are on a timer.

BUILDING CONTROLS SYSTEM:

The building is equipped with a Siemens building automation system (BAU). Any changes to the controls operation is handled from the Government Center. The system already has numerous control points within the system. The following are a few of the utilized trending data was downloaded from the BAU

- Chiller: amperage, tonnage, supply and return temperatures, and gpm
- Building outside air temperature
- Air supply and return setpoints and temperatures

Building Controls

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

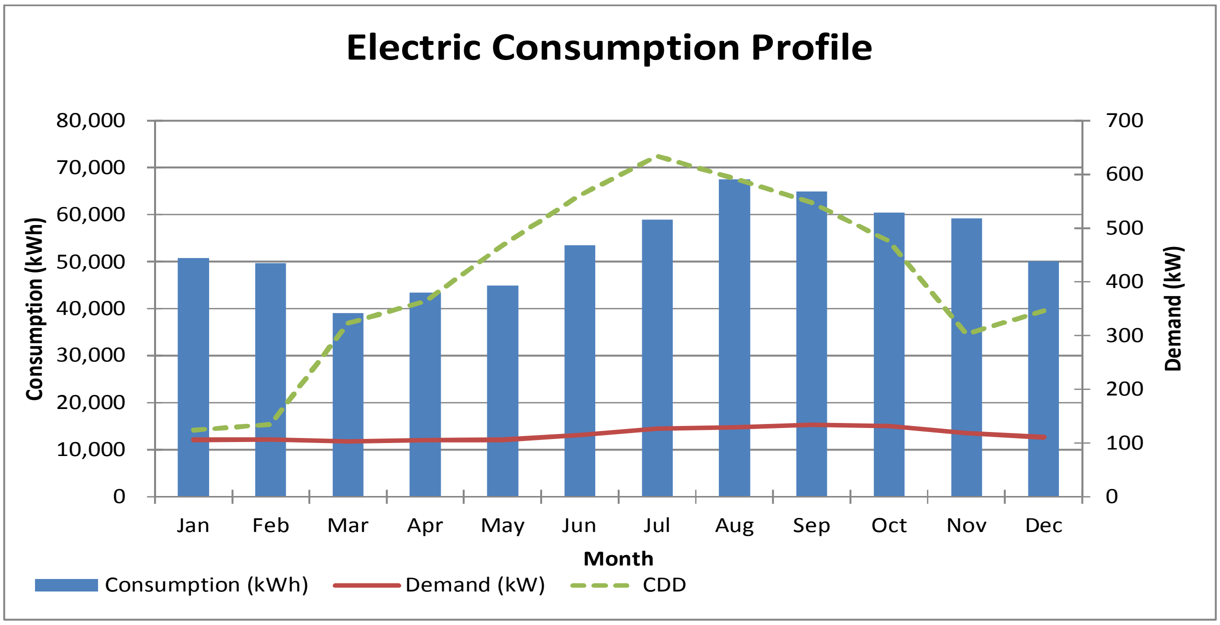
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
East Regional Library	1	GSD-1	$ 0.05810	$ 11.47	642,060	1,393	139

The data in the table above was generated using the following electric billing data.

Meter KU59527; Account: 6807049231; Address: 1300 E SUNRISE BLVD FT LAUD

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jul-15	$ 19.48	61,560	$ 3,391	116	$ 1,231	$ 244	$ 4,886
Aug-15	$ 19.48	61,440	$ 3,385	119	$ 1,263	$ 247	$ 4,913
Sep-15	$ 19.48	62,160	$ 3,424	136	$ 1,443	$ 264	$ 5,151
Oct-15	$ 19.48	55,320	$ 3,048	126	$ 1,337	$ 221	$ 4,625
Nov-15	$ 19.48	57,120	$ 3,147	110	$ 1,167	$ 209	$ 4,543
Dec-15	$ 19.48	56,280	$ 3,100	119	$ 1,263	$ 214	$ 4,597
Jan-16	$ 19.48	54,240	$ 2,748	109	$ 1,156	$ 441	$ 4,365
Feb-16	$ 19.48	48,840	$ 2,474	107	$ 1,082	$ 314	$ 3,889
Mar-16	$ 19.48	37,800	$ 1,915	100	$ 1,011	$ 258	$ 3,204
Apr-16	$ 19.48	39,840	$ 2,018	101	$ 1,021	$ 277	$ 3,336
May-16	$ 19.48	44,160	$ 2,237	109	$ 1,102	$ 182	$ 3,540
Jun-16	$ 19.48	52,560	$ 2,663	125	$ 1,264	$ 210	$ 4,156
Jul-16	$ 20.24	56,400	$ 2,685	138	$ 1,438	$ 363	$ 4,506
Aug-16	$ 20.24	73,560	$ 3,501	139	$ 1,448	$ 436	$ 5,406
Sep-16	$ 20.24	67,560	$ 3,216	133	$ 1,386	$ 405	$ 5,027
Oct-16	$ 20.24	65,400	$ 3,113	137	$ 1,428	$ 388	$ 4,949
Nov-16	$ 20.24	61,200	$ 2,913	127	$ 1,323	$ 362	$ 4,619
Dec-16	$ 20.24	44,040	$ 2,096	102	$ 1,063	$ 272	$ 3,452
Jan-17	$ 20.24	47,160	$ 2,245	103	$ 1,073	$ 286	$ 3,624
Feb-17	$ 25.00	50,400	$ 2,593	106	$ 1,124	$ 330	$ 4,072
Mar-17	$ 25.00	40,320	$ 2,074	107	$ 1,134	$ 285	$ 3,519
Apr-17	$ 25.00	46,920	$ 2,520	109	$ 1,155	$ 330	$ 4,030
May-17	$ 25.00	45,480	$ 2,442	103	$ 1,092	$ 317	$ 3,876
Jun-17	$ 25.00	54,360	$ 2,919	104	$ 1,102	$ 361	$ 4,407
Yearly Averages		**642,060**	**$ 32,934**	**1,393**	**$14,553**	**$ 3,608**	**$51,345**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). An exception occurs in the months of January and February where consumption is comparable to those in early summer. This may be attributed to increased activities within the building during these months.

Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in August while the average low occurs in March.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
East Regional Library	Library	19.28	10.7	14.3	15.6

Overall, this building is operating above the 75th percentile of comparable facilities. This indicates improvement opportunities in both equipment and system efficiencies as well as building automation.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
East Regional Library	Lighting - Interior	$ 2,451.25	$ 1,631.25	$ -	$ 682	$ 4,764.50	$ 47,526.68	10.0
East Regional Library	Controls for (CO2, OA, SAT)	$ 4,428.50	$ -	$ -	$ -	$ 4,428.50	$ 19,204.78	4.3
East Regional Library	AHU Replacement - CAPITAL PROJ	$ -	$ -	$ -	$ -	$ -	$ 209,345.51	-
Breakage Fee							$ 5,660.49	
PA Cost							$ 2,889.93	
Total		**$ 6,879.75**	**$ 1,631.25**	**$ -**	**$ 682**	**$ 9,193.00**	**$ 284,627.40**	**31.0**

NOTE: The facility payback includes a capital project that could not be improved with additional capital budget dollars. This air handler replacement FIM, is included for consideration as the County has stated that capital projects do not adhere to the required payback limitation.

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Screw Based Incandescent and Compact fluorescent fixtures

Our design strategy for the replacement of screw based incandescent and compact fluorescent lamps is to replace them with screw based LED where the application permits. LED has become an attractive replacement option when incandescent fixtures are controlled by dimmers due to its excellent dimming capability.

LED Replacement for High Intensity Discharge Interior

The replacement of HID (high intensity discharge), including metal halide or high-pressure sodium provide significant energy reduction opportunities when changing to LED. New types of LED fixtures and retrofit kits can be installed across many existing HID applications not previously available.

Various fixture types utilize HID sources at Broward County. The most common application is high bay or low bay industrial style fixtures. Due to the efficient optical distribution of LED sources in new fixtures, replacing industrial HID fixtures with new LED industrial high bays is the recommended solution, greatly reducing input power, increasing lighting quality and extending the life of the system.

Some fixture types don't lend themselves to replacement from a cost perspective for interior spaces, such as decorative sconces, pendants and some parking garage fixtures. In these cases, the fixtures will be relamped with high output, screw-based LED lamps and the ballasts will be removed.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

NOTE: Lighting systems in some of the buildings fall outside of the dominant scenario and require an adjusted design approach. In the case of East Regional Library, the art display lighting and auditorium lighting utilize self-ballasted ceramic metal halide PAR lamps. Current LED screw based lamps would not provide sufficient output to match the ceramic metal halide technology, and these fixtures will not be retrofit.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
LIBRARY, FL, East Regional	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	139	139
	Existing T8 Fluorescent - Proposed Retrofit LED	334	334
	Existing Incandescent - Proposed Relamp LED	2	2
	Existing T12 Fluorescent - Proposed Retrofit LED	1	1
	Existing High Intensity Discharge - Proposed Relamp LED	30	30

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 42,192 kWh

Annual Electric Demand: 142.5 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
East Regional Library	Lighting - Interior	$ 2,451.25	$ 1,631.25	$ -	$ 682	$ 4,764.50	$ 47,526.68	10.0

AUTOMATION OPTIMIZATION

Automation optimization improves the energy efficiency of existing central chiller plant, and heating, cooling and air conditioning systems (HVAC) to reduce energy consumption and costs by implementing optimization control strategies. During automation optimization, the sequence of operation for each measure for controlled devices is developed based on in-depth investigations of the existing mechanical and control systems, and the measure is implemented in existing control systems through control programming.

PROJECT SCOPE

Based on trending data and site visits, the following facility improvement measures are proposed to improve the energy efficiency of the existing systems.

- Room temperature reset
- Outdoor air (OA) intake control

To implement the optimization measures:

- Sequence of operations for those proposed measures will be developed, and associated control program will be implemented.
- Sensors required for the measures will be calibrated, repaired or installed

The implementation of the optimization measures are based on the condition that the existing mechanical equipment and control devices are operable normally and allow the implementation of the proposed measures. If during the implementation, the mechanical equipment, and the devices are deteriorated and prevent the implementations, the measures may be cancelled or modified accordingly.

Room Temperature Reset: Based on trending data, most rooms in the building used constant room temperature set point. For spaces that need HVAC for comfort, room temperature can be reset during unoccupied hours to save energy. During unoccupied mode, reset the room temperature cooling set point to 78ºF (adjustable), and reset room temperature heating set point to 65ºF (adjustable). The occupied and unoccupied modes are defined based on schedules.

Outdoor air intake control: Based on trending data, it was found that the OA dampers of the existing HVAC systems were open during unoccupied hours. Closing the OA dampers during unoccupied hours at warm and humid seasons can reduce energy consumption and better control indoor humidity levels.

SAVINGS

The savings for Automation Optimization were calculated according to some or all of the followings: building load profiles which were simulated based on available trending data and building electricity use in 24 months, existing operation schedules provided by the County in June 2017, nameplate data, onsite measurements, trending data from control systems, and assumptions. Models and calculations were built and conducted in Excel spreadsheets. The Bin data was used for annual energy consumption simulations. The average blended electric rate calculated based on electric bills from 24 months was applied for energy cost calculations.

Full calculations are provided in Section H, Appendices of this Report.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 56,817 kWh

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
East Regional Library	Controls for (CO2, OA, SAT)	$ 4,428.50	$ -	$ -	$ -	$ 4,428.50	$ 19,204.78	4.3
East Regional Library	CAPITAL PROJ	$ -	$ -	$ -	$ -	$ -	$ 209,345.51	-

CHILLED-WATER AHU REPLACEMENTS

The East Regional Library attempted a complete chilled-water air-handing unit replacement at this facility. Three (3) units located in an exterior mechanical room were replaced. The remaining units that serve the library were unable to be replaced. This scope is included within this project as a capital project only. The scope does not carry any savings or guarantee.

PROJECT SCOPE – INTERIOR LIGHTING

The following table specifies which existing units are to be replaced and/or retrofitted along with the new equipment specifications required to obtain the calculated energy savings; proposed equipment model numbers were based on available options at the time the energy audit was conducted.

Chilled Water AHU Replacements

Site	System Identifier	Equipment Type	Existing Model Number	Existing Tons	Existing Efficiency	Proposed Model Number	Proposed Tons	Proposed Efficiency
East Regional Library	AHU-4	AHU - Chilled Water	CP24FC50208			UCCAA10A1C0EL01		
	AHU-5	AHU - Chilled Water	39ED32			CSAA035UA		
	AHU-6	AHU - Chilled Water	39ED08			UCCAA08A0C0ER03		

D.22. Library - Galt Ocean

FACILITY DESCRIPTION

The Galt Ocean Library is a one-story, 2,450 square foot space located within a strip-mall complex at 3403 Galt Ocean Drive in Fort Lauderdale. The library takes up two (2) tenant units and is, therefore, a leased property. The library consists of book stacks, reading spaces, meeting rooms, offices, and a break room. The hours of operations are as follows:

Galt Ocean Library:

Sunday:	closed
Monday:	10AM – 6PM
Tuesday:	10AM – 6PM
Wednesday:	closed
Thursday:	12 noon – 8PM
Friday:	10AM – 6PM
Saturday:	10AM – 6PM

COOLING SYSTEM:

Cooling for the library is provided by two (2) roof-top package units; each equipped with two (2) condensers. These units are new and were recently installed. The landlord is responsible for all major repairs and/or equipment replacements. Broward County cannot implement major changes without landlord consent.


Roof-top Units

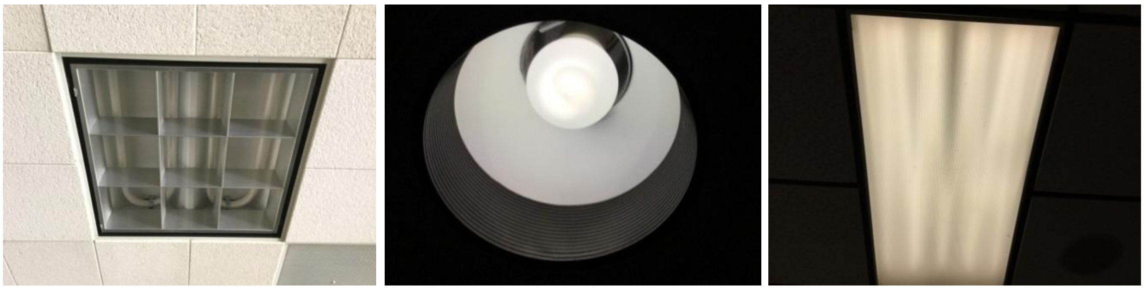
The following table provides the mechanical equipment inventory for this facility.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	**Mfctr**	**Model**	**Serial**	**Description**	**Notes**	**HP**	**Tons/ MBTU**	**V**	**Ph**	**Amps**	**Eff /EER**	**Cal kW**
Galt Ocean Library												
RTU-1 A	Carrier	50ES-A42-30TP	1510C64700	compressor	R-410A		3.5	230	1	17.9	11	3.7
				O.D. fan		0.2		230	1	1.2		0.2
				I.D. fan		0.75		230	1	6		1.2
RTU-1 B	Carrier	PCE4A4221A	W1E7719788	compressor	R-410A		3.5	230	1	17.9	11	3.7
				O.D. fan		0.25		230	1	1.3		0.3
				I.D. fan		0.75		230	1	5.4		1.1
RTU-2 A	Carrier	50ES-A42-30TP	2313C45906	compressor	R-410A		3.5	230	1	17.9	11	3.7
				O.D. fan		0.2		230	1	1.2		0.2
				I.D. fan		0.75		230	1	6		1.2
RTU-2 B	Carrier	50ES-A42-30TP	4413C39055	compressor	R-410A		3.5	230	1	17.9	11	3.7
				O.D. fan		0.2		230	1	1.2		0.2
				I.D. fan		0.75		230	1	6		1.2

LIGHTING SYSTEM

Interior lighting primarily consists of 32 Watt, T8 fluorescent U-bend 2-lamp fixtures and compact fluorescent lamps in recessed cans. Meeting and break rooms are equipped with 2 or 3-lamp T8 fluorescent 2x4 fixtures.



Interior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control. However, most lights were found to be switched off during afterhours.

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 gpm faucets
- 1.5 gpf urinals
- 3.5 gpf toilets

Some faucets are operated manually while other have been equipped with sensors. All toilets and urinal are operated manually.

Sample Restroom Fixtures

BUILDING CONTROLS SYSTEM

The RTUs are controlled via digital thermostats. These thermostats are set to 75 and 72F and are not on a setback or time of day schedule. The library staff has full control over the usage of the RTUs.

HVAC Controls Equipment

BROWARD COUNTY FLORIDA

SIEMENS

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by two (2) electric meters. Both billing accounts utilize the General Service (GS-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

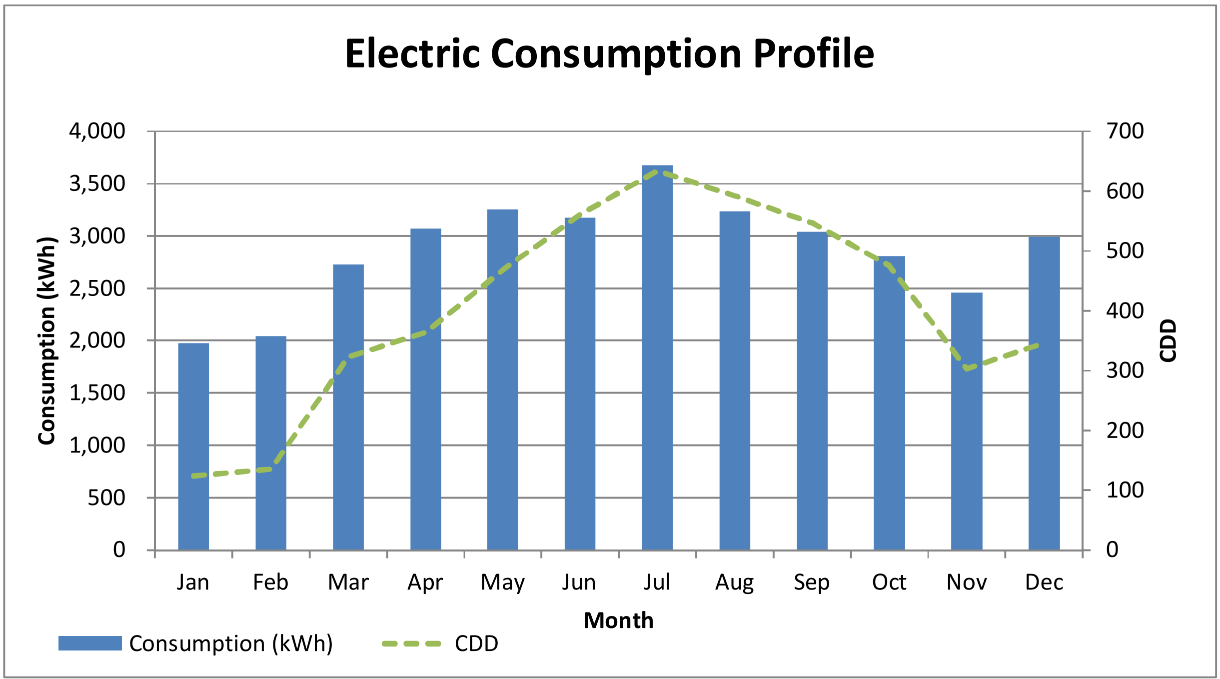
Electric Baseline Summary

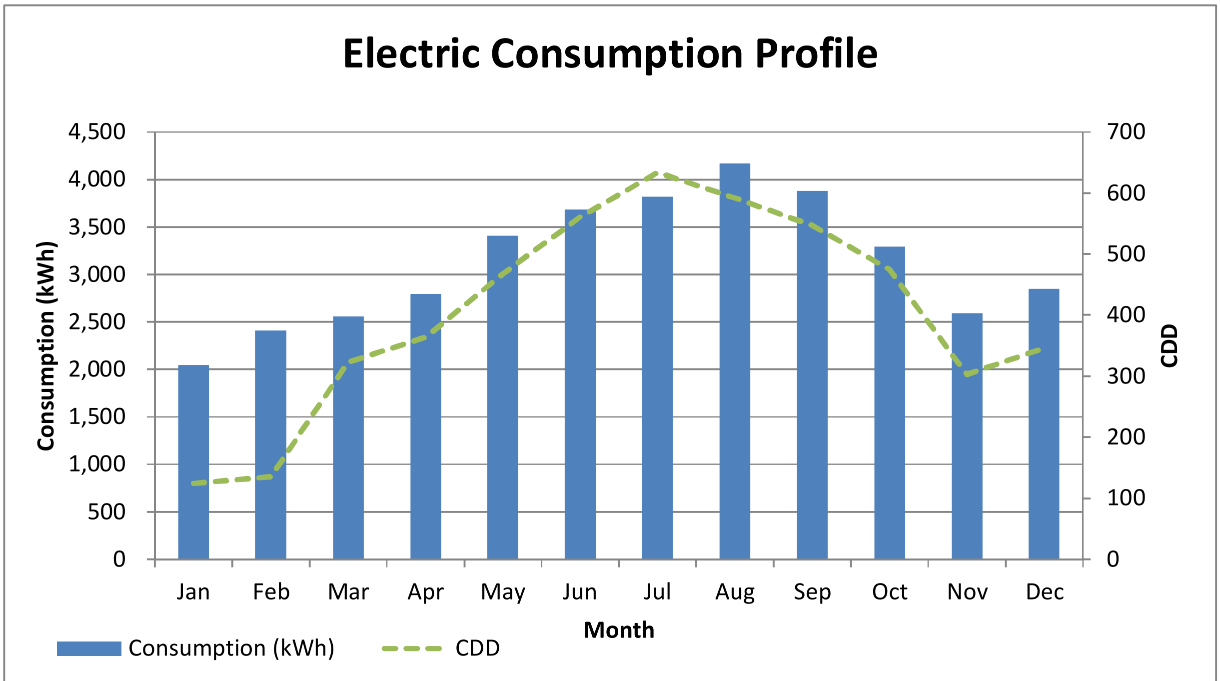
Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Galt Ocean Library	2	GS-1	$ 0.09757	-	71,969	-	-

The data in the table above was generated using the following electric billing data.

Meter KC78809; Account: 613047174; Address: 3403 GALT OCEAN DR FT LAUD
Meter AC03132; Account: 259721439; Address: 3405 GALT OCEAN DR FT LAUD

Date	Customer Charges	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 20.00	6,799	$ 654	0	$ -	$ 37	$ 711
Jul-15	$ 20.00	7,124	$ 685	0	$ -	$ 39	$ 744
Aug-15	$ 20.00	6,798	$ 654	0	$ -	$ 34	$ 708
Sep-15	$ 20.00	6,620	$ 637	0	$ -	$ 33	$ 690
Oct-15	$ 20.00	6,398	$ 616	0	$ -	$ 31	$ 667
Nov-15	$ 20.00	5,381	$ 518	0	$ -	$ 26	$ 563
Dec-15	$ 20.00	6,184	$ 595	0	$ -	$ 12	$ 627
Jan-16	$ 20.00	3,764	$ 342	0	$ -	$ 26	$ 388
Feb-16	$ 20.00	4,066	$ 369	0	$ -	$ 30	$ 419
Mar-16	$ 20.00	5,448	$ 494	0	$ -	$ 30	$ 544
Apr-16	$ 20.00	5,929	$ 538	0	$ -	$ 33	$ 591
May-16	$ 20.00	6,070	$ 551	0	$ -	$ 34	$ 605
Jun-16	$ 20.00	6,921	$ 617	0	$ -	$ 51	$ 688
Jul-16	$ 20.00	7,876	$ 702	0	$ -	$ 58	$ 780
Aug-16	$ 20.00	8,010	$ 714	0	$ -	$ 57	$ 791
Sep-16	$ 20.00	7,223	$ 643	0	$ -	$ 51	$ 715
Oct-16	$ 20.00	5,799	$ 517	0	$ -	$ 41	$ 577
Nov-16	$ 20.00	4,732	$ 422	0	$ -	$ 33	$ 474
Dec-16	$ 20.00	5,490	$ 489	0	$ -	$ 51	$ 560
Jan-17	$ 20.00	4,281	$ 386	0	$ -	$ 36	$ 442
Feb-17	$ 20.00	4,849	$ 437	0	$ -	$ 57	$ 514
Mar-17	$ 20.00	5,123	$ 477	0	$ -	$ 44	$ 541
Apr-17	$ 20.00	5,795	$ 540	0	$ -	$ 50	$ 610
May-17	$ 20.00	7,258	$ 677	0	$ -	$ 62	$ 759
Yearly Averages		**71,969**	**$ 6,636**		**$ -**	**$ 477**	**$ 7,353**





The resulting energy usage profiles, illustrated above, for this facility are influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). The average peak for the 24 month period evaluated occurs in summer months while the average low occurs in January; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Galt Ocean Library	Library	29.38	10.7	14.3	15.6

Overall, this building is operating above the 75th percentile of comparable facilities. This indicates improvement opportunities in both equipment and system efficiencies. It has previously been noted that this facility recently underwent HVAC upgrades. More recent electric consumption data would result in already improved metric values for this facility,

SIEMENS

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Galt Ocean Library

Account #	2002504	**Meter #**	200008427
Rate		**Address**	
Meter Size		**Meter Type**	

Date	Total Charges
Feb-16	
Jan-16	$ (186.12)
Dec-15	CR
Nov-15	CR
Oct-15	$ (267.03)
Sep-15	$ 470.30
Aug-15	$1,266.48
Jul-15	$ 304.86
Jun-15	$ 36.02
May-15	$ 25.68
Apr-15	$ 36.02
Mar-15	$ 36.02
Feb-15	$ 36.02
Jan-15	$ 25.68
Dec-14	$ 36.02
Nov-14	$ 25.68
Oct-14	$ 34.41
Sep-14	$ 34.29
Aug-14	$ 24.45
Jul-14	$ 34.29
Jun-14	$ 44.13
May-14	$ 14.61
Apr-14	$ 21.64
Mar-14	$ 34.29
Feb-14	$ 34.29
TOTALS	**$ 2,122.03**

Galt Ocean Library

Account #	2002505	**Meter #**	200213367
Rate		**Address**	
Meter Size		**Meter Type**	

Date	Total Charges
Feb-16	$ 105.00
Jan-16	$ 105.00
Dec-15	$ 94.14
Nov-15	$ 105.00
Oct-15	$ 94.14
Sep-15	$ 88.73
Aug-15	$ 99.07
Jul-15	$ 99.07
Jun-15	$ 99.07
May-15	$ 99.07
Apr-15	$ 109.41
Mar-15	$ 109.41
Feb-15	$ 109.41
Jan-15	$ 99.07
Dec-14	$ 99.07
Nov-14	$ 109.41
Oct-14	$ 94.65
Sep-14	$ 84.49
Aug-14	$ 104.17
Jul-14	$ 94.33
Jun-14	$ 94.33
May-14	$ 94.33
Apr-14	$ 104.17
Mar-14	$ 94.33
Feb-14	$ 104.17
TOTALS	**$ 2,493.04**

This account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

All recommended FIMs for this facility have been removed from the final scope by Broward County. Please refer to Section G of this report for documentation of these originally proposed opportunities.

D.23. Library - Hollywood Beach

FACILITY DESCRIPTION

The Hollywood Beach Library is inside of a building that splits the building space into this library and a community center. The library is 2,000 square feet and is located at1301 South Ocean Drive, Hollywood, FL 33019. The library is one open space that houses books and is used for several community events. The hours of operation are as follows:

Monday – Friday: 10AM – 6PM
Saturday: Closed
Sunday: Closed

COOLING SYSTEM:

Cooling for the building is provided by 1 large condensing unit connected to 5 air handles that feed conditioned air into the building. The cooling system utilizes R22 refrigerant. It was undeterminable which units serve the library and which units serve the community center.

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Hollywood Beach Library												
Pump	Weg				with VFD	7.5		460	3	9.66	87.0%	6.3
Cooling Tower	Protec	PCT-125-S/S	3764		265 GPM			460	3			
AC-1	Carrier	50BA-016---570	0593F31680	compressor	R-22			230	3	50		15.9
				fan		2		230	3	7		2.2
AC-2	Carrier	50BT-012---520	0593F31727	compressor	R-22			230	3	36.3		11.6
				fan		2		230	3	6		1.9
AC-3		No Nameplate										
AC-4	Carrier	50BA-016---570	0593F31679	compressor	R-22			230	3	50		15.9
				fan		2		230	3	7		2.2
AC-5	Carrier	50BT-008---530	0593F31715	compressor	R-22			230	3	31.3		10.0
				fan		1		230	1	4		0.7
C-6 (Heat Pum	FHP	EC120-3VTC	SK128233	compressor	R410A			230	3	18		5.7
				fan		2		230	3	6.4		2.0
Water Heater	Ruud	ES 85-9-G	DN1102RR0502E		85 GAL			208	3	25		8.1
Solar Panels												

Cooling System Examples

LIGHTING SYSTEM:

Interior lighting primarily consists of T8 lighting in 2 lamp, 2x4 fixtures.

Interior Lighting Example

Exterior lighting for this facility primarily consist of metal halide light fixtures for the surrounding building area and parking lot.

The building does not make use of occupancy sensors or any other types of lighting control.

SOLAR POWER GENERATION SYSTEM

This facility utilizes on-site solar energy production. Statistics on the production of the solar system could not be acquired at the time of the site visit. The solar panels are located on the roof.

Solar Energy Generation

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 faucets
- 1.6 gpf toilets
- 1.0 gpf urinals

Water fixtures are operated both manually and via sensor.

Water Fixture Examples

BUILDING CONTROLS SYSTEM:

The building is currently not equipped with a building automation system. Each zone has a dedicated thermostat.

TRENDING DATA AQUISITION:

At the time when Siemens conducted a second site visit to install data loggers on HVAC equipment there was no access to the equipment room. For this reason, no trending data was acquired for this facility.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service (GS-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

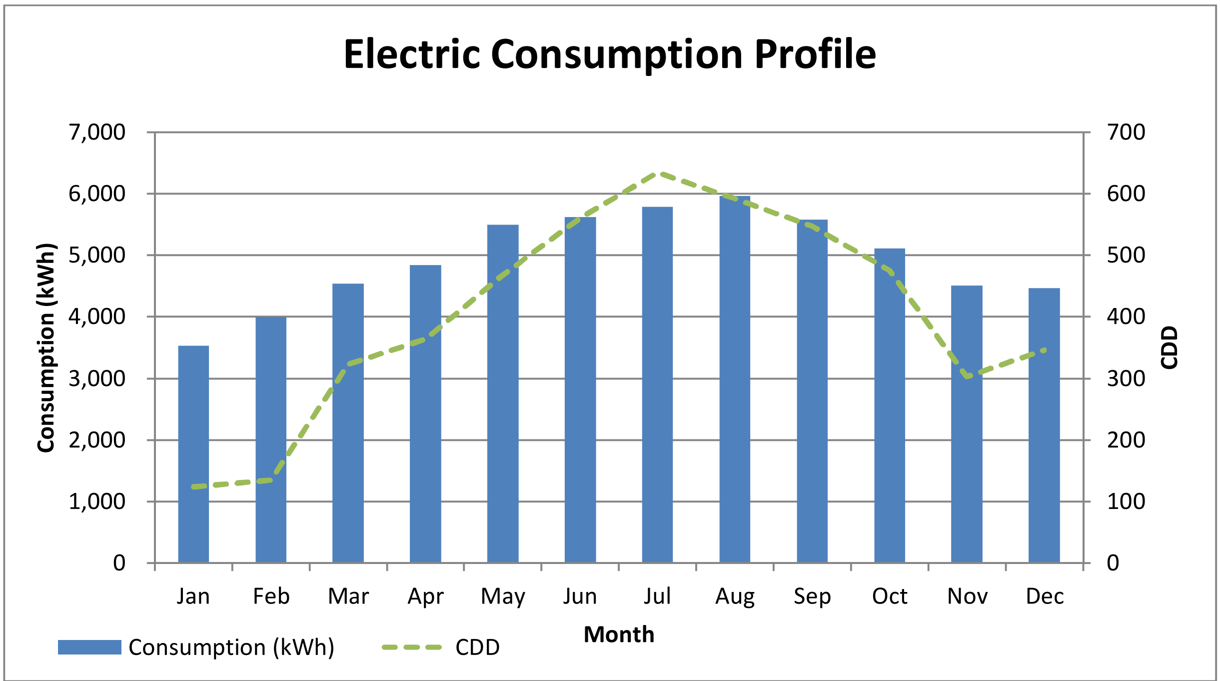
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Hollywood Beach Library	1	GS-1	$ 0.10082	-	59,458	-	-

The data in the table above was generated using the following electric billing data.

Meter KL02584; Account: 9205832380; Address: 1301 S OCEAN DR #LIBRARY

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 10.00	5,359	$ 516	$ 29.28	$ 555
Jul-15	$ 10.00	5,316	$ 512	$ 29.03	$ 551
Aug-15	$ 10.00	5,734	$ 552	$ 28.78	$ 591
Sep-15	$ 10.00	4,965	$ 478	$ 24.67	$ 512
Oct-15	$ 10.00	4,881	$ 470	$ 24.46	$ 504
Nov-15	$ 10.00	4,663	$ 449	$ 23.29	$ 482
Dec-15	$ 10.00	4,466	$ 430	$ 8.96	$ 449
Jan-16	$ 10.00	3,185	$ 289	$ 23.30	$ 322
Feb-16	$ 10.00	3,751	$ 340	$ 28.97	$ 379
Mar-16	$ 10.00	4,560	$ 414	$ 25.87	$ 450
Apr-16	$ 10.00	4,614	$ 419	$ 26.21	$ 455
May-16	$ 10.00	5,515	$ 500	$ 32.16	$ 543
Jun-16	$ 10.00	5,889	$ 525	$ 44.15	$ 579
Jul-16	$ 10.00	6,266	$ 558	$ 47.10	$ 615
Aug-16	$ 10.00	6,190	$ 551	$ 44.83	$ 606
Sep-16	$ 10.00	6,189	$ 551	$ 44.80	$ 606
Oct-16	$ 10.00	5,337	$ 475	$ 38.44	$ 524
Nov-16	$ 10.00	4,352	$ 388	$ 31.03	$ 429
Dec-16	$ 10.00	4,470	$ 398	$ 40.54	$ 449
Jan-17	$ 10.00	3,887	$ 350	$ 31.78	$ 392
Feb-17	$ 10.00	4,253	$ 383	$ 48.96	$ 442
Mar-17	$ 10.00	4,522	$ 421	$ 38.37	$ 470
Apr-17	$ 10.00	5,072	$ 472	$ 42.94	$ 525
May-17	$ 10.00	5,480	$ 511	$ 45.96	$ 567
Yearly Average		**59,458**	**$ 5,476**	**$ 402**	**$ 5,998**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in August while the average low occurs in January; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Hollywood Beach Library	Library	23.78	10.7	14.3	15.6

Overall, this building is operating above the 75th percentile of comparable facilities. As mentioned earlier, improvement opportunities are limited at this facility due to the City's partial ownership of the building.

UTILITY DATA ANALYSIS - WATER

Water consumption data could not be acquired for this facility.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Hollywood Beach Library	Lighting - Interior	$ 451.14	$ -	$ -	$ 50	$ 501.14	$ 4,841.37	9.7
Breakage Fee							$ 425.00	
PA Cost							$ 50.69	
Total		**$ 451.14**	**$ -**	**$ -**	**$ 50**	**$ 501.14**	**$ 5,317.06**	**10.6**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps: The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures: In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Pin-Based Compact Fluorescent Fixtures: In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, our design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps and remove the existing fluorescent ballasts. In some cases, it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

Emergency Lighting: Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
LIBRARY, HB, Hollywood Beach	Existing T8 Fluorescent - Proposed Retrofit LED	35	35
	Existing Compact Fluorescent - Proposed Relamp LED	3	3

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 4,475 kWh

Annual Electric Demand: 19.38 kWh

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Hollywood Beach Library	Lighting - Interior	$ 451.14	$ -	$ -	$ 50	$ 501.14	$ 4,841.37	9.7

D.24. Library - Hollywood

FACILITY DESCRIPTION

The Hollywood Library is a two story 46,200 square foot facility located at 2600 Hollywood Boulevard, Hollywood, FL 33020. The library was opened in 2006. The second floor is not in use and was left with the only the concrete structure in place. The space consist of bock sticks, reading areas, computer rooms, meeting rooms, and host a multitude of community events for adults and children. The hours of operations are as follows:

Monday – Wednesday:	10AM – 8PM
Thursday – Saturday:	10AM – 6PM
Sunday:	Closed

Observed issues found during site visit

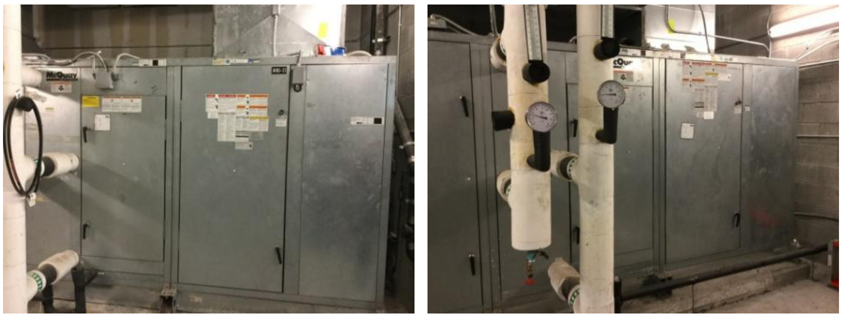
- Missing pipe insulation for water cooled chiller
- Second floor is not completely constructed

Observed Issues

COOLING SYSTEM:

The cooling for the building is provided by a Daikin 190 ton air cooled scroll chiller that utilizes R410a refrigerant. The air cooled chiller provides chilled water to two McQuay air handlers located in the mechanical room of the first floor. These two air handlers provided the conditioned air for the building. The chiller and the air handlers were in good condition.

Daikin Air Cooled Chiller



McQuay Air Handlers

The empty second story of the building has multiple air handlers that were installed but are not in use.

Second Story Air Handlers

LIGHTING SYSTEM:

Interior lighting primarily consists of T8 fluorescent lamps in either 3-lamp 2x4 fixtures or double lamp runners. The building also contains compact fluorescent fixtures. Metal halide lighting was found in the lobby.

Interior Lighting Examples

Exterior lighting for this facility consist of PL13MX2 lighting and metal halide lighting for the surrounding area of the building and the parking lot.

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 faucets
- 3.5 and 1.6 gpf toilets
- 1 gpf urinals

BUILDING CONTROLS SYSTEM:

The building is currently equipped with a Siemens building automation system. Available trending data was downloaded from the BAU. The following lists the available points being trended

- AHU 1: VAV Box damper position for VAV units 1-14
- AHU 1: VAV Box air flow for VAV units 1-14
- AHU 1: Zone temperature for zones 1-14
- AHU 1: Zone temperature set point for zones 1-14
- AHU 1: Heater status for VAV 1, 2, 4, 5, 7, 8, 11, 12
- AHU 2: VAV Box damper position for VAV units 1-11
- AHU 2: VAV Box air flow for VAV units 1-11
- AHU 2: Zone temperature for zones 1-11
- AHU 2: Zone temperature set point for zones 1-11
- AHU 2: Heater status for VAV 2, 3, 6, 7, 9, 10

The full point list is far more extensive but the above listed points provided the most useful data to help develop the usage baseline and identify improvement opportunities. The trend data is available in the Appendix.

Building Controls

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by two (2) electric meters. Both billing accounts utilize the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

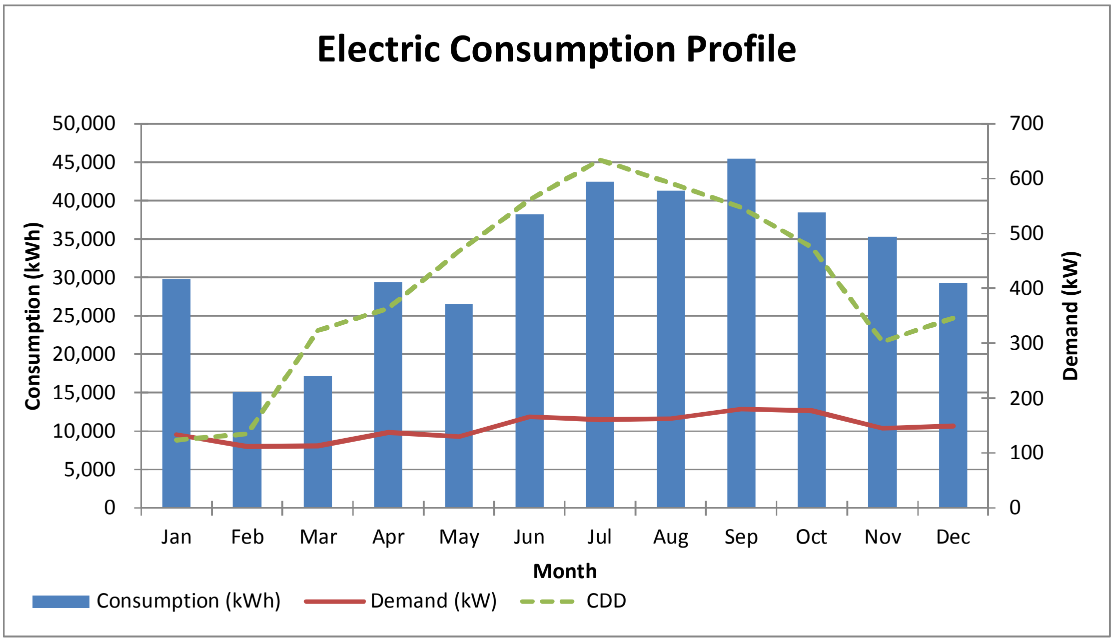
Electric Baseline Summary

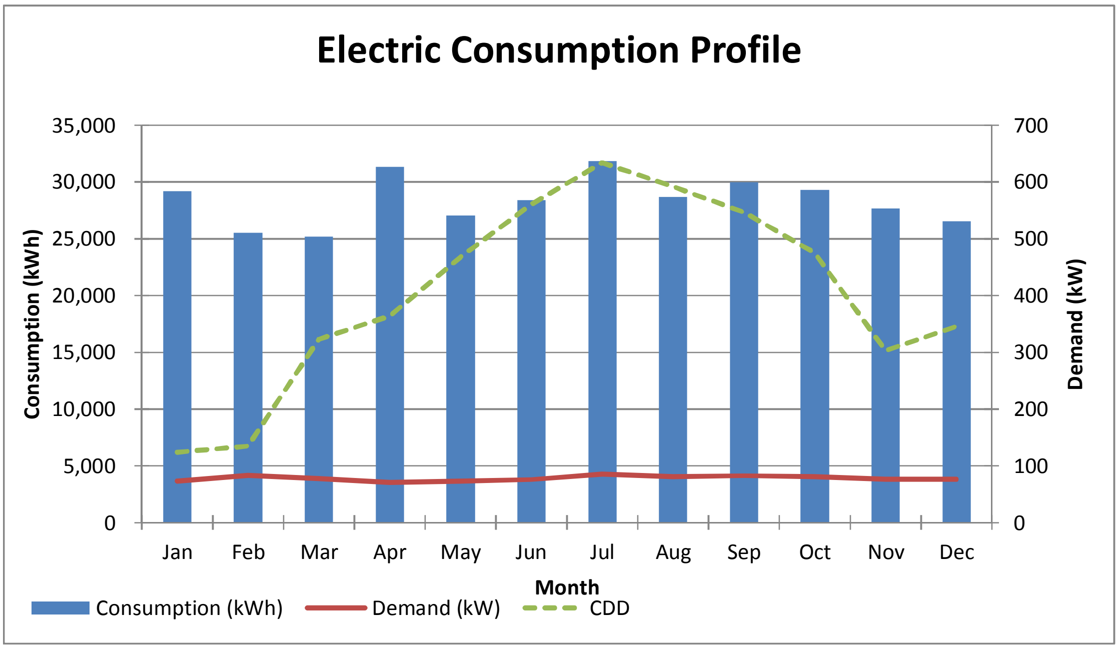
Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Holllywood Library	2	GSD-1	$ 0.05810	$ 11.47	729,334	2,704	263

The data in the table above was generated using the following electric billing data.

Meter KNL6880; Account: 5841867244; Address: 2600 HOLLYWOOD BLVD # LIBR 1A
Meter KNL6881; Account: 4913435543; Address: 2600 HOLLYWOOD BLVD # LIBR 1B

Date	Customer Charges	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 38.96	79,059	$ 4,355	236	$ 2,504	$ 386	$ 7,284
Jul-15	$ 38.96	74,045	$ 4,079	227	$ 2,408	$ 367	$ 6,893
Aug-15	$ 38.96	75,915	$ 4,182	262	$ 2,780	$ 377	$ 7,378
Sep-15	$ 38.96	78,520	$ 4,326	257	$ 2,727	$ 377	$ 7,469
Oct-15	$ 38.96	70,593	$ 3,889	221	$ 2,345	$ 333	$ 6,606
Nov-15	$ 38.96	63,950	$ 3,240	231	$ 2,451	$ 614	$ 6,344
Dec-15	$ 38.96	72,545	$ 3,675	197	$ 2,090	$ 399	$ 6,203
Jan-16	$ 38.96	45,003	$ 2,280	206	$ 2,083	$ 384	$ 4,785
Feb-16	$ 38.96	46,543	$ 2,358	192	$ 1,941	$ 388	$ 4,726
Mar-16	$ 38.96	79,013	$ 4,003	221	$ 2,234	$ 354	$ 6,631
Apr-16	$ 38.96	60,762	$ 3,078	198	$ 2,002	$ 308	$ 5,427
May-16	$ 38.96	55,348	$ 2,635	224	$ 2,265	$ 508	$ 5,446
Jun-16	$ 40.48	69,583	$ 3,312	257	$ 2,678	$ 526	$ 6,556
Jul-16	$ 40.48	65,953	$ 3,139	259	$ 2,699	$ 513	$ 6,391
Aug-16	$ 40.48	74,969	$ 3,569	263	$ 2,740	$ 540	$ 6,889
Sep-16	$ 40.48	57,021	$ 2,714	258	$ 2,688	$ 464	$ 5,907
Oct-16	$ 40.48	55,247	$ 2,630	223	$ 2,324	$ 425	$ 5,419
Nov-16	$ 40.48	47,848	$ 2,278	222	$ 2,313	$ 395	$ 5,026
Dec-16	$ 50.00	45,474	$ 2,340	217	$ 2,261	$ 448	$ 5,099
Jan-17	$ 50.00	36,246	$ 1,865	184	$ 1,950	$ 341	$ 4,206
Feb-17	$ 50.00	38,144	$ 2,048	189	$ 2,003	$ 364	$ 4,466
Mar-17	$ 50.00	42,445	$ 2,279	195	$ 2,067	$ 390	$ 4,786
Apr-17	$ 50.00	46,551	$ 2,500	208	$ 2,205	$ 422	$ 5,177
May-17	$ 50.00	77,890	$ 4,183	260	$ 2,756	$ 624	$ 7,613
Yearly Averages		**729,334**	**$ 37,478**	**2,704**	**$ 28,257**	**$ 5,123**	**$ 71,364**





The resulting energy usage profiles, illustrated above, for this facility are primarily influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). This is more prominent in the larger metered account. It is undefined as to what the smaller meter account directly represents as weather influences are not evident. Electric demand usage for both meters is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in summer months while the average low occurs in February/March.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Holllywood Library	Library	15.79	10.7	14.3	15.6

Overall, this building is operating at the 75th percentile of comparable facilities. This indicates improvement opportunities of both equipment and systems efficiencies. The historical data, however, does not take into consideration the chiller plant improvements made in August of 2017. An analysis of more recent billing data would result in a lower metric value.

SIEMENS

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Hollywood Branch Library

Account # 309625-243446	**Meter #**
Rate	**Address**
Meter Size	**Meter Type**

	60325541	60325533 Irrigation	
Date	**Consumption C1 (cubic feet?)**	**Consumption C2 (cubic feet?)**	**Total Charges**
Jun-17	2700	11200	$ 1,161.64
May-17	4000	10200	$ 1,256.95
Apr-17	3400	5600	$ 915.62
Mar-17	3700	2900	$ 780.85
Feb-17	5000		$ 648.73
Jan-17	8200		$ 836.62
Dec-16	7900		$ 834.05
Nov-16	4300	6100	$ 1,045.63
Oct-16	5700		$ 667.18
Sep-16	3600	3700	$ 817.12
Aug-16	11600		$ 1,046.71
Jul-16	14800		$ 1,230.25
Jun-16	2900	12300	$ 1,263.91
May-16	15200		$ 1,323.76
Apr-16	15700		
Mar-16	3900	10800	$ 1,246.96
Feb-16	14700		$ 1,295.24
Jan-16	15200		$ 1,394.29
Dec-15	17200		$ 1,570.12
Nov-15	19300		$ 1,449.16
Oct-15	17500		$ 980.11
Sep-15	10200		$ 1,439.68
Aug-15			$ 1,614.41
Jul-15			$ 1,467.62
Jun-15			$ 1,621.63
TOTALS	**206700**	**62800**	**$ 27,908.24**

This account expenses was coupled with two sets of water consumption numbers. It is not known which part of the expense belongs to each account.

SIEMENS

Hollywood Branch Library

Account # 110269-210918	**Meter #** WA 60181877
Rate	**Address**
Meter Size	**Meter Type**

Date	Consumption (cubic feet?)	Total Charges
Jun-17	800	$ 180.12
May-17	1100	$ 216.03
Apr-17	800	$ 180.12
Mar-17	1000	$ 204.06
Feb-17	1700	$ 287.85
Jan-17	4000	$ 563.16
Dec-16	600	$ 156.18
Nov-16	600	$ 156.18
Oct-16	700	$ 168.15
Sep-16	600	$ 156.18
Aug-16	700	$ 168.15
Jul-16	600	$ 156.18
Jun-16	800	$ 180.12
May-16	900	$ 192.09
Apr-16	800	$ 180.12
Mar-16	700	$ 168.15
Feb-16	500	$ 144.21
Jan-16	700	$ 168.15
Dec-15	300	$ 120.27
Nov-15	300	$ 120.27
Oct-15	400	$ 132.24
Sep-15	300	$ 120.27
Aug-15	300	$ 156.18
Jul-15	600	$ 120.27
Jun-15		$ 156.18
TOTALS	**19800**	**$ 4,550.88**

This account has almost a complete set of 24 months of consumption and expense data. The consumption data for this account is measured in cubic feet. The average monthly consumption is 825 cubic feet. The average monthly expense $182.04. The blended dollar per cubic foot rate for this account is $0.22.

RECOMMENDED IMPROVEMENT MEASURES

All recommended FIMs for this facility have been removed from the final scope by Broward County. Please refer to Section G of this report for documentation of these originally proposed opportunities.

D.25. Library - Imperial Point

FACILITY DESCRIPTION

Imperial Point Library is a 14,500 square foot library located at 5985 North Federal Highway, Ft Lauderdale, FL 33308. The design of this library is unique as 95% of the conditioned space is on the second level. This is because the first level of this facility is occupied primarily by parking space. The library has spaces for other community activities such as chess club and children's dance classes. The hours of operation are as follows:

Monday:	10AM – 6PM
Tuesday:	12PM – 8PM
Wednesday:	12PM – 8PM
Thursday:	10AM – 6PM
Friday:	10AM – 6PM
Saturday:	10AM – 6PM
Sunday:	Closed

COOLING SYSTEM

The cooling system for this facility is made up of 5 DX roof top units that feed mixed conditioned air into the space below. At the time of the visit, facility staff commented that there are hot spots throughout the building. The condition of the units was fair to poor. Due to the proximity to the ocean, some of the units had noticeable degradation of the condenser coils.

Namplate Data of Mechanical Equipment

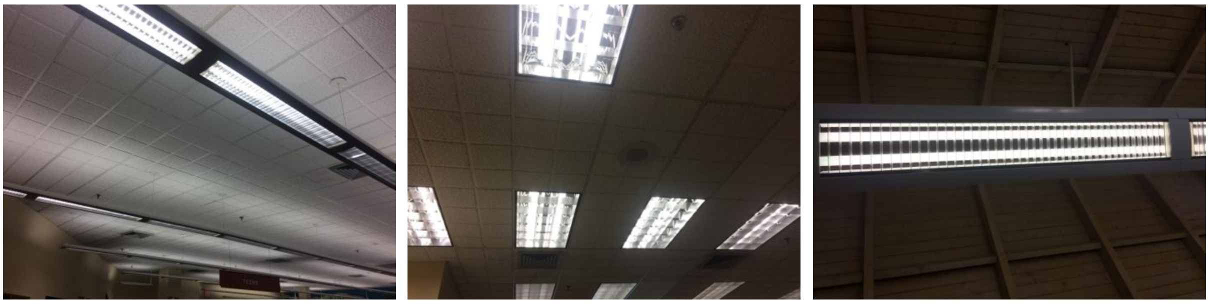
General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Imperial Point Library												
RTU-1	Carrier	501FF012---511	1204G20562	compressor	R-22		10	230	3	15.8		5.7
				compressor				230	3	14.7		5.3
				O.D. fan				230	1	1.4		0.3
				O.D. fan				230	1	1.4		0.3
				I.D. fan				230	3	5.8		2.1
RTU-2	Carrier	No Nameplate		compressor	R-22			208	3	29		9.4
				compressor				208	3	28.9		9.4
				O.D. fan								
				O.D. fan								
				I.D. fan								
RTU-3	Trane	TCD180E300AA	927100499D	compressor	2009		15	208	3	30.1	9.9	9.8
				compressor				208	3	20.5		6.6
				fan		0.5		208	1	3.2		0.6
				fan		0.5		208	1	3.2		0.6
RTU-4	Trane	TSC120E3R0A0000					10				11.3	
RTU-5	Trane	TSC120E3R0A0L000	9261023036				12				11.3	



HVAC Equipment Examples

LIGHTING SYSTEM:

Interior lighting at this facility consist of 4' T8 fixtures in the main space with either 3 lights or 2 lights.



Interior Lighting Examples

Exterior lighting at this facility consist of 60 Watt T8 lighting in the parking garage.

Exterior Lighting Examples

During the site visit, facility staff mentioned that there are issues with lights flickering occasionally throughout the building. The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM:

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 0.5 gpm faucets
- 1.6 gpf urinals
- 2.0 gpf toilets

All water fixtures are operated manually.



Restroom Fixtures Examples

BUILDING CONTROLS SYSTEM:

The building is currently not equipped with a building automation system. Each zone has a dedicated thermostat. Thermostats are placed in areas that are not close to the return air grills.

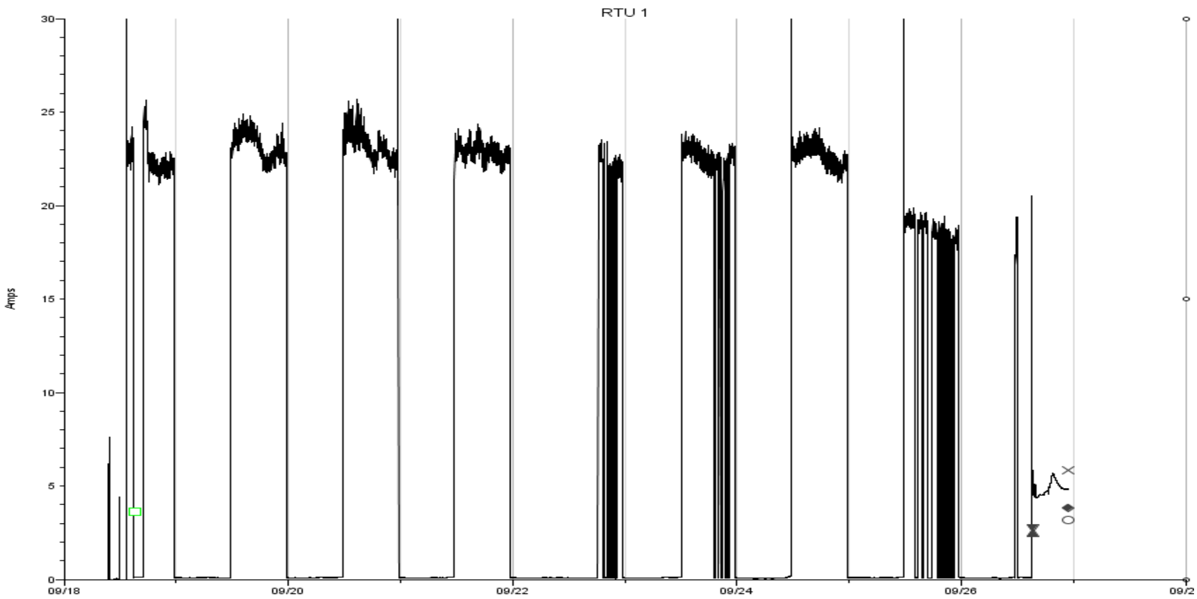

Building Controls

TRENDING DATA AQUISITION:

In order to determine the runtime operation of each unit, data loggers were installed to monitor amperage and/or supply air temperature. This data was trended for a minimum of seven (7) days in order to capture a typical week. The following graphs illustrate the resulting data from this logging session.

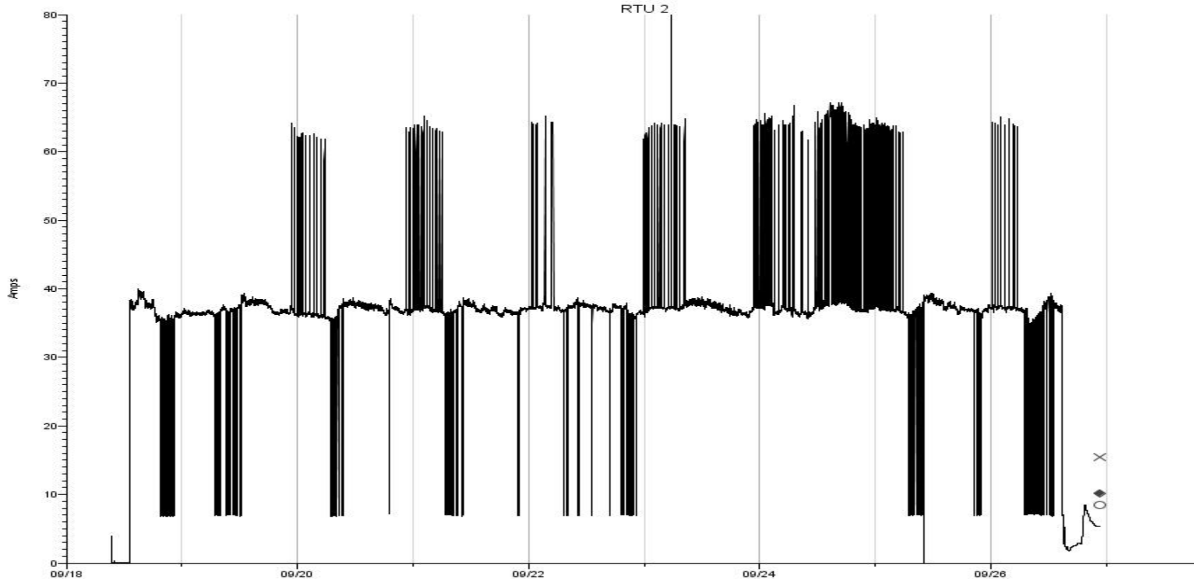
SIEMENS

Trending Data – RTU 1



This unit registered an average of 22.48 amps and was operating for a total of 76.83 hours during a one week period.

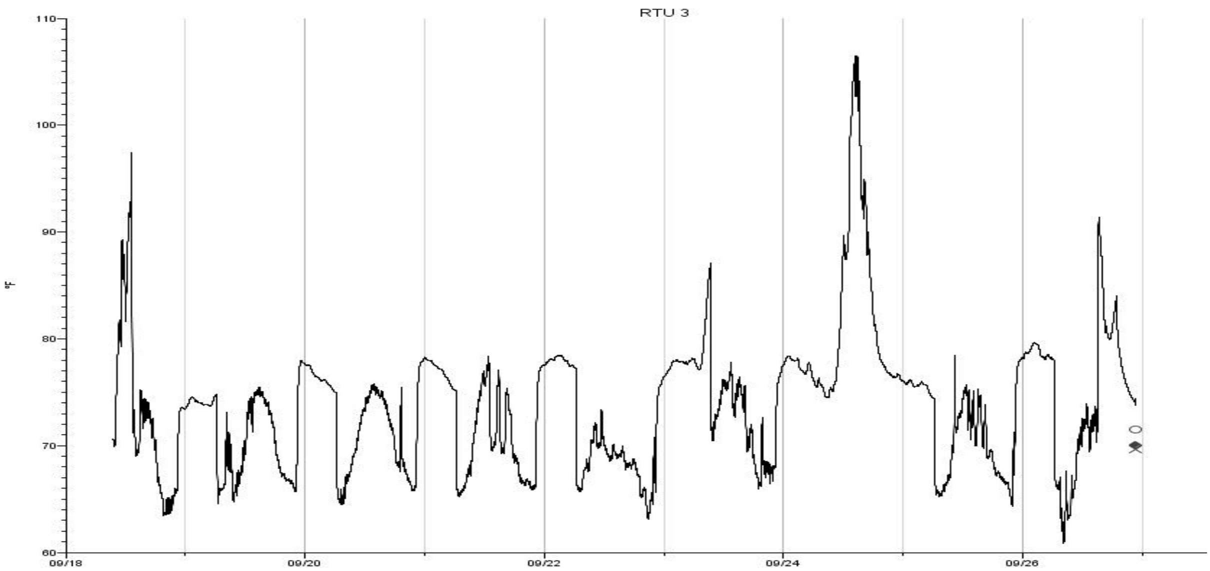
Trending Data – RTU 2



This unit is a 2 compressor RTU. The first compressor registered an average of 37.07 amps. When the second compressor was running alongside the first compressor the machine averaged 63.58 amps. The machine was operating on one compressor for a total of 147.6 hours during a one week period and was operating on two compressors for 12.9 hours during a one week period.

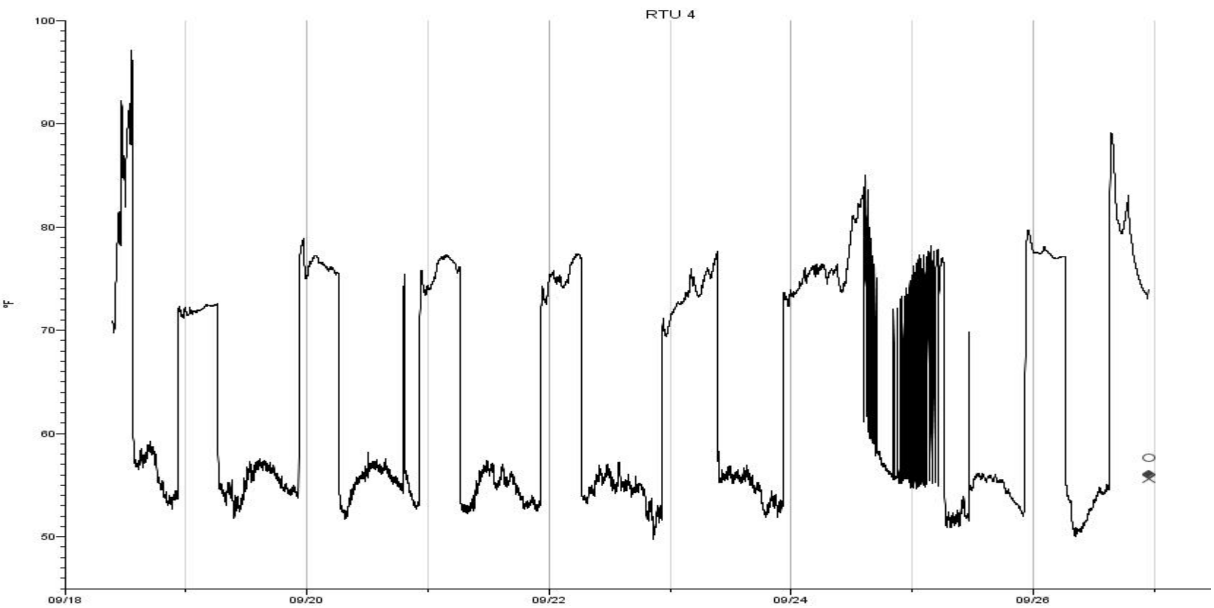
SIEMENS

Trending Data – RTU 3



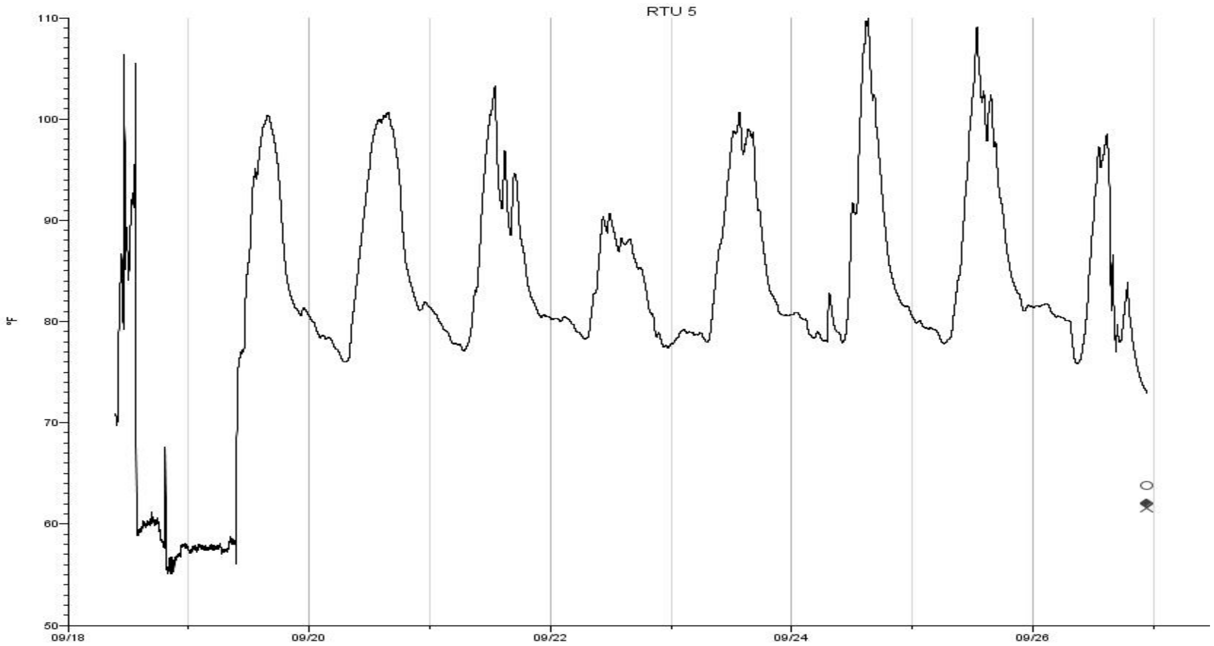
This unit was logged by tracking the supply air temperature. If the supply air temperature was below 71F the unit was considered to be operating. The unit was operating for a total of 67.63 hours during a one week period.

Trending Data – RTU 4



This unit was logged by tracking the supply air temperature. If the supply air temperature was below 63F the unit was considered to be operating. The unit was operating for a total of 109.43 hours during a one week period.

Trending Data – RTU 5



This unit was logged by tracking the supply air temperature. If the supply air temperature was below 63F the unit was considered to be operating. The unit was operating for a total of 19.75 hours during a one week period.

The following table compares the operating hours of each unit with the hours of service for the facility.

Day	Hours of Service	Run Hours RTU 1	Run Hours RTU 2	Run Hours RTU 3	Run Hours RTU 4	Run Hours RTU 5
Monday	10:00AM - 6:00PM	11:30AM - 10:30PM	12:00AM - 11:59PM	6:30AM - 10:30PM	6:30AM - 10:30PM	off
Tuesday	12:00PM - 8:00PM	11:30AM - 10:30PM	12:00AM - 11:59PM	6:30AM - 10:30PM	6:30AM - 10:30PM	off
Wednesday	12:00PM - 8:00PM	11:30AM - 10:30PM	12:00AM - 11:59PM	6:30AM - 10:30PM	6:30AM - 10:30PM	off
Thursday	10:00AM - 6:00PM	11:30AM - 10:30PM	12:00AM - 11:59PM	6:30AM - 10:30PM	6:30AM - 10:30PM	off
Friday	10:00AM - 6:00PM	6:00PM - 10:30PM	12:00AM - 11:59PM	6:30AM - 10:30PM	6:30AM - 10:30PM	off
Saturday	10:00AM - 6:00PM	12:00PM - 10:30PM	12:00AM - 11:59PM	9:30AM - 10:30PM	9:30AM - 10:30PM	off
Sunday	closed	11:30AM - 10:30PM	12:00AM - 11:59PM	off	3:00AM - 6:00AM	off

Units 1, 3, and 4 seem to be operating under some sort of schedule. These schedules don't necessarily follow the most optimal schedule for this facility. Unit 2 runs continuously. Unit 5 only operated momentarily during the period of logging so it seems this unit does not get used often.

UTILITY DATA ANALYSIS – ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

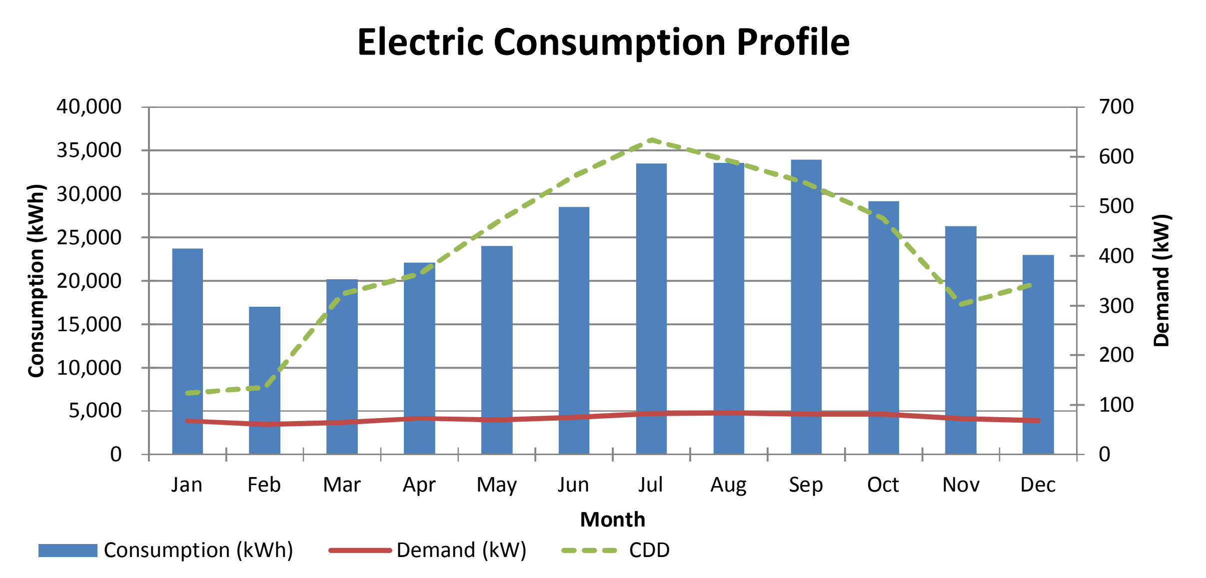
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Imperial Point Library	1	GSD-1	$ 0.05809	$ 11.47	314,940	879	89

The data in the table above was generated using the following electric billing data.

Meter KU30298; Account: 9663048172; Address: 5985 N FEDERAL HWY # LIB FT LAUD

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	26,340	$ 1,451	73	$ 775	$ 127	$ 2,372
Jul-15	$ 19.48	32,700	$ 1,801	81	$ 859	$ 149	$ 2,829
Aug-15	$ 19.48	30,060	$ 1,656	79	$ 838	$ 141	$ 2,655
Sep-15	$ 19.48	32,880	$ 1,811	80	$ 849	$ 137	$ 2,817
Oct-15	$ 19.48	27,360	$ 1,507	80	$ 849	$ 127	$ 2,502
Nov-15	$ 19.48	25,680	$ 1,415	70	$ 743	$ 113	$ 2,290
Dec-15	$ 19.48	22,260	$ 1,128	71	$ 753	$ 207	$ 2,107
Jan-16	$ 19.48	22,920	$ 1,161	67	$ 677	$ 163	$ 2,021
Feb-16	$ 19.48	13,680	$ 693	58	$ 586	$ 114	$ 1,413
Mar-16	$ 19.48	17,460	$ 885	62	$ 627	$ 138	$ 1,669
Apr-16	$ 19.48	21,900	$ 1,109	67	$ 677	$ 107	$ 1,914
May-16	$ 19.48	22,260	$ 1,128	70	$ 708	$ 111	$ 1,966
Jun-16	$ 20.24	30,660	$ 1,459	76	$ 792	$ 199	$ 2,471
Jul-16	$ 20.24	34,320	$ 1,634	85	$ 886	$ 223	$ 2,762
Aug-16	$ 20.24	37,080	$ 1,765	89	$ 927	$ 238	$ 2,951
Sep-16	$ 20.24	34,980	$ 1,665	82	$ 854	$ 216	$ 2,756
Oct-16	$ 20.24	30,960	$ 1,474	81	$ 844	$ 199	$ 2,537
Nov-16	$ 20.24	26,820	$ 1,277	74	$ 771	$ 177	$ 2,245
Dec-16	$ 20.24	23,760	$ 1,131	66	$ 688	$ 158	$ 1,997
Jan-17	$ 25.00	24,480	$ 1,259	68	$ 721	$ 177	$ 2,182
Feb-17	$ 25.00	20,340	$ 1,046	64	$ 678	$ 154	$ 1,904
Mar-17	$ 25.00	22,920	$ 1,231	66	$ 700	$ 174	$ 2,130
Apr-17	$ 25.00	22,260	$ 1,195	78	$ 827	$ 182	$ 2,229
May-17	$ 25.00	25,800	$ 1,385	70	$ 742	$ 192	$ 2,344
Yearly Averages		**314,940**	**$ 16,134**	**879**	**$ 9,186**	**$ 1,962**	**$27,531**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in September while the average low occurs in February; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Imperial Point Library	Library	21.72	10.7	14.3	15.6

Overall, this building is operating above the 75th percentile of comparable facilities. This indicates improvement opportunities of both equipment and systems efficiencies; as well as building automation.

UTILITY DATA ANALYSIS – WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Imperial Point Branch Library

Account #	2053854	**Meter #**	200113349
Rate		**Address**	
Meter Size		**Meter Type**	

Date	Total Charges
Jan-16	$ 526.72
Dec-15	$ 505.00
Nov-15	$ 3.58
Oct-15	$ 502.13
Sep-15	$ 20.68
Aug-15	$ 442.60
Jul-15	$ 432.26
Jun-15	$ 422.60
May-15	$ 432.26
Apr-15	$ 1,369.16
Mar-15	$ 452.94
Feb-15	$ 452.94
Jan-15	$ 421.92
Dec-14	$ 442.60
Nov-14	$ 456.73
Oct-14	$ 346.51
Sep-14	$ -
Aug-14	$ 411.61
Jul-14	$ 421.45
Jun-14	$ 411.61
May-14	$ 421.45
Apr-14	$ 500.17
Mar-14	$ 500.17
Feb-14	$ 411.61
Jan-14	$ 421.45
TOTALS	**$10,730.15**

This account only had total expense amounts per month available for water usage utility data. No relevant conclusions can be drawn from this data.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Imperial Point Library	Lighting - Interior	$ 1,660.53	$ 1,383.87	$ -	$ 438	$ 3,482.41	$ 38,982.46	11.2
Imperial Point Library	Lighting - Exterior	$ 290.47	$ 160.01	$ -	$ 59	$ 509.48	$ 3,882.68	7.6
Imperial Point Library	RTU COMBINED	$ 6,805.80	$ 2,751.20	$ -	$ -	$ 9,557.00	$ 190,319.92	19.9
Imperial Point Library	RTU Code Compliance	$ -	$ -	$ -	$ -	$ -	$ 5,715.11	-
Breakage Fee							$ 2,465.00	
PA Cost							$ 2,496.34	
Total		**$ 8,756.81**	**$ 4,295.08**	**$ -**	**$ 497**	**$13,548.89**	**$ 243,861.51**	**18.0**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – INTERIOR LIGHTING

LED Replacement of Linear Lamps

The design strategy is to specify and standardize on the same type of linear LED T8 and T5 lamps types throughout the buildings to be included in this project. We select a non-proprietary proven LED tube that will provide the greatest performance and energy savings of any of the lighting systems considered. The proposed LED Linear tubes are a premium high lumen, extended life with best in class warranty.

The predominant LED lamp we have selected for this project is an UL Type B LED linear type. The UL Type B lamp a direct wire lamp that doesn't require an external ballast or driver. The existing T-8 or T5 ballast will be removed from the fixture and disposed of. New lamp sockets approved for direct wire LED lamps will also be installed on the feed ends to ensure problem free installation and reduce future maintenance. This LED retrofit strategy will allow us to maintain recommended light levels while providing a reduction in energy usage in all linear lamp fixtures and still standardize on lamp types. All fixtures retrofitted will be dry wiped to remove dust and particulate matter to improve fixture lumen efficiency.

Fixture types associated with these lamps are surface or recessed linear fixtures.

In the case of existing 2'x2' troffers, a different approach is used. There is less flexibility in lamp wattage when dealing with U-shaped lamps, and installing linear lamp kits can be a challenge due to variation in fixture construction. Additionally, in many cases, it is possible to reduce light output if the fixture can be made more efficient. To provide consistency of components and reduce energy use, we have proposed installing 2x2 volumetric style retrofit door kits with dedicated LED boards and drivers.

LED Replacement for Pin-Based Compact Fluorescent Fixtures

In keeping with the direction to remove fluorescent ballasts, reduce energy use and minimize cost, our design strategy for existing pin-based compact fluorescent lamps is to retrofit the existing fixtures with line voltage pin based LED lamps and remove the existing fluorescent ballasts. In some cases, it is possible to remove two fluorescent lamps and replace them with a single higher powered LED lamp without sacrificing luminaire output and distribution.

LED Replacement for Screw Based Incandescent and Compact fluorescent fixtures

Our design strategy for the replacement of screw based incandescent and compact fluorescent lamps is to replace them with screw based LED where the application permits. LED has become an attractive replacement option when incandescent fixtures are controlled by dimmers due to its excellent dimming capability.

Emergency Lighting

Backup power for emergency lighting is currently supplied by various means, including generator backup (emergency lights at full output), integral battery backup ballasts (fluorescent fixtures at reduced output), and unit inverter emergency lights. Of those approaches, the scenarios with existing battery backup ballasts in fluorescent fixtures require replacement of the battery ballasts because they are not compatible with the UL Type B LED lamps. In those cases, a standalone EM kit with a dedicated emergency battery, LED driver, and LED board will be installed in the fixture. This kit will remain off until there is a power outage, at which point the LED board will illuminate.

Interior Lighting Retrofit Scope

BUILDING NAME	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
LIBRARY, IP, Imperial Point	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	8	8
	Existing T8 Fluorescent - Proposed Retrofit LED	290	290
	Existing Compact Fluorescent - Proposed Relamp LED	3	3
	Existing Compact Fluorescent - Proposed Retrofit LED	35	35

PROJECT SCOPE – EXTERIOR LIGHTING

LED Replacement for Fluorescent Exterior

Luminaires with pin based compact fluorescent lamps will generally be retrofit by removing the existing fluorescent lamps and ballast, and installing new line voltage, pin based LED lamps. Existing screw based incandescent and fluorescent lamps will be replaced with new screw based LED lamps.

Exterior fixtures with existing linear fluorescent lamps, such as surface mounted enclosed and gasketed fixtures in park pavilions are evaluated for fixture condition, and either retrofit with new LED T8, UL Type B lamps, or replaced with new luminaires utilizing dedicated LED boards and drivers.

Exterior Lighting Retrofit Scope

BUILDING	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
LIBRARY, IP, Imperial Point	Existing T8 Fluorescent - Proposed Retrofit LED	36	36

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 33,583 kWh

Annual Electric Demand: 134.52 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Imperial Point Library	Lighting - Interior	$ 1,660.53	$ 1,383.87	$ -	$ 438	$ 3,482.41	$ 38,982.46	11.2
Imperial Point Library	Lighting - Exterior	$ 290.47	$ 160.01	$ -	$ 59	$ 509.48	$ 3,882.68	7.6

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

Cooling for this building is provided by a total of five (5) roof-top units of varying tonnages.

PROJECT SCOPE

This FIM addresses the replacement of five (5) roof top units. The new equipment will be of equal capacity and include, as part of the installation, package new programmable thermostats provided by Siemens. The thermostats will be able to communicated, via their own IP address, to remote BAUs for additional access. The units will be placed on a time of day schedule. The new schedule will command the units to turn on 1.5 hours before the facility opens and 1.5 hours after it closes.

Scope of Work

Building	Equipment	Make	Model	Tons	Existing EER	New EER
Imperial Point Library	RTU	Carrier	501FF012---511	10	11.3	12.5
Imperial Point Library	RTU	Carrier		10	11.3	12.5
Imperial Point Library	RTU	Trane	TCD180E300AA	15	9.9	12.1
Imperial Point Library	RTU	Trane	TSC120E3R0A0000	10	11.3	12.1
Imperial Point Library	RTU	Trane	TSC120E3R0A0L000	12	11.3	12.1

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.

SIEMENS

FIM SAVINGS SUMMARY

Annual Electric Consumption: 117,163 kWh

Annual Electric Demand: 240.35 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Imperial Point Library	RTU COMBINED	$ 6,805.80	$ 2,751.20	$ -	$ -	$ 9,557.00	$ 190,319.92	19.9

Savings Capital: Capital budget dollars were used in order to improve the payback to the requested limitation values. These dollars represent unused amounts left over from the Capital Project Plan total. Funds were first applied to their respective capital project until the required payback was achieved. All remaining amounts were distributed to FIM opportunites such as the one above.

Code Compliance: Associated with the scope of work summarized above are code compliance issued uncovered by contracted MEPs (mechanical, electrical, and plumbing vendor). This cost was requested to be listed separately. For this facility, the code compliance cost is:

- $5,715.11

The identified issue at Imperial Library concern includes changes in outside air requirements as stated by current building code.

D.26. Library - Lauderhill

FACILITY DESCRIPTION

The Lauderhill Library is a one-story, 10,000 square foot building constructed in 2004 and located at 6399 Oakland Park Blvd. The library consists of book stacks, reading spaces, meeting rooms, offices, and a break room. The hours of operations are as follows:

Lauderhill Library:

Sunday:	closed
Monday:	12 noon – 8PM
Tuesday:	12 noon – 8PM
Wednesday:	10AM – 6PM
Thursday:	10AM – 6PM
Friday:	10AM – 6PM
Saturday:	10AM – 6PM

COOLING SYSTEM:

Cooling for the building is provided by a split package system consisting of two (2) condensing units (roughly 15 and 30 tons in size) that serve one, large air handling unit (AHU). The AHU resides in an adjacent mechanical room on the exterior of the building.

Condensing Units

Outside air (OA) enters the AHU mechanical room through exterior facing louvers. The OA duct is equipped with a modulating damper, installed just after the opening, capable of controlling how much outside air is brought into the building. The OA is then pre-conditioned before entering the AHU and mixing with return air from the plenum.

Outside Air System

The mechanical room itself is a return air plenum. The return air intake on the AHU is equipped with a modulating damper; also capable of controlling how much return air is used.

Air Handing Unit Equipment

Supply air is distributed throughout the facility via variable air volume (VAV) boxes.

In addition, but separate from, the aforementioned split system, another 2-ton split DX unit is dedicated to cooling the communications and server closet of the library. It is controlled via a digital thermostat; however, the unit is connected to the onsite building automation system that is primarily controlled by the County from the Government Center.

Dedicated Split System

Namplate Data of Mechanical Equipment

General Information						Size / Capacity		Nameplate Information				
EQUIPMENT	Mfctr	Model	Serial	Description	Notes	HP	Tons/ MBTU	V	Ph	Amps	Eff /EER	Cal kW
Lauderhill Library												
Condenser	York	HB360C00A4	NBNM018535	compressor	R-22		30	460	3	16.4	9.5	11.8
				compressor				460	3	16.4		11.8
				compressor				460	3	16.4		11.8
				compressor				460	3	16.4		11.8
				fan		1		460	3	2.2		1.6
				fan		1		460	3	2.2		1.6
				fan		1		460	3	2.2		1.6
				fan		1		460	3	2.2		1.6
Condenser	York	HB180C00A	NBNM019280	compressor	R-22		15	460	3	12.8	9.7	9.2
				compressor				460	3	12.8		9.2
				fan		1		460	3	2.15		1.5
				fan		1		460	3	2.15		1.5
AHU-3	York		CANM 21908D		with VFD	15		460	3	19.3		13.8
OA Pre Cool	York	BA00811227	DANM-16019B									
FCU-4	Mitsubishi			fan								
Condenser	Mitsubishi			compressor								
				fan								
				fan								

LIGHTING SYSTEM

Interior lighting consists of 32 Watt, T8 fluorescent lamps in either 2 or 3-lamp 2x4 fixtures. Reading areas of the library have task lighting fixtures dropped from the ceiling consisting of single-lamp T8 fixtures. Also, 2-lamp, T8 fluorescent U-Bend fixtures can be found within restrooms.

Interior Lighting Examples

Exterior Lighting consists of HPS lamps in wall packs and recess cans.

Exterior Lighting Examples

The building does not make use of occupancy sensors or any other types of lighting control.

DOMESTIC WATER SYSTEM

Domestic water usage is limited to restrooms. The following are example of the types of fixture found within the restroom of the facility:

- 2.2 gpm faucets
- 3.5 gpf toilets
- 3.5 gpf urinals

Some faucets are operated manually while others have been equipped with sensors. All toilets and urinal are operated manually.

Sample Restroom Fixtures

Irrigation for the site uses city water. Sprinkler heads are on a timer.

BUILDING CONTROLS SYSTEM

The building is equipped with a Siemens building automation system. Any changes to the controls operation is handled from the Government Center.


HVAC Controls Equipment

Available trending data was downloaded from the BAU. The following lists the available points being trended:

- Air Handler
    - fan status
    - fan speed
    - supply and return air temperature
    - supply and return air temperature setpoints
    - humidity
    - stage 1 and 2 amperages
- General Data
    - outside air CFM
    - relative humidity
    - temperature
    - other points

The full point list is far more extensive but eh above listed points provided the most useful data to help develop the usage baseline and identify improvement opportunities.

UTILITY DATA ANALYSIS - ELECTRIC

The electric usage at this facility is monitored by one (1) electric meter. The billing account utilizes the General Service Demand (GSD-1) rate structure. When creating the baseline shown below, the most recent 24 month of electric billing data was utilized as obtained directly from the Florida Power and Light website. The data was made available via website's the user portal and historical data from the facility's smart meters.

The following table documents both the rate structure values used to calculate energy savings based on most recent electric billing data as well as the established demand and consumption values representing baseline electric usage for the facility.

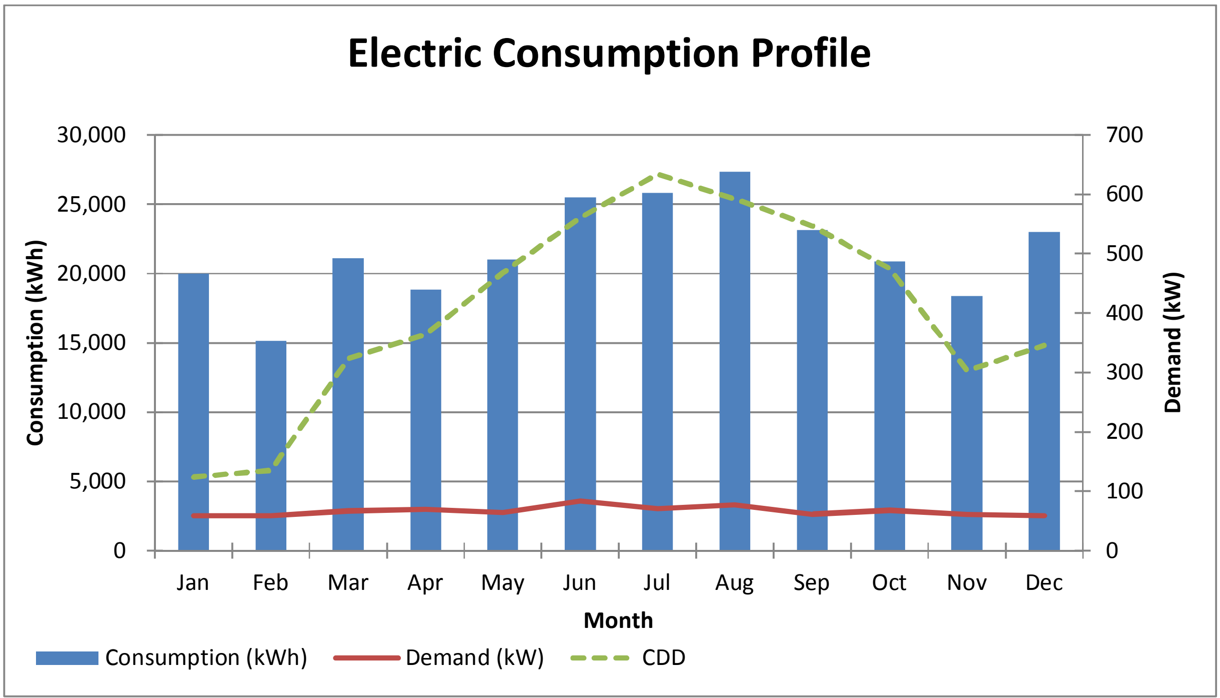
Electric Baseline Summary

Facility	# of Meters	Rate Structure	$ / kWh	$ / kW	Average Consumption per Year	Average Demand per Year	Max Demand
Lauderhill Library	1	GSD-1	$ 0.05800	$ 11.45	260,182	13,333	90

The data in the table above was generated using the following electric billing data.

Meter KNL7180; Account: 306770273; Address: 2710 DAVIE BLVD FT LAUD

Date	Customer Charge	Consumption (kwh)	Consumption Charge	Demand (kW)	Demand Charge	Other Fees/Taxes	Total Charges
Jun-15	$ 19.48	24,766	$ 1,364	81	$ 859	$ 131	$ 2,375
Jul-15	$ 19.48	23,673	$ 1,304	63	$ 668	$ 112	$ 2,104
Aug-15	$ 19.48	23,830	$ 1,313	64	$ 679	$ 113	$ 2,125
Sep-15	$ 19.48	23,769	$ 1,309	63	$ 668	$ 104	$ 2,102
Oct-15	$ 19.48	21,125	$ 1,164	60	$ 637	$ 97	$ 1,916
Nov-15	$ 19.48	18,659	$ 1,028	60	$ 637	$ 91	$ 1,775
Dec-15	$ 19.48	21,596	$ 1,094	57	$ 605	$ 189	$ 1,908
Jan-16	$ 19.48	14,479	$ 734	56	$ 566	$ 116	$ 1,435
Feb-16	$ 19.48	14,335	$ 726	63	$ 637	$ 121	$ 1,504
Mar-16	$ 19.48	19,973	$ 1,012	62	$ 627	$ 150	$ 1,808
Apr-16	$ 19.48	18,418	$ 933	67	$ 677	$ 104	$ 1,734
May-16	$ 19.48	20,480	$ 1,038	60	$ 607	$ 97	$ 1,761
Jun-16	$ 20.24	26,217	$ 1,248	87	$ 907	$ 191	$ 2,365
Jul-16	$ 20.24	28,023	$ 1,334	78	$ 813	$ 190	$ 2,357
Aug-16	$ 20.24	30,896	$ 1,471	90	$ 938	$ 213	$ 2,642
Sep-16	$ 20.24	22,504	$ 1,071	60	$ 625	$ 146	$ 1,863
Oct-16	$ 20.24	20,646	$ 983	76	$ 792	$ 154	$ 1,949
Nov-16	$ 20.24	18,128	$ 863	62	$ 646	$ 131	$ 1,660
Dec-16	$ 20.24	24,355	$ 1,159	61	$ 636	$ 155	$ 1,970
Jan-17	$ 25.00	25,580	$ 1,316	62	$ 657	$ 175	$ 2,174
Feb-17	$ 25.00	15,927	$ 819	55	$ 583	$ 125	$ 1,553
Mar-17	$ 25.00	22,197	$ 1,192	72	$ 763	$ 172	$ 2,152
Apr-17	$ 25.00	19,238	$ 1,033	72	$ 763	$ 158	$ 1,980
May-17	$ 25.00	21,550	$ 1,157	69	$ 731	$ 167	$ 2,080
Yearly Averages		**260,182**	**$ 13,333**	**800**	**$ 8,361**	**$ 1,701**	**$23,645**



The resulting energy usage profile, illustrated above, for this account is influenced by cooling needs throughout the year; as identified by the comparison of monthly consumption to bin weather data's cooling degree days (CDD). Electric demand usage is relatively constant from month to month, indicating a base consumption need. The average peak for the 24 month period evaluated occurs in August while the average low occurs in February; further confirming the influence of outdoor weather conditions on building electric consumption.

The billing is, as previously shown, analyzed as a combination of all meters. As described in a previous section, an index value is calculated and compared to similar facilities within the same geographic region. Below are the results of this comparison.

Benchmarking Summary

Facility	Faclity Type	kWh/Sq Ft	CBECS - 2012 kWh/Sq Ft Data		
			25th percentile	Median	75th percentile
Lauderhill Library	Library	26.02	10.7	14.3	15.6

Overall, this building is operating above the 75th percentile of comparable facilities. This indicates improvement opportunities of both equipment and systems efficiencies; as well as building automation. However, the low dollar value of annual billing costs can inhibit favorable payback results of suggested FIMs.

UTILITY DATA ANALYSIS - WATER

The following table(s) summarizes the water consumption data that was available for this facility.

Lauderhill Library

Account # 5050680-0	**Meter #** 60872754
Rate	**Address**
Meter Size 2"	**Meter Type**

Date	Consumption ()	Total Charges
Jun-17	3	$ 645.05
May-17	3	$ 645.05
Apr-17	3	$ 645.05
Mar-17	3	$ 645.05
Feb-17	4	N/A
Jan-17	2	N/A
Dec-16	N/A	N/A
Nov-16	N/A	N/A
Oct-16	N/A	N/A
Sep-16	N/A	N/A
Aug-16	N/A	N/A
Jul-16	N/A	N/A
Jun-16	N/A	N/A
May-16	N/A	N/A
Apr-16	N/A	N/A
Mar-16	N/A	N/A
Feb-16	N/A	N/A
Jan-16	N/A	N/A
Dec-15	N/A	N/A
Nov-15	N/A	N/A
Oct-15	N/A	N/A
Sep-15	N/A	N/A
Aug-15	N/A	N/A
Jul-15	N/A	N/A
Jun-15	N/A	N/A
TOTALS	**18**	**$2,580.20**

This account does not have sufficient consumption and expense data to draw any relevant conclusions.

RECOMMENDED IMPROVEMENT MEASURES

This section addresses the Facility Improvement Measures (FIMs) recommended for implementation at this facility. Each solution is presented with a brief description of the intended scope, savings calculation method, guaranteed savings in units of energy, and the individual FIM's financial analysis with payback. As requested, the following improvements costs are listed separately and do not directly affect a FIM's payback:

- Development Costs
- Measurement & Verification (performance assurance)
- Code compliance issues uncovered that directly relates to the constructability of a specific measure

BUILDING LEVEL SUMMARY

The following table summarized the complete list of FIMs recommended for this facility. The summation at the bottom of the table represents the total costs and savings of all FIMs only. As stated, the fixed costs associated with in with development, performance assurance, and code compliance is considered as separate items.

Building Level Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Lauderhill Library	Lighting - Exterior	$ 1,349.53	$ 743.41	$ -	$ 245	$ 2,337.95	$ 28,904.50	12.4
Lauderhill Library	Split System	$ 1,903.30	$ 6,168.40	$ -	$ -	$ 8,071.70	$ 109,239.74	13.5
Breakage Fee							$ 1,700.00	
PA Cost							$ 1,446.32	
Total		**$ 3,252.83**	**$ 6,911.81**	**$ -**	**$ 245**	**$10,409.65**	**$ 141,290.56**	**13.6**

SAVINGS CALCULATION METHODOLOGY

FIMs were developed using spreadsheet models and engineering calculations. Energy using equipment was measured to determine power consumption, kW. Extensive data logging of equipment was also used to determine energy consumption, kWh. Savings calculations are provided as in Section H, Appendices.

LIGHTING RETROFIT

The following section describes all lighting scope of work proposed for implementation.

PROJECT SCOPE – EXTERIOR LIGHTING

LED Replacement for High Intensity Discharge Exterior

The replacement of HID (high intensity discharge), including metal halide or high-pressure sodium n exterior applications provides significant energy reduction opportunities when changing over to LED. For exterior pole mounted applications, often the number of fixtures can be reduce based on the improved photometric and light distribution of the new LED fixtures that wasn't previously available in HID fixtures. All proposed LED fixtures are from recognized manufacturers that have met the required standards for light quality, efficiency and longevity. In our design effort and fixture selection process, consideration is given to the maintenance benefits of the prescribed solution resulting in less future costs to maintain exterior fixtures in difficult to reach applications. The proposed LED fixture replacement has been specified to furnish light levels that are in compliance with recommended light levels and support the existing site condition requirements. Where time clocks or automated lighting controls are not in place, proposed LED building and site lighting will incorporate an integral photocell to maximize energy savings.

In general, the design approach is to replace existing HID luminaires with new LED luminaires of like type, ie: shoeboxes, wallpacks, floodlights. Some fixture types are replaced with new LED fixtures of a different type, ie: recessed canopy lights replaced with low profile LED canopy lights.

Where deemed appropriate in parks and office buildings, integral occupancy sensors have been used on pole mounted shoebox luminaires in parking lots to automatically dim the lighting during hours of inactivity.

Decorative post top luminaires, recessed step lights, and bollards typically use low wattage HID lamps in architectural form factors. Replacement luminaires of this type are relatively high in cost, with relatively low energy savings potential. As a result, the proposed design typically calls for removing the HID lamp and ballast, and installing a new screw based LED lamp.

LED Replacement for Fluorescent Exterior

Luminaires with pin based compact fluorescent lamps will generally be retrofit by removing the existing fluorescent lamps and ballast, and installing new line voltage, pin based LED lamps. Existing screw based incandescent and fluorescent lamps will be replaced with new screw based LED lamps.

Exterior fixtures with existing linear fluorescent lamps, such as surface mounted enclosed and gasketed fixtures in park pavilions are evaluated for fixture condition, and either retrofit with new LED T8, UL Type B lamps, or replaced with new luminaires utilizing dedicated LED boards and drivers.

Exterior Lighting Retrofit Scope

BUILDING	EXISTING & RETROFIT STANDARD LEGEND DESCRIPTIONS	EXISTING QTY	RETROFIT QTY
LIBRARY, LC, Lauderhill	Existing Excluded due to lack of cost effective replacement or more efficient option - No Retrofit Proposed	2	2
	Existing High Intensity Discharge - Proposed New LED Fixture	19	19
	Existing Compact Fluorescent - Proposed Retrofit LED	14	14

SAVINGS

The energy and cost savings were developed using a spreadsheet model. In the analysis, the existing lighting wattage per fixture was reduced to reflect the installation of higher efficiency technology. A detailed room by room survey of the facility, available in Section H, Appendices, was performed to accurately determine the existing lighting type and quantity.

The runtime operations of the new lighting fixtures are reduced in areas that are recommended for lighting occupancy sensors. This runtime reduction was determined based on the results of lighting and occupancy data logging sessions conducted at various facilities. The results of these data logging session, as well as the resulting hour of operations of lights per space type are provided also provided in Section H, Appendices.

FIM SAVINGS SUMMARY

Annual Electric Consumption: 23,268 kWh
Annual Electric Demand: 64.98 kW

FIM Financial Summary

Building or Facility	Description	SAVINGS Electric KWh $	SAVINGS Electric KW $	SAVINGS Water $	SAVINGS O & M	Total Savings	Project Costs	Simple Payback
Lauderhill Library	Lighting - Exterior	$ 1,349.53	$ 743.41	$ -	$ 245	$ 2,337.95	$ 28,904.50	12.4

MECHANICAL

As DX equipment ages and the condition of the equipment deteriorate, the energy efficiency of these units also degrades. In recent years the energy efficiency of DX equipment has improved due to mandates as well as manufacture improvements. DX air-conditioning systems are rated by their Seasonal Energy Efficiency Ratios (SEER). The higher the SEER rating the more energy efficient the units are. Older units have average SEER ratings between 8-10 while new units have average SEER ratings of 13 or greater.

Cooling for the building is provided by a split package system consisting of two (2) condensing units (roughly 15 and 30 tons in size) that serve one, large air handling unit (AHU). The AHU resides in an adjacent mechanical room on the exterior of the building.

PROJECT SCOPE

This FIM addresses the replacement of two (2) DX systems. For the 30 ton system the AHU is in good physical condition; therefore, the coils will be replaced in order to accommodate the change from R-22 to R-410A. The coils of the pre-cool outside air unit will be changed as well. For the 15 ton unit both the condensing unit and air handler will be changed.

Scope of Work

Building	Equipment	Make	Model	Tons	Existing EER	New EER
Lauderhill Library	Condenser	York	HB360C00A4	30	9.5	11.7
Lauderhill Library	Condenser	York	HB180C00A	15	9.7	12.8
Lauderhill Library	AHU	York				
Lauderhill Library	OA Pre Cool Coil					
Lauderhill Library	AHU Coil					

SAVINGS

The energy and cost savings were developed using a spreadsheet model. Using nameplate data, onsite electrical spot measurements, and data logging information, the total HVAC electrical contribution of this facility's electric utility bill was determined. The calculations took into consideration current conditions and efficiencies. Savings were obtained by replacing existing efficiency values with the higher efficiency value of the new equipment; as published by the manufacturer. The detailed calculations are available in the Section H, Appendices. All calculations were based off Trane manufacturer cut-sheets, also provided.