US EPA ARCHIVE DOCUMENT

GETTING IT FUNDED: FINDING FUNDING FOR YOUR CLEAN ENERGY PROGRAMS

A case study of the City of Orlando Revolving Energy Fund, Energy Manager position, and lessons learned from the implementation of the ARRA Energy Efficiency Conservation Block Grant.

- ARRA EECBG Project Details
- Reasoning behind the Revolving Energy Fund
- Importance of long-term sustainability funds
- Decision maker buy-in
- Funding challenges
- Keys to Success

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ARRA EECBG Project Details

Energy Manager – seeded from ARRA EECBG

Scope of work – Controls (most important), HVAC, lighting

Results: $70k after 6 months, tracking right with the EOR's estimate of $140k annually

1	Facility	Est $ saved	Actual $ saved/yr	Est. implement $	Actual $	ROI	kWh before	Est kWh saved	Real kWh saved	Months	Est kWh after	Actual kWh after	Est % savings	real % savings	On target?	Notes
2		annual	(to date, see notes column)			yrs	annual	annual	(to date)		annual	prev 12 months	annual	(to date)		
3	FM91 Colonialtown	$300.00	$1,203.06	$12,000.00	$18,205.00	10.09	75,262	2,941	15,496	8	72,321	59,796	3.91	20.59	exceeded	Record from 8/9/11
4	FM261 Claudia Allen	$1,128.00	$8,181.12	$20,000.00	$28,705.00	2.34	323,959	11,275	106,869	8	312,684	217,090	3.48	32.99	exceeded	Record from 8/5/11
5	FM566 Wadeview	$2,536.00	$1,345.32	$53,640.00	$63,800.00	11.86	254,331	25,354	17,936	3	228,977	236,396	9.97	7.05	yes	Record from 12/30/11
6	FM789 Rock Lake	$330.00	-$195.68	$20,000.00	$18,705.00	X	135,625	3,304	(3,046)	3	132,321	138,671	2.44	X	no	Record from 1/4/12
7	FM180/600 Facilities	$45,429.00	$8,583.41	$142,760.00	$277,700.00	10.78	1,064,715	454,693	102,189	4	610,022	962,526	42.71	9.60	no	Record from 12/13/11
8	FM361/2 Solid Waste	$7,164.00	$1,760.68	$42,240.00	$73,900.00	17.49	232,753	71,647	25,335	5	161,106	207,418	30.78	10.88	no	Record from 11/11/11
9	FM568 Streets & Drainage	$17,172.00	$3,796.71	$75,400.00	$74,500.00	8.18	180,582	22,320	49,379	5	158,262	131,203	12.36	27.34	yes	Record from 11/18/11
10	FM72 FS2	$7,593.00	$2,230.14	$44,620.00	$62,795.00	18.77	185,726	76,672	28,600	8	109,054	157,126	41.28	15.40	no	Record from 8/25/11
11	FM73 FS3	$1,721.00	$778.64	$27,140.00	$50,714.00	37.99	114,229	17,952	9,412	7	96,277	104,817	15.72	8.24	no	Record from 9/7/11
12	FM147 FS4	$1,721.00	$141.50	$25,460.00	$42,800.00	176.44	76,896	17,958	1,600	7	58,938	75,296	23.35	2.08	no	Record from 9/9/11
13	FM167 FS5	$1,388.00	$278.57	$24,620.00	$42,500.00	76.28	71,125	14,627	3,282	6	56,498	67,843	20.57	4.61	no	Record from 9/19/11
14	FM148 FS6	$2,955.00	$863.65	$35,860.00	$44,900.00	25.99	136,404	38,545	10,819	6	97,859	125,585	28.26	7.93	no	Record from 9/27/11
15	FM2179 FS7	$0.00	$3,686.58	$12,000.00	$41,305.00	7.47	307,107	-	46,932	8	307,107	260,174	0.00	15.28	exceeded	Record from 8/3/11
16	FM378 FS8	$3,728.00	$4,543.42	$24,260.00	$53,600.00	5.90	239,957	38,034	53,363	6	201,923	186,593	15.85	22.24	exceeded	Record from 10/14/11
17	FM203 FS10	$2,581.00	$877.50	$24,260.00	$56,280.00	21.38	170,150	26,566	10,404	4	143,584	159,746	15.61	6.11	yes	Record from 12/5/11
18	FM166 FS11	$1,982.00	$764.86	$25,940.00	$38,780.00	25.35	152,862	20,565	7,158	6	132,297	145,704	13.45	4.68	no	Record from 10/4/11
19	FM2105 FS13	$1,886.00	$738.98	$21,740.00	$30,305.00	20.50	70,609	19,607	7,575	6	51,002	63,034	27.77	10.73	no	Record from 10/7/11
20	FM 575 Fire EMS	$2,207.00	$1,057.01	$43,600.00	$17,805.00	4.21	110,445	4,036	13,445	3	106,409	97,001	3.65	12.17	yes	Record from 12/27/11
21	FM 17 Ivey Lane	$869.00	$351.79	$21,760.00	$14,735.00	13.96	42,302	1,590	2,845	4	40,712	39,457	3.76	6.73	yes	Record from 12/19/11
22	FM 76 Lock Haven	$112.00	$4,797.13	$14,000.00	$21,905.00	3.42	142,906	1,122	62,979	9	141,784	84,396	0.79	44.07	exceeded	Record from 7/19/11
23	FM 372 OPD Drug	$1,656.00	$939.85	$35,200.00	$48,200.00	17.09	114,923	16,563	8,540	4	98,360	106,384	14.41	7.43	yes	Record from 11/28/11
24	FM 367 Wastewater Ops	$20,389.00	$5,471.21	$105,640.00	$116,400.00	7.09	641,800	203,895	68,626	4	437,905	573,174	31.77	10.69	yes	Record from 1/4/12
25	FM 540 Mennello Museum	7,145.00	$889.20	$71,550.00	$83,000.00	38.89	220,040	71,450	10,137	5	148,590	209,903	32.47	4.61	no	Record from 10/27/11
26	FM 750 Primrose Plaza	5,000.00	$16,444.00	$35,000.00	$89,700.00	3.18	837,036	50,000	214,100	7	787,036	622,935	5.97	25.58	exceeded	Record from 9/16/11
27	FM 191 Conserv II Admin	2,350.00	0.00	$20,000.00	$28,405.00		0	0	0		0	98,740	0.00	0.00		Record from 7/27/11
28			$69,528.65	$978,690.00	$1,439,644.00		5,901,744	1,210,716	873,975	6	4,691,028	5,027,769	20.51	14.81		
29	EOR Estimated	$139,342.00														
30	Estimated from to-date	$147,237.14		EOR ESTIMATED	TO DATE											
31	To-date savings	$69,528.65	Mobilization & Demobilization		$78,967.20											
32			Bond & Insurance		$24,600.00											
33			Change Orders (3)		$92,347.42	%	5.255									
34			consultant fee	$121,815.16	$121,815.16		Projected									
35			total	$1,100,505.16	$1,757,373.78		$1,757,373.78									
36			ROI inc TLC fees	7.90	25.28		11.94									
37																
38			ROI (yr)	7.02	20.71		11.11									

Reasoning behind the Revolving Energy Fund

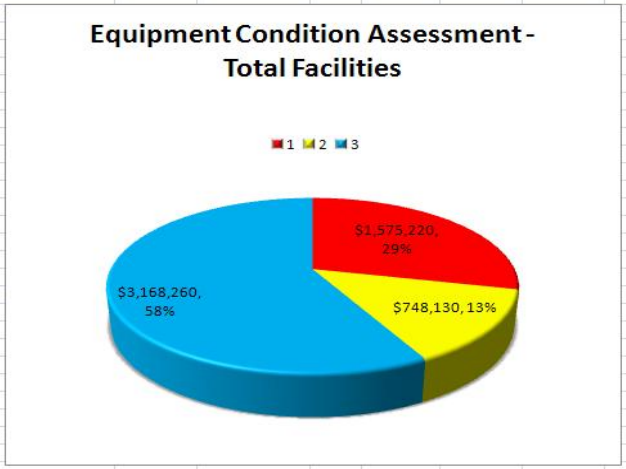
- Reducing emergency funds & strategizing deferred maintenance
- Turning seed money into a long-term sustainability budget
  - Post-ARRA plan
- Sources for Revolving Loan Funds if there's no seed money to kick it off:
  - Utility incentives/rebates
  - Sustainable construction projects
  - Routine replacement of capital assets w/ higher efficiency

ogram	fm no	site name	bldg name/occupancy	Equipment Tag / Size & Type	year installed	ECA	Remaining Equipment Life	Equipment age	Current Replacement Value	Tonnage
FPR	160	ENGELWOOD	RECREATION CENTER	CH-1 / 130 Ton Air Cooled Chiller	2010	3	19	1	$98,000	130.0
FPR	160	ENGELWOOD	RECREATION CENTER	AHU-1 / 11.5k CFM Air Handling Unit	1998	3	7	13	$10,000	
FPR	160	ENGELWOOD	RECREATION CENTER	AHU-2 / 15k CFM VAV AHU	1998	3	7	13	$12,000	
FPR	160	ENGELWOOD	RECREATION CENTER	AHU-3 / 8.5k CFM VAV AHU	1998	3	7	13	$8,000	
FPR	160	ENGELWOOD	RECREATION CENTER	P-1 / 7.5 HP CHW Pump	1998	2	2	13	$4,500	
FPR	160	ENGELWOOD	RECREATION CENTER	P-2 / 7.5 HP CHW Pump	1998	2	2	13	$4,500	
									$137,000	
FPR	566	WADEVIEW PARK	RECREATION CENTER	AHU-A & CU-A / 3.5 Ton DX Split	1990	1	gone	21	$5,500	3.5
FPR	566	WADEVIEW PARK	RECREATION CENTER	AHU-B & CU-B / 3 Ton DX Split	1990	1	gone	21	$5,500	3.0
FPR	566	WADEVIEW PARK	RECREATION CENTER	AHU-C & CU-C / 3 Ton DX Split	1990	1	gone	21	$5,500	3.0
FPR	566	WADEVIEW PARK	RECREATION CENTER	AHU-D & CU-D / 5.5 Ton DX Split	1990	1	gone	21	$7,500	5.5
FPR	566	WADEVIEW PARK	RECREATION CENTER	AHU-E & CU-E / 7.5 Ton DX Split	2010	3	14	1	$9,500	7.5
									$33,500	
OFD	599	FIRE STATION 12	FIRE STATION	AH-1 / 6.3k CFM DX Mulit-zone AHU	1996	1	gone	15	$11,000	
OFD	599	FIRE STATION 12	FIRE STATION	CU-1 / 20 Ton DX Condenser	1996	1	gone	15	$6,500	20.0
									$17,500	
FPR	201	DR. SMITH CENTER	RECREATION CENTER	AHU-1 & CU-1 / 1.5 Ton DX Split	1983	1	gone	28	$3,000	1.5
FPR	201	DR. SMITH CENTER	RECREATION CENTER	AHU-2 / 2.2k CFM DX AHU	1983	1	gone	28	$5,000	
FPR	201	DR. SMITH CENTER	RECREATION CENTER	CU-2 / 5 Ton DX Condesner	2008	3	12	3	$3,000	5.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	AHU-3 / 6k CFM DX AHU	1997	2	1	14	$7,000	
FPR	201	DR. SMITH CENTER	RECREATION CENTER	CU-1A / 5 Ton DX Condenser	2008	3	12	3	$3,000	5.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	CU-1B / 5 Ton DX Condesner	2008	3	12	3	$3,000	5.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	CU-2A / 5 Ton DX Condenser	2008	3	12	3	$3,000	5.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	CU-2B / 5 Ton DX Condenser	2008	3	12	3	$3,000	5.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	AHU-4 & CU-4 / 5 Ton DX Split	1997	2	1	14	$7,500	5.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	P-1 / 9 Ton DX Rooftop Package Unit	1997	2	1	14	$20,500	9.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	P-2 / 9 Ton DX Rooftop Package Unit	1997	2	1	14	$20,500	9.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	P-3 / 9 Ton DX Rooftop Package Unit	1997	2	1	14	$20,500	9.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	P-4 / 9 Ton DX Rooftop Package Unit	2005	3	9	6	$20,500	9.0
FPR	201	DR. SMITH CENTER	RECREATION CENTER	P-5 / 8.5 Ton DX Rooftop Package Unit	1997	2	1	14	$19,500	8.5
FPR	201	DR. SMITH CENTER	RECREATION CENTER	P-6 / 9 Ton DX Rooftop Package Unit	1997	2	1	14	$20,500	9.0
									$159,500	
FPR	168	JACKSON CENTER	RECREATION CENTER	AHU-1 & CU-1 / 3.5 Ton DX Split	1995	1	gone	16	$5,500	3.5
FPR	168	JACKSON CENTER	RECREATION CENTER	AHU-2 & CU-2 / 3.5 Ton DX Split	1995	1	gone	16	$5,500	3.5

ECA scale of 1 to 3 (1 = imminent failure, 2 = nearing end of useful life, 3 = fully functional)

Total ECA = 1 cost	$1,575,220	ECA = 1	$1,575,220
1 year out	$136,670	ECA = 2	$748,130
2 years out	$470,130	ECA = 3	$3,168,260
3 years out	$141,330		
HVAC inventory	$5,491,610		

Total tonnage 3710.0
5.3 million sq ft



Decision Maker Buy-in: justifying the cost

- Savings that makes sense – long term sustainability planning: A city-wide initiative
- Funding challenges
  - Access to capital
  - Lowest hanging fruit for fastest payback: proof of concept projects
  - How to avoid having the savings skimmed off for "budget reductions"
- How our Revolving Energy Fund works
  - Payback mechanics: Estimated savings vs reality
  - REF fund recycling: how to make it grow
- ESCO's

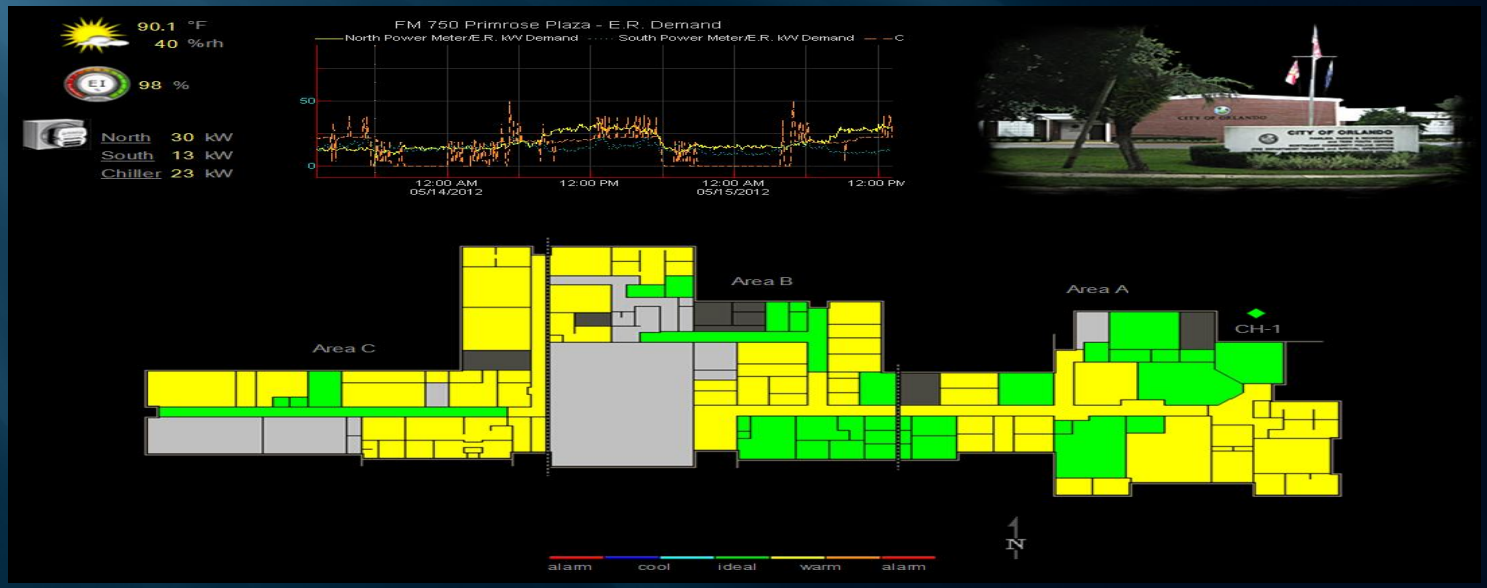
Keys to Success: On-staff Energy Manager

- **The Energy Manager position should be self sustaining**
  - Mechanical Engineering background
  - Construction and Controls experience
  - Professional Certifications
- **Latitude to operate as an outside consultant from within your organization**
- **Sustainability Champion: Source for current energy efficiency and renewable energy technologies and rebate opportunities**
- **Bridging the gap between design, operation, and maintenance professionals**

Keys to Success & Savings drivers: EMS Controls

Controls – the infrastructure to bring it all together

- The heart of our energy efficiency project was the installation of a Web-based native BACnet Energy Management System (EMS) infrastructure
- This tool allows us to fine tune the programmed operations of our equipment located at the 26 project sites addressed with this grant, perform real time energy and efficiency calculations, remote troubleshoot equipment failures, trend and report any pertinent building metric we can develop from control input/output points, and graphically display the real-time indoor climate, environmental quality, and power consumption of these facilities.



Keys to Success: beyond ROI's and life cycle cost analysis

- **Lighting – the lowest hanging fruit (usually)**
  - Before even considering replacing lights with higher efficiencies, focus on shutting off the lights that don't need to be on. We've installed occupancy sensors in spaces where 24/7 lighting is unnecessary, and have modified our site lighting circuits to operate off either a photocell, programmable timer, or integrated the contactors into our EMS.
  - Photometrics: a MUST for lighting retrofits. Before you buy into the dog and pony show of LED vendors, have them provide you with an .ies photometric file of your existing lighting levels vs their proposed.

Step 1. Enter data your data in the table below to calculate how much you could save:

Lighting Systems		Present Lamp	LED Lamp	
Lamp Description		MH Shoebox	LED Multi Use Fixture	
Lamp Retail Price ($)	P	$150.00	$1,050.00	$
Lamp Wattage (W_L)	W_L	400	96	Watts
Lamp Life (Hrs)	L	10,000	80,000	Hours
Daily Operating Hours (Hrs)	H_D	12		Hours
Average Labor Rate per Lamp ($/Lp)	R_L	$45.53		($/Lp)
Average Electricity Rate per KWH ($) - [5% Annual Inc.]	R_E	$0.085		$
Total Number of Existing Bulbs In Use in 1 Location	N_E	21		pcs
Total Number of Proposed Bulbs In Use in 1 Location	N_P	21		pcs
Total Number of Locations	S	1		Location(s)

Note: Required Data Fields

Result 1. Calculation Results:

SYSTEMS SUMMARY		Present Lamp	LED Lamp	
Lamp Part Number		MH Shoebox	LED Multi Use Fixture	
Lamp Retail Price ($)	P	$150.00	$1,050.00	$
Lamp Wattage (W_L) + Ballast Wattage (10%)	W_L	400	96	Watts
Published Lamp Life (Hrs)	L	10,000	80,000	Hours
Estimated Usage Life in Year (Yrs)	Y	2.28	18.26	Year(s)
Annual Operating Hours (Hrs) H_A=365xH_D	H_A	4380		Hours
Average Labor Rate per Lamp ($/Lp)	R_L	$45.53		($/Lp)
Average Electricity Rate per KWH ($) - [5% Annual Inc.]	R_E	$0.085		$
Total Number of Existing Bulbs In Use in 1 Location	N_E	21		pcs
Total Number of Proposed Bulbs In Use in 1 Location	N_P	21		pcs
Total Number of Stores/Locations	S	1		Location(s)

Result 2. Annual System Operating Cost Comparison:

ANNUAL OPERATING COST		Present Lamp	LED Lamp
Bulb Cost BC=(H_A/L)xPxN	BC	$1,379.70	$1,207.24
Labor Cost to Re-lamp LC=(H_A/L)xR_LxN+RC	LC	$418.77	$0.00
Avg. Annual Electric Cost EC=(WxH$_A$xR_ExN)/1000	EC	$3,127.32	$750.56
Total Operating Cost TC=BC+LC+EC	TC	$4,925.79	$1,957.79

Result 3. Estimated Annual Savings:

ANNUAL SAVINGS PER STORE/LOCATION FOR USING LED LAMPS			ANNUAL SAVINGS: KWH	CARBON (TONS)
Annual Electric Bill Savings AE=EC_{lamp}-EC_{LED}	AE	$2,376.76	27,962	22.13
Total Annual Savings AS=TC_{lamp}-TC_{LED}	AS	$2,967.99		
Return on Investment ROI=[AS/(P_{LED}-P_{lamp})xN]x100%	ROI	16%	LED LIFE SAVINGS: KWH	CARBON (TONS)
Energy Bill Savings Over LED Lamp Life	ES	$43,411.20	510,720	404.23
Total Savings Over LED Lamp Life	TS	$54,209.92		

*** YOUR INITIAL LABOR COST	1	LOCATION(S) IS ======>	$956.09
*** YOUR INITIAL LAMP COST	1	LOCATION(S) IS ======>	$22,050.00
*YOUR INITIAL LAMP/LABOR COST	1	LOCATION(S) IS ======>	$23,006.09
*** YOUR ESTIMATED ANNUAL SAVINGS FOR	1	LOCATION(S) IS ======>	$2,967.99
		PAYBACK (Years) IS ======>	7.8

Result 4. Estimated Multiple Stores/Years Savings:

PROJECTED SAVINGS FOR ADDITIONAL STORES USING LED LAMPS

NUMBER OF LOCATIONS	1 YEAR	5 YEARS	OVER LIFE OF LED
1	$2,967.99	$14,839.96	$54,209.92

Savings drivers continued: HVAC

- **HVAC – the lion's share of your power consumption**
  - Factor in your rebate structure when replacing your HVAC systems
  - Target equipment that is near the end of it's useful life.

  - We've enacted a policy with our maintenance department and mechanical contractors that they are to perform a cost analysis of the minimum code equipment vs. the highest efficiency equipment that is appropriate for the application that will pay for itself within 5 years, factoring in rebates.

  - With a BAS now in place, this calculator can be refined to a more exact number of runtime hours for each specific piece of equipment, whereas before ASHRAE Std. 90.1 design data for our climate zone was used.

5 Ton Direct Expansion Split System (example from Beardall). 13 SEER installed price estimated based on quotes for 15,16 SEER.

SEER Rating	OUC Rebate	Installed Cost (less rebate)		Δup front cost	kW draw	$, kWh/yr	$, kW/yr	Annual oper. cost	Δ operating $	Payback vs base
13	0	$5,889		Baseline	4.7	$988	$451.20	$1,439.26	Baseline	Baseline
15	$500	$6,395		$506	4	$841	$384.00	$1,224.90	$214.36	2.36
16	$600	$6,798		$909	3.75	$788	$360.00	$1,148.34	$290.91	3.12

Constants:			
Cooling hours	2803		
kWh charge	$0.075	$0.1174	if no demand charge at site
kW demand charge	$8		
Note: 13 SEER is minimum energy efficiency per FL code			

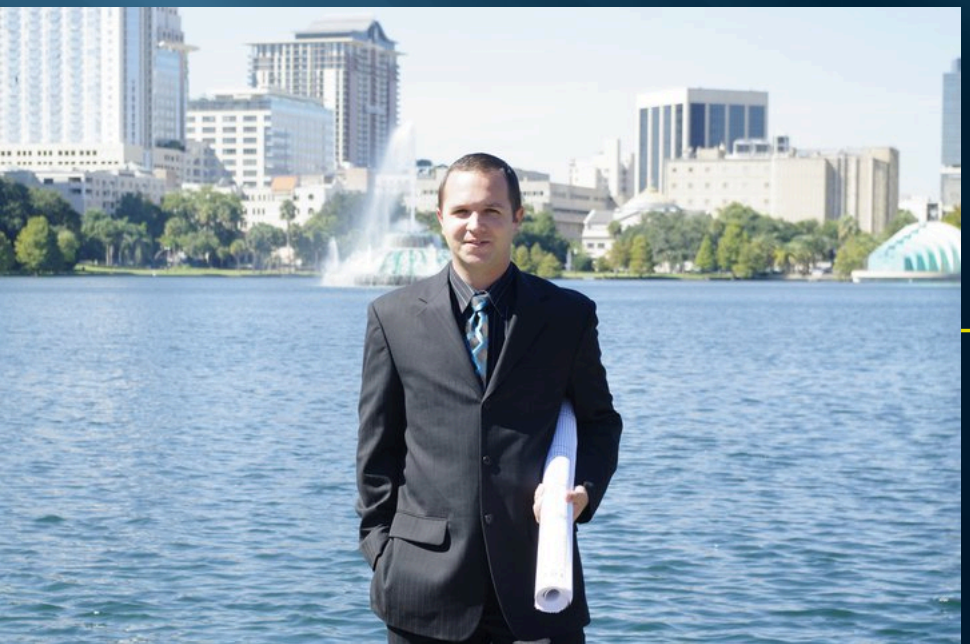
kW = (BTU/hr)/SEER

4 Ton Direct Expansion Split System (example from Parks & Rec).

kBtu	SEER Rating	OUC Rebate	Equipment cost inc rebate	installed cost less rebate	Δup front cost	kW draw	$, kWh/yr	$, kW/yr	Annual oper. cost	Δ operating $	Payback vs base	lifecycle energy savings vs baseline	total life cycle cost
48	13	0	3530	6445	0	3.69	$1,215	0	$1,215	0	0		$24,670.54
48	18	1010	6760	10685	3230	2.67	$878	0	$878	$338	9.57	$5,062.65	$23,847.89

You can find our official Municipal Sustainability Plan at

http://www.cityoforlando.net/elected/greenworks/pdf/sustainabilitybook_web.pdf



If you have any questions, please feel free to contact me at

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Thank you!