



Brattleboro Memorial Hospital - Energy Action Plan (2014-15)

Purpose: To reduce operational cost savings, improve building comfort & performance, improve the patient care experience, and reduce our environmental impact.

Current: Annual energy costs (baseline): \$ 2,632,106

Annual energy use per square-foot: 251 kBtu

Goals: Reduce energy costs by 3%: \$ 78,963

Reduce energy use per sq-ft by 3%: 244 kBtu

Signed: Robert Prohaska
Rob Prohaska, Director Plant Services

Team: Rob Prohaska, Gary Swindler (EVT), David Adams (EVT), John Penney (JFPCS)



Signed: David Adams
David Adams - Staff Manager, Account Management

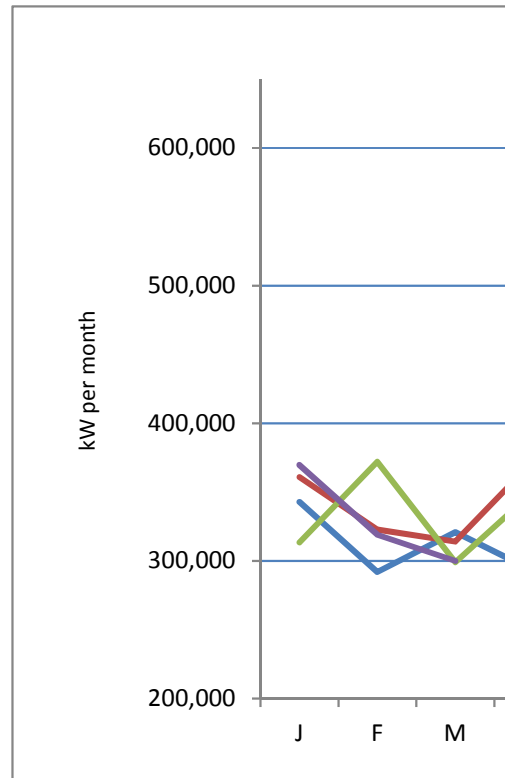
Action Plan			Completed Efforts / 2012- Present						
	Project Costs	Annual Savings	Project Description	Date	Proj. Costs	Incentives	Annual Savings	kWh Reduce	Oil (gallons)
1. Upgrade of chilled water plant systems			Lighting - LED wall packs & canopy	Jun12	\$ 2,884	\$ 1,320	\$ 709	8,909	
Oct14	Upgrade chiller to VSD	\$ 270,000	\$ 15,250	Lab exhaust study	Aug12	\$ 4,200	\$ 3,150	\$ -	\$ -
Oct14	Add DP to VFD serving CW pumps	\$ 12,000	\$ 5,500	HVAC	Sep12	\$ 5,000	\$ 2,500	\$ 1,521	11,561
Oct14	CW temperature reset	\$ 4,000	\$ 4,600	Lighting - HBOT area	Apr13	\$ 2,480	\$ 500	\$ 690	2,552
2. Optimization of building HVAC systems			Energy audit - JFPCS	Nov14	\$ 9,800	\$ 4,900	\$ -	\$ -	\$ -
Nov13	Energy audit conducted by JFPCS (cost share with EVT)	\$ 9,800	\$ -	Exterior LED - pole mounted	Jan14	\$ 4,750	\$ 3,250	\$ 1,635	11,864
Nov14	VAV SP Setpoint Reset - Richards	\$ 4,000	\$ 3,143	Various measures from JFPCS audit	May14	\$ 34,100	\$ 7,900	\$ 3,705	41,168
Nov14	AC-1 serving the OR Suite - add unoccupied cycle	\$ 6,700	\$ 16,099						
Nov14	AC-1 serving the OR Suite - add economizer cycle	\$ 14,900	\$ 5,994						
Nov15	Add VFDs to heating pumps	\$ 9,700	\$ 2,150						
3. Pursue targeted upgrades of lighting to LEDs			Totals:		\$ 63,214	\$ 23,520	\$ 8,260	76,054	345
Jul14	Replace helipad lighting with LED bollards	\$ -	\$ -	Results & Energy Star Impacts					
Jul14	Replacing parking lot lighting with LEDs	\$ -	\$ -						
Oct14	Conduct lighting audit of targeted spaces for potential upgrades/controls	\$ -	\$ -	← kBtu per square-foot					
4. Hospital renovation projects									
Jul14	ER, MRI, and entranceway	\$ -	\$ 5,000						
Oct16	OR suite expansion								
Oct17	Boiler room renovation								
5. Employee engagement through energy workshops & campaigns									
Jan15	Host a Kaizen event to focus on energy waste in targeted hospital areas								
Apr15	Launch Employee Energy Challenge								
6. Build efficiency into operations & maintenance practices and new designs									
Aug14	Upgrade circulator pumps to Grundfos technology								
Sep14	Kitchen - equipment and operational changes								
Oct14	Verify operational control strategies & scheduling for HVAC systems								
Nov14	Institute use of SkySpark as a facilities management tool								
		\$ 331,100	\$ 57,736						

Square footage: 165000

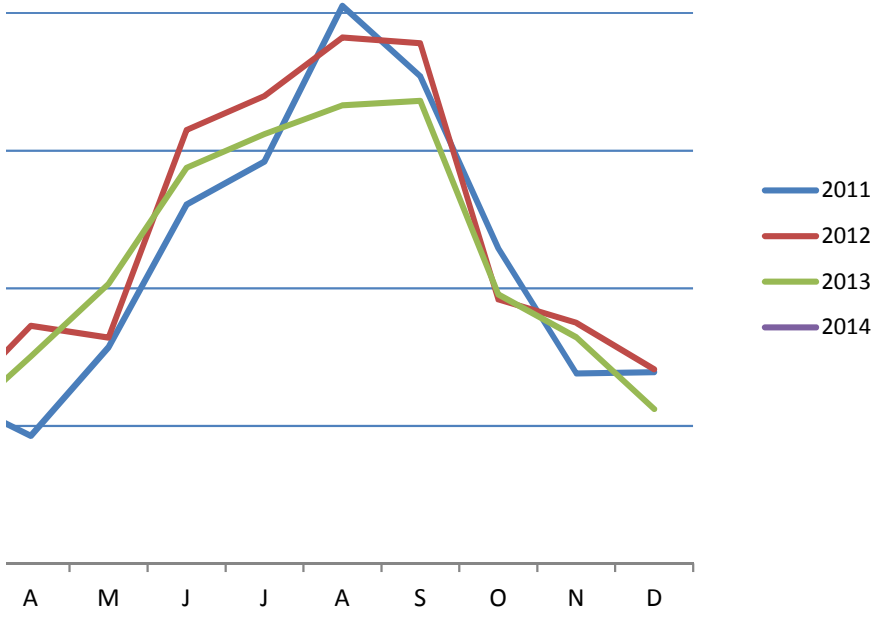
Utility Usage Data			Btu per Square-foot Calcs			
Month	Electricity (kW)	Oil (gal)	kBtu			kBtu/sq-ft
	Hospital		Electricity	Oil	Total	
Last 12mo	4,883,314	176,950	16661867.37	603753.4	17265620.77	
Feb14	299,941	20,690	1023398.692	2855220	3878618.692	249
Jan14	319,143	27,548	1088915.916	3801624	4890539.916	249
Dec13	369,708	13,787	1261443.696	1902606	3164049.696	248
Nov13	312,380	13,727	1065840.56	1894326	2960166.56	246
Oct13	364,280	13,743	1242923.36	1896534	3139457.36	252
Sep13	395,466	6,845	1349329.992	944610	2293939.992	251
Aug13	536,207	13,710	1829538.284	1891980	3721518.284	251
Jul13	533,008	6,465	1818623.296	892170	2710793.296	251
Jun13	512,121	13,717	1747356.852	1892946	3640302.852	252
May13	487,575	6,872	1663605.9	948336	2611941.9	252
Apr13	403,104	26,538	1375390.848	3662244	5037634.848	257
Mar13	350,381	13,308	1195499.972	1836504	3032003.972	245
Feb13	299,029	20,201	1020286.948	2787738	3808024.948	245
Jan13	372,142	26,117	1269748.504	3604146	4873894.504	244
Dec12	313,484	12,834	1069607.408	1771092	2840699.408	243
Nov12	341,185	19,332	1164123.22	2667816	3831939.22	249
Oct12	374,889	12,767	1279121.268	1761846	3040967.268	249
Sep12	391,842	6,364	1336964.904	878232	2215196.904	243
Aug12	578,079	12,755	1972405.548	1760190	3732595.548	249
Jul12	582,322	6,433	1986882.664	887754	2874636.664	249
Jun12	539,642	12,779	1841258.504	1763502	3604760.504	249
May12	515,073	12,820	1757429.076	1769160	3526589.076	248
Apr12	364,115	12,829	1242360.38	1770402	3012762.38	247
Mar12	372,698	12,843	1271645.576	1772334	3043979.576	247
Feb12	314,049	19,281	1071535.188	2660778	3732313.188	251
Jan12	322,869	25,631	1101629.028	3537078	4638707.028	256
Dec11	360,860	19,265	1231254.32	2658570	3889824.32	250
Nov11	339,146	19,257	1157166.152	2657466	3814632.152	
Oct11	338,106	6,392	1153617.672	882096	2035713.672	
Sep11	429,088	12,754	1464048.256	1760052	3224100.256	
Aug11	554,063	12,860	1890462.956	1774680	3665142.956	
Jul11	605,244	6,387	2065092.528	881406	2946498.528	
Jun11	492,056	12,787	1678895.072	1764606	3443501.072	
May11	460,944	12,934	1572740.928	1784892	3357632.928	
Apr11	357,073	12,665	1218333.076	1747770	2966103.076	
Mar11	292,683	19,407	998634.396	2678166	3676800.396	
Feb11	320,957	25,750	1095105.284	3553500	4648605.284	
Jan11	291,952	19,307	996140.224	2664366	3660506.224	
Dec10	342,796	0	1169619.952	0	1169619.952	

READDATE	YEAR	YEAR2	MONTH	MONTH	MAX(DAYS)	KWHTOT	KWHPEAK	KWHOFF	KWPEAK	
1/14/2011	2011	2011	J		1	32	342796	185900	156896	568
2/11/2011	2011		F		2	28	291952	152648	139304	559
3/14/2011	2011		M		3	31	320957	162167	158790	669
4/11/2011	2011		A		4	28	292683	152344	140339	753
5/10/2011	2011		M		5	29	357073	193866	163207	919
6/9/2011	2011		J		6	30	460944	251112	209832	1164
7/9/2011	2011		J		7	30	492056	268447	223609	1082
8/10/2011	2011		A		8	32	605244	306557	298687	1220
9/12/2011	2011		S		9	33	554063	281726	272337	1072
10/11/2011	2011		O		10	29	429088	233919	195169	1035
11/9/2011	2011		N		11	29	338106	183219	154887	797
12/9/2011	2011		D		12	30	339146	183251	155895	748
1/10/2012	2012	2012	J		1	32	360860	179208	181652	603
2/9/2012	2012		F		2	30	322869	173114	149755	706
3/9/2012	2012		M		3	29	314049	166660	147389	785
4/10/2012	2012		A		4	32	372698	193270	179428	885
5/9/2012	2012		M		5	29	364115	194994	169121	971
6/11/2012	2012		J		6	33	515073	263372	251701	1131
7/11/2012	2012		J		7	30	539642	290575	249067	1193
8/10/2012	2012		A		8	30	582322	310840	271482	1143
9/12/2012	2012		S		9	33	578079	293300	284779	1040
10/10/2012	2012		O		10	28	391842	209528	182314	911
11/9/2012	2012		N		11	30	374889	201481	173408	829
12/11/2012	2012		D		12	32	341185	172219	168966	779
1/10/2013	2013	2013	J		1	30	313484	166857	146627	599
2/11/2013	2013		F		2	32	372142	186757	185385	781
3/10/2013	2013		M		3	27	299029	159786	139243	660
4/9/2013	2013		A		4	30	350381	179170	171211	785
5/9/2013	2013		M		5	30	403104	223320	179784	869
6/11/2013	2013		J		6	33	487575	253146	234429	1058
7/10/2013	2013		J		7	29	512121	270277	241844	1093
8/9/2013	2013		A		8	30	533008	291908	241100	1093
9/11/2013	2013		S		9	33	536207	279470	256737	1085
10/10/2013	2013		O		10	29	395466	215541	179925	1072
11/11/2013	2013		N		11	32	364280	189343	174937	791
12/10/2013	2013		D		12	29	312380	164554	147826	698
1/13/2014	2014	2014	J		1	34	369708	189567	180141	612
2/11/2014	2014		F		2	29	319143	169914	149229	679
3/11/2014	2014		M		3	28	299941	156315	143626	599

KWOFF	Actual kWh/l	Cost (@0.111/kWh)	Rolling 12-month	
456	10,712	\$	38,050	
444	10,427	\$	32,407	
435	10,353	\$	35,626	
620	10,453	\$	32,488	
716	12,313	\$	39,635	
902	15,365	\$	51,165	
834	16,402	\$	54,618	
1076	18,914	\$	67,182	
945	16,790	\$	61,501	
883	14,796	\$	47,629	
580	11,659	\$	37,530	
594	11,305	\$	37,645	4824108
493	11,277	\$	40,055	4842172
458	10,762	\$	35,838	4873089
564	10,829	\$	34,859	4866181
704	11,647	\$	41,369	4946196
721	12,556	\$	40,417	4953238
897	15,608	\$	57,173	5007367
917	17,988	\$	59,900	5054953
1025	19,411	\$	64,638	5032031
936	17,518	\$	64,167	5056047
755	13,994	\$	43,494	5018801
712	12,496	\$	41,613	5055584
676	10,662	\$	37,872	5057623
494	10,449	\$	34,797	5010247
506	11,629	\$	41,308	5059520
613	11,075	\$	33,192	5044500
627	11,679	\$	38,892	5022183
711	13,437	\$	44,745	5061172
952	14,775	\$	54,121	5033674
969	17,659	\$	56,845	5006153
931	17,767	\$	59,164	4956839
919	16,249	\$	59,519	4914967
756	13,637	\$	43,897	4918591
622	11,384	\$	40,435	4907982
591	10,772	\$	34,674	4879177
551	10,874	\$	41,038	4935401
502	11,005	\$	35,425	4882402
547	10,712	\$	33,293	4883314



Electricity Use (kW)



Oil Usage (gallons)

Month	2014	2013	2012	2011	Diff 2011-12	Diff 2011-13	Diff 2011-2014
J	27548	26,117	25,631	19,307	(6,324)	(6,810)	(8,241)
F	20690	20,201	19,281	25,750	6,469	5,549	5,060
M	13858	13,308	12,843	19,407	6,564	6,099	5,549
A	19716	26,538	12,829	12,665	(164)	(13,873)	(7,051)
M	6419	6,872	12,820	12,934	114	6,062	6,515
J	12841	13,717	12,779	12,787	8	(930)	(54)
J		6,465	6,433	6,387	(46)	(78)	
A		13,710	12,755	12,860	105	(850)	
S		6,845	6,364	12,754	6,390	5,909	
O		13,743	12,767	6,392	(6,375)	(7,351)	
N		13,727	19,332	19,257	(75)	5,530	
D		13,787	12,834	19,265	6,431	5,478	
Totals:	101072	175,030	166,668	179,765	13,097	4,735	1,778

Cost Savings: \$ 39,945.85 \$ 14,441.75 \$ 5,422.90

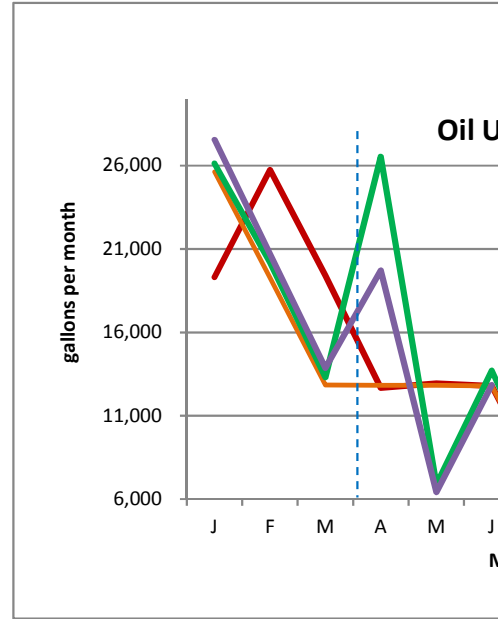
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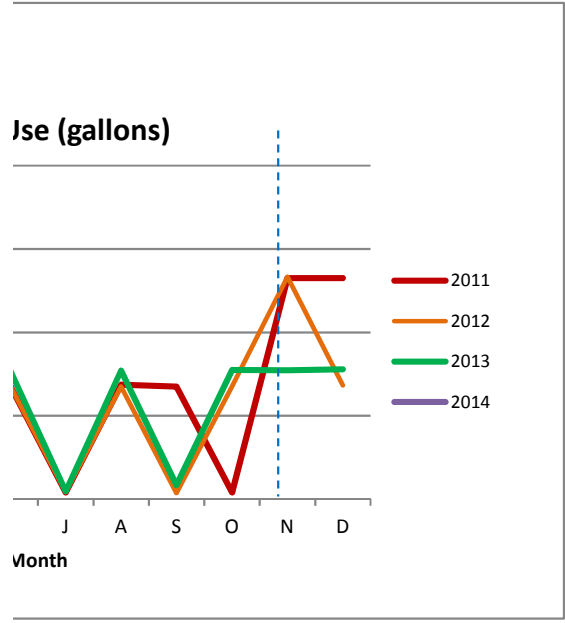
Oil Usage (j Rolling 12-month

Dec-10		0
Jan-11	19,307	19,307
Feb-11	25,750	45,057
Mar-11	19,407	64,464
Apr-11	12,665	77,129
May-11	12,934	90,063
Jun-11	12,787	102,850
Jul-11	6,387	109,237
Aug-11	12,860	122,097
Sep-11	12,754	134,851
Oct-11	6,392	141,243
Nov-11	19,257	160,500
Dec-11	19,265	179,765
Jan-12	25,631	186,089
Feb-12	19,281	179,620
Mar-12	12,843	173,056
Apr-12	12,829	173,220
May-12	12,820	173,106
Jun-12	12,779	173,098
Jul-12	6,433	173,144
Aug-12	12,755	173,039
Sep-12	6,364	166,649
Oct-12	12,767	173,024
Nov-12	19,332	173,099
Dec-12	12,834	166,668
Jan-13	26,117	167,154
Feb-13	20,201	168,074
Mar-13	13,308	168,539
Apr-13	26,538	182,248
May-13	6,872	176,300
Jun-13	13,717	177,238
Jul-13	6,465	177,270
Aug-13	13,710	178,225
Sep-13	6,845	178,706
Oct-13	13,743	179,682
Nov-13	13,727	174,077
Dec-13	13,787	175,030
Jan-14	27,548	176,461
Feb-14	20,690	176,950
Mar-14	13,858	177,500
Apr-14	19,716	170,678
May-14	6,419	170,225
Jun-14	12,841	169,349

Grand Total

\$ 59,810.50





Action Plan

		Project Costs	Annual Savings
1. Upgrade of chilled water plant systems			
Oct14	Upgrade chiller to VSD	\$ 270,000	\$ 15,250
Oct14	Add DP to VFD serving CW pumps	\$ 12,000	\$ 5,500
Oct14	CW temperature reset	\$ 4,000	\$ -
2. Optimization of building HVAC systems			
Nov13	Energy audit conducted by JFPCS (cost share with EVT)	\$ 9,800	\$ -
Nov14	VAV SP Setpoint Reset - Richards	\$ 4,000	\$ -
Nov14	AC-1 serving the OR Suite - add unoccupied cycle	\$ 6,700	\$ -
Nov14	AC-1 serving the OR Suite - add economizer cycle	\$ 14,900	\$ -
Nov15	Add VFDs to heating pumps	\$ 9,700	\$ -
3. Pursue targeted upgrades of lighting to LEDs			
Jul14	Replace helipad lighting with LED bollards	\$ -	\$ 50
Jul14	Replacing parking lot lighting with LEDs	\$ -	\$ 500
Oct14	Conduct lighting audit of targeted spaces for potential upgrades/controls		
16-Oct	Replaced corridor lights on first, second floor and third hosp. floors	\$ 1,200	\$ 1,500
16-Oct	Replaced corridor lights in the MOB	\$ 4,500	\$ 4,500
4. Hospital renovation projects			
Jul14	ER, MRI, and entranceway	\$ -	\$ 5,000
Oct16	OR suite expansion		
Oct17	Boiler room renovation		
Ongoing	LED Lighting retrofits		
5. Employee engagement through energy workshops & campaigns			
Jan15	Host a Kaizen event to focus on energy waste in targeted hospital areas		
Apr15	Launch Employee Energy Challenge		
6. Build efficiency into operations & maintenance practices and new designs			
Aug14	Upgrade circulator pumps to Grundfos technology		
Sep14	Kitchen - equipment and operational changes		\$ 1,000
Oct14	Verify operational control strategies & scheduling for HVAC systems		
Nov14	Institute use of SkySpark as a facilities management tool		
		\$ 336,800	\$ 33,300

Update 1-18

Note; Items highlighted in Blue are completed projects not anticipated in the original Energy Action Plan

New Daiken chiller installed project completed estimated savings \$15,250

Completed 2017. Metering installed at the end of 2017 to verify savings. Therefore, savings are still estimated.

Not completed. Project completion based upon results from metering of VFD on CW pumps

Completed

Not completed, savings anticipated not borne out by energy audit

OR setback project not done; we anticipate installing a setback strategy as part of the New OR suite being built starting in 2018

OR setback project not done; we anticipate installing a setback strategy as part of the New OR suite being built starting in 2018

Not completed, not funded internally

Completed. There is no separate metering on these lights; savings are estimated

60% completed. There is no separate metering on these lights; savings are estimated

Completed an audit & full lighting redesign of the Gannett Building; funded by Efficiency Vermont

Cost partially funded by Efficiency VT. Savings are estimated as these lights are not on a separate meter. Savings based upon MOB savings.

Cost partially funded by Efficiency VT One year payback over old lighting that is on 24/7

Completed with LED lighting installed along with some high efficiency fluorescent lighting

OR suite project delayed by need to get CON and construction permits. Project still in permitting phase

Boiler room renovation to begin 5-2018

BMH replaces ceiling fixtures with LED as part of all renovations.

Projects were identified without use of Kaizan event. (See blue lines above)

Efficiency VT did fund an energy event geared toward employees and home energy savings in 2017.

Chilled water pumps changed out, see #1 above

50 year old walk in cooler & freezer replaced March 2017 No separate metering so we have estimated savings

In house audit of systems conducted. Unable to quantify savings as items are not individually metered

No done due to resource constraints