

BOSTON MEDICAL CENTER PROPOSED ENERGY CONSERVATION MEASURES SHEET 1 OF 7 2/5/2016

BMC ENERGY PLANNING, 2012 ENERGY CONSERVATION PLAN FOR IMPLEMENTATION, commencing 2012

Building	ECM Description	Annual Electric Savings		Annual Thermal (District Steam) Savings		Annual Water Savings		Estimated Impact of ECM Implemented								
		Electricity Saved, kWh/yr.	Operating Cost Savings, \$/yr.	Steam Saved, MLbs/yr.	Operating Cost Savings, \$/yr.	Annual Water Saved, Gals/yr.	Annual Operating Cost Savings, \$/yr.	Estimated Total Implementation Cost, \$	Contractor Bid (\$)	Potential Electric Utility Incentive, \$	Net Owner's Implementation Cost, \$	Total Operating Cost Savings, \$/yr.	MTCDE reduction due to Electric Savings	MTCDE reduction due to Steam Savings	Total MTCDE	Estimated Simple Payback Period, Years
Power Plant	CHW Cross Connect - Includes VFDs on CW Pumps, Optimization, Programming	1,285,995	\$147,889		\$0		\$0	\$450,000	\$464,000	\$231,479	\$232,521	\$147,889	482	0	482	1.6
Yawkey	Improve Un-Occupied Setback and Optimize Interoperability of AHUs with Terminal Devices	2,498,304	\$287,305	22,983	\$413,694		\$0	\$60,000	\$57,595	\$60,000	-\$2,405	\$700,999	937	1,814	2,751	0.00
Menino	Eliminate Operation of Air-cooled process chiller- Use Power Plant during Summer & Shapiro Free Cool during Winter (Electric Savings Included in Menino ECM-5)	0	\$0		\$0	-250,000	-\$3,388	\$200,000	Included in Menino ECM#5	\$0	\$200,000	-\$3,388	0	0	0	
	VFDs for AHU-2 Supply and Exhaust Fans	62,500	\$7,188	6	\$108	0	\$0	\$30,000		\$11,250	\$18,750	\$7,296	23	0	24	2.6
	HVAC Setback During Unoccupied Hours for the Following: a. 2nd Floor Cafeteria and Conference Area b. Bsmt. Warehouse c. 1st Floor Radiology Office Space d. 7th Floor Gyms e. Operating Rooms and Support Spaces	263,744	\$30,331	2,390	\$43,020	0	\$0	\$66,000	\$91,732	\$47,474	\$44,258	\$73,351	99	189	288	0.6
Newton Pavilion	Eliminate 8760 Chiller Operation, install new freezestats.	530,340	\$60,989	-	\$0	0	\$0	\$50,000	\$50,846	\$39,776	\$11,071	\$60,989	199	0	199	0.2
	Install VFDs on 100 HP CW Pumps (PRICING INCLUDES POWER PLANT VFDs and Siemens Programming)	302,986	\$34,843	-	\$0	0	\$0	\$110,000	\$54,345	\$54,537	\$55,463	\$34,843	114	0	114	1.6
	HVAC Setback During Unoccupied Hours for the Following: a. Bsmt Warehouse b. Purchasing c. Short Stay d. Radiology Offices e. Cafeteria f. 2nd Floor Pain Clinic and Conference Rooms g. 2nd Floor Family Waiting h. 2nd Floor Admin Offices i. Operating Rooms and Support Spaces	219,885	\$25,287	2,743	\$60,346		\$0	\$97,405	\$91,255	\$39,579	\$51,676	\$85,633	82	216	299	0.6
Shapiro	Restore AHU occupancy schedule so AHUs do not operate 24/7.		\$0		\$0		\$0			\$0	\$0	\$0	0	0	0	#DIV/0!
DOB	Garage Lighting Control	99,128	\$11,400		\$0		\$0			\$17,843	-\$17,843	\$11,400	37	0	37	-1.6
Moakley	Lighting Control	128,229	\$14,746		\$0		\$0			\$14,028	-\$14,028	\$14,746	48	0	48	-1.0
Sum of 2012 ECMs		5,391,111	\$619,978	28,122	\$517,168	-250,000	-\$3,388	\$1,063,405	\$809,773	\$515,966	\$579,462	\$1,133,758	2,022	2,219	4,241	0.5

BMC Energy Plan, Year 2013 Energy Projects Implementation List

Building	ECM Description	Annual Electric Savings		Annual Thermal (District Steam) Savings		Annual Water Savings		Estimated Impact of ECM if Implemented							
		Electricity Saved, kWh/yr.	Operating Cost Savings, \$/yr.	Steam Saved, MLbs/yr.	Operating Cost Savings, \$/yr.	Annual Water Saved, Gals/yr.	Annual Operating Cost Savings, \$/yr.	Estimated Total Implementation Cost, \$	Potential Electric Utility Incentive, \$	Net Owner's Implementation Cost, \$	Total Operating Cost Savings, \$/yr.	MTCDE reduction due to Electric Savings	MTCDE reduction due to Steam Savings	Total MTCDE	Estimated Simple Payback Period, Years
Yawkey	Install new Return Air Duct Risers and Convert Existing RA Risers to Supply Air	1,471,548	\$176,586	226	\$4,972		\$0	\$2,899,638	\$264,879	\$2,634,759	\$181,558	552	18	570	14.5
Menino	Install Energy Efficient Controls for Kitchen Ventilation System	242,328	\$29,079	2,038	\$44,836	0	\$0	\$189,440	\$43,619	\$145,821	\$73,915	91	161	252	2.0
	Convert AHU-5 to a Mixed Air System	422,451	\$50,694	4,995	\$109,890	0	\$0	\$159,000	\$76,041	\$82,959	\$160,584	158	394	553	0.5
Shapiro	Convert Shapiro MRI Cooling to Power Plant Chilled Water	156,389	\$18,767	0	\$0	0	\$0		\$28,150	-\$28,150	\$18,767	59	0	59	-1.5
Newton Pavilion	Install Energy Efficient Controls for Kitchen Ventilation System - VAV w Setback	224,865	\$26,984	2172	\$47,784	-	\$0	\$132,685	\$40,476	\$92,209	\$74,768	84	171	256	1.2
Sum of 2013 Energy Conservation Measures		2,517,581	302,110	9,431	207,482	0	0	3,380,763	453,165	2,927,598	509,592	944	744	1,688	5.7

BOSTON MEDICAL CENTER PROPOSED ENERGY CONSERVATION MEASURES SHEET 3 OF 7 2/5/2016

BMC Energy Plan, Year 2014 Energy Projects															
Building	ECM Description	Annual Electric Savings		Annual Thermal (District Steam) Savings		Annual Water Savings		Estimated Impact of ECM if Implemented							
		Electricity Saved, kWh/yr.	Operating Cost Savings, \$/yr.	Steam Saved, MLbs/yr.	Operating Cost Savings, \$/yr.	Annual Water Saved, Gals/yr.	Annual Operating Cost Savings, \$/yr.	Estimated Construction Cost, \$	Potential Electric Utility Incentive, \$	Net Owner's Implementation Cost, \$	Total Operating Cost Savings, \$/yr.	MTCDE reduction due to Electric Savings	MTCDE reduction due to Steam Savings	Total MTCDE savings	Estimated Simple Payback Period, Years
Moakley	Review AHU Scheduling and setback of thermostats during Un-Occupied hours	365,779	\$43,893	9,938	\$218,636	0	\$0	\$23,370	\$11,685	\$11,685	\$262,529	137	784	921	22.47
	VAV terminal devices using excess air during Un-Occupied Hours														
Menino	Convert Lobby AHU from CV to VAV	190,570	\$22,868	2,149	\$47,278	0	\$0	\$79,855	\$38,114	\$41,741	\$70,146		0	0	0.60
Dowling Bldg	Remove Four Air Cooled Chillers and Connect to House CHW to FCUs with EC Motors	130,446	\$15,654	0	\$0	0	\$0	\$64,115	\$24,785	\$39,330	\$15,654	49	0	49	2.51
FGH	Airflow Setback of AHU-1, AHU-2 and AHU-3	57,101	\$6,852	1,033	\$22,726	0	\$0	\$25,000	\$10,849	\$14,151	\$29,578	21	82	103	0.48
BCD	Airflow Setback of AHU-1, AHU-2, AHU-3, AHU- and AHU-5	47,614	\$5,714	674	\$14,828	0	\$0	\$25,000	\$9,047	\$15,953	\$20,542	18	53	71	0.78
X	Airflow Setback	1,039,718	\$124,766	11,015	\$242,330	0	\$0	\$400,000	\$197,546	\$207,945	\$367,096	390	869	1,259	0.57
2014 Energy Conservation Measures		<u>1,831,228</u>	<u>219,746</u>	<u>24,809</u>	<u>545,798</u>	<u>0</u>	<u>0</u>	<u>617,340</u>	<u>292,026</u>	<u>330,805</u>	<u>765,544</u>	<u>615</u>	<u>1,788</u>	<u>2,403</u>	<u>0.43</u>

BMC Energy Plan, for Year 2015																		
Building	ECM #	ECM Description	Annual Electric Savings		Annual Thermal (District Steam) Savings		Annual Gas Saving		Annual Water/Sewer Savings		Estimated Impact of ECM if Implemented							
			Electricity Saved, kWh/yr.	Operating Cost Savings, \$/yr.	Steam Saved, MLbs/yr.	Operating Cost Savings, \$/yr.	Annual Gas Savings, Therms/year	Operating Cost Savings, \$/year	Annual Water Saved, Gals/yr.	Annual Operating Cost Savings, \$/yr.	Estimated Construction Cost, \$	Potential Electric Utility Incentive, \$	Net Owner's Implementation Cost, \$	Total Operating Cost Savings, \$/yr.	MTCDE reduction due to Electric Savings	MTCDE reduction due to Steam Savings	Total MTCDE savings	Estimated Simple Payback Period, Years
Moakley		IMP Renovations	306,220	\$37,746	2,038	\$44,836	\$0	\$0	0	\$0	TBD			\$82,582	115	161	276	
Menino		Implement Retro-Commissioning Report Recommended Remedial Work	262,299	\$34,099	7,841	\$196,010	\$0	\$0	0	\$230,109	\$207,500			\$368,000	98	619	717	0.56
Total of Year 2015 Energy Conservation Measures			<u>568,519</u>	<u>71,845</u>	<u>9,879</u>	<u>240,846</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>230,109</u>				<u>368,000</u>	<u>213</u>	<u>780</u>	<u>993</u>	

BMC Energy Plan, for Year 2016																	
Building	ECM Description	Annual Electric Savings		Annual Thermal (District Steam) Savings		Annual Gas Savings		Annual Water/Sewer Savings		Estimated Impact of ECM if Implemented							
		Electricity Saved, kWh/yr.	Operating Cost Savings, \$/yr.	Steam Saved, MLbs/yr.	Operating Cost Savings, \$/yr.	Annual Gas Savings, therms/year	Operating Cost Savings, \$/yr	Annual Water Saved, Gals/yr.	Annual Operating Cost Savings, \$/yr.	Estimated Construction Cost, \$	Potential Electric Utility Incentive, \$	Net Owner's Implementation Cost, \$	Total Operating Cost Savings, \$/yr.	MTCDE reduction due to Electric Savings	MTCDE reduction due to Steam Savings	Total MTCDE savings	Estimated Simple Payback Period, Years
Yawkey	IMP Renovations, for 1st Flr Servery/Cafeteria and 3rd Flr Maternity, Ktichen MAU to CHW Conversion and VAV kitchen hood control, HW Perimeter Baseboard to reduct Min ACH, 3rd flr Maternity AHU DX to CHW conversion with low PD for components and low leakage, C-Section Airflow UnOcc Setback, Improved Exterior Glazing, Hi Efficiency Lighting, and Duct Static Pressure Reset	553,837	\$72,553	807	\$17,948	0	\$0	0	\$0	\$667,312	\$110,767		\$90,501	208	637	845	0.0
Menino	IMP Renovations	3,177,365	\$381,284	10579	\$232,738	0	\$0	0	\$0	TBD	\$635,473		\$614,022	1,192	8,349	9,541	
Moakley	Retro-Cx Bldg AHUs, address DAT setpoint issues, simultaneous heating/cooling, CHW control valve operation, VFDs on some AHUs running at full speed, some AHUs may hve Face/Bypass not operating optimally	694,255	\$90,253	1578	\$39,452	0	\$0	0	\$0	\$198,000	TBD		\$129,705	261	1,245	1,506	
<u>Plans for Year 2016</u>		<u>4,425,457</u>	<u>544,090</u>	<u>12,964</u>	<u>290,138</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>			<u>\$0</u>	<u>\$834,228</u>	<u>1,661</u>	<u>10,231</u>	<u>1,506</u>	

BMC Energy Plan, for Year 2017																	
Building	ECM Description	Annual Electric Savings		Annual Thermal (District Steam) Savings		Natural Gas Savings		Annual Water/Sewer Savings		Estimated Impact of ECM if Implemented							
		Electricity Saved, kWh/yr.	Operating Cost Savings, \$/yr.	Steam Saved, MLbs/yr.	Operating Cost Savings, \$/yr.	Annual Natural Gas Saved, Therms/year	Annual Gas Cost Savings, \$/year	Annual Water Saved, Gals/yr.	Annual Operating Cost Savings, \$/yr.	Estimated Construction Cost, \$	Potential Electric Utility Incentive, \$	Net Owner's Implementation Cost, \$	Total Operating Cost Savings, \$/yr.	MTCDE reduction due to Electric Savings	MTCDE reduction due to Steam Savings	Total MTCDE savings	Estimated Simple Payback Period, Years
Yawkey , Harrison Campus Impact	2 MW CHP Project, with Heat Recovery Hot Water, and Island Mode Capability for Resiliency	16,157,759	\$1,775,617	44459	\$1,098,149	-1,701,161	-\$1,372,326	0	\$0	\$14,000,000	\$3,240,324	\$10,759,676	\$1,501,440			560	7.2
Menino	Convert MRI Cooling to Power Plant CHW	156,389	\$18,767	0	\$0	0	\$0	0	\$0			\$18,767	\$18,767				
Albany Garage	Renewable Type Project, installing 500 kW Solar Panels on Garage Roof Level	Under Study															
Plans for Year 2017		16,314,148	\$1,794,384	44,459	1,098,149	-1,701,161	-1,372,326	0	0	\$14,000,000	3,240,324	\$10,759,676	\$1,501,440	0	0	560	

1. CHP, for MTCDE reduction, represents new MTCDE based on gas usage and savings of electric and steam savings

Master Planning of Potential Energy Conservation Measures Moving Forward

Building	ECM Description	Annual Electric Savings		Annual Thermal (District Steam) Savings		Annual Natural Gas Savings		Annual Water Savings		Estimated Impact of ECM if Implemented							
		Electricity Saved, kWh/yr.	Operating Cost Savings, \$/yr.	Steam Saved, MLbs/yr.	Operating Cost Savings, \$/yr.	Annual Natural Gas Saved, Therms/yr.	Annual Operating Cost Savings, \$/yr.	Annual Water Saved, Gals/yr.	Annual Operating Cost Savings, \$/yr.	Estimated Construction Cost, \$	Potential Electric Utility Incentive, \$	Net Owner's Implementation Cost, \$	Total Operating Cost Savings, \$/yr.	MTCDE reduction, due to Electric Svgs	MTCDE reduction, due to Steam Svgs	MTCDE total	Estimated Simple Payback Period, Years
Campus	BMC Campus Consolidation	11,252,751	\$1,350,330	30,245	\$665,390	8,082	\$8,082		\$0	-	\$0	\$0	\$2,023,802				-
Power Plant	2nd Floor Offices Airflow Setback	10,000	\$1,200	850	\$18,700				\$0	-	\$0	\$0	\$19,900				0.0
Yawkey	Install VFDs for AHU-9 (No VFD/Yes Schedule), 10 (Yes VFD/No Schedule), 11 (No VFD/No Schedule), & 12 (No VFD/No Schedule) and Implement Occupancy Schedule	250,000	\$30,000	-	\$0				\$0	-	\$0	\$0	\$30,000				0.0
	Install HW Baseboard Beneath Windows																
	Eliminate 4th Flr. Package Roof-top AC Units	2,133,591	\$256,031	12,562	\$276,364				\$0	\$3,818,520	\$426,718	\$3,391,802	\$532,395				6
	VAV Upgrade Project																
Menino	Steam Condensate Heat recovery	0	\$0	1071	\$23,562			0	\$0	\$120,000	\$0	\$120,000	\$23,562				5.1
	Replace OR EVAC System That Utilizes City Water For Pump Seal	-4,500	-\$540	0	\$0			4,200,000	\$56,910	\$95,000	\$0	\$95,000	\$56,370				1.7
	Convert Menino Addition Electrical Room from DX to Chilled Water	25,000	\$3,000		\$0				\$0	\$0	\$0	\$0	\$3,000				0.0
	Remove Filter System from Menino and Shapiro EF Isolation Rm Discharge	7,031	\$844		\$0				\$0	\$6,785	\$1,406	\$5,379	\$844				6.4
Newton Pavilion	Retro-Commission Bldg. AHUs, CHW control valve operation, simultaneous heating/cooling, DAT setpoint	200,000	\$23,000	900	\$19,800			0	\$0	\$100,000	\$40,000	\$60,000	\$42,800				1.4
	Steam Condensate Heat Recovery	-	\$0	826	\$18,172			-	\$0	\$120,000	\$0	\$120,000	\$18,172				6.6
	Steam Condensate Recovery for Tower Makeup Water		\$0		\$0			4,800,000	\$65,040	\$200,000	\$0	\$200,000	\$65,040				3.1
	Reduce Patient Room VAV Minimum Airflow Setpoints to 4 ACH Equivalent	137,168	\$16,460	133	\$2,926			0	\$0	\$104,000	\$27,434	\$76,566	\$19,386				3.9
Future ECMs that may be implemented		14,011,041	1,680,325	46,587	1,024,914	8,082	8,082	9,000,000	121,950	4,564,305	495,558	4,068,747	2,835,271			0	1.44