

Energy Management Annual Report – Fiscal Year 2019

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Michigan Medicine Energy Management Annual Report – FY2019

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1. EXECUTIVE SUMMARY

In fiscal year 2019, energy management teams continued to expand energy conservation efforts in Michigan Medicine (MM) hospital facilities and as a result, MM continues to show improvements in energy efficiency.

Energy Performance

In fiscal year 2019, the total utility cost for all Michigan Medicine (MM) hospital facilities was \$24.9 Million. Overall, actual facilities site energy usage per square foot was 1.65% higher than 2018, however electric and steam savings coupled with high utility rates resulted in \$33,990 in total avoided utility cost. Weather normalized site energy usage per square foot was 1.0% more efficient than 2018. For further details, see section 2, "Energy Performance" of this report.

Energy Conservation

Fiscal year 2019 continued energy conservation efforts by various teams, and continue to show improvements to the overall MM building portfolio. During fiscal year 2019, energy conservation measures were incorporated into larger infrastructure projects which are anticipated to save an estimated \$96,000 annually. For further details, see section 3, "Energy Conservation" of this report.

Environmental Impact

In addition to the demand reduction and cost benefits of energy conservation, improvements also provide a significant environmental benefit by reducing the greenhouse gas emissions associated with the generation of building utilities. Existing facilities improved total utility driven greenhouse gas emission efficiency by 0.2% compared to the previous fiscal year, yielding over 317 Tons of avoided greenhouse gas emissions. For further details, see section 4, "Environmental Impact" of this report.

Building Summary & Energy Star

Based on analyses of building utilities and efficiencies, the following buildings are identified as the most efficient MM facilities, categorized by building type:

- Hospital Building: Brighton Center for Specialty Care 178.85 kBTU/ft²
- Medical Office Building: Kellogg Eye Center Brighton 53.2 kBTU/ft²
- General Office Building: Burlington Office Center 34.9 kBTU/ft²

In total, on a scale of 0 to 100 (100 being the most efficient) the MM building portfolio has earned a score of 52 in the U.S. EPA Energy Star rating system. For further details and a complete listing of UMHHC building performance, see section 5, "Building Summary & Energy Star" of this report.

2. ENERGY PERFORMANCE

In fiscal year 2019, the total utility cost for all Michigan Medicine (MM) facilities was \$24.9 Million. Overall, facilities site energy usage per square foot was 1.65% higher than 2018, however electric and steam savings coupled with high utility rates resulted in \$33,990 in of total avoided utility cost. This is detailed in Figure 2.1 below.

Figure 2.1: Breakdown of Avoided Utility Cost vs. FY2018

Utility	FY2018 Efficiency	FY2019 Efficiency	FY2019 Average Utility Rate	Avoided Utility Cost
Electric	27.4 KWH/ft ²	26.96 KWH/ft ²	\$0.079/KWH	\$227,569
Steam	0.0607 MLB/ft^2	0.0600 MLB/ft^2	\$15.26/MLB	\$75,228
Natural Gas	0.0228 MCF/ft ²	0.0292 MCF/ft ²	\$4.77/MCF	-\$205,015
Water/Sewer	0.0469 CCF/ft ²	0.0479 CCF/ft ²	\$10.22/CCF	-\$63,791
			Total:	\$33,990

Since the MM portfolio of building area and outside weather conditions are continually changing, it is important to normalize utility figures for comparison and evaluation of performance from year to year. Figure 2.2 illustrates the recent history of actual total MM building energy efficiency (measured in BTU/ft²), and weather normalized efficiency (BTU/ft², calculated by Energy Star Portfolio Manager). Energy efficiency normalizes electric, steam, and natural gas utility into a common energy unit, BTU. Since water & sewer are not an energy utility, this data is not included in this chart. Actual FY19 BTU/ft² efficiency was 2.4% less efficient than FY18, however when weather normalized to account for colder outside conditions, normalized performance was 1.0% more efficient than FY18. Actual MM facility efficiency has improved 20% since fiscal year 2005.

Figure 2.2: Total MM Actual & Weather Normalized Energy Efficiency

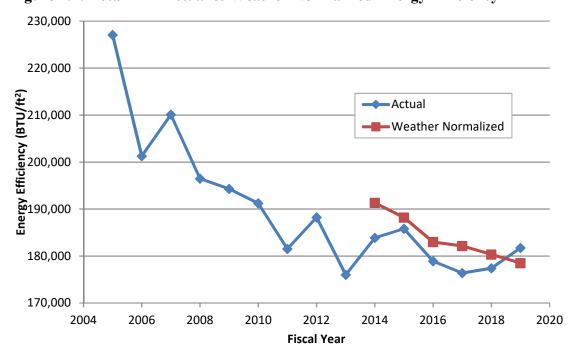


Figure 2.3 illustrates the recent history of total actual MM building energy efficiency (measured in BTU/ft²) and utility cost efficiency (measured in \$ft²).

Figure 2.3: Total MM Historical Energy & Cost Efficiency

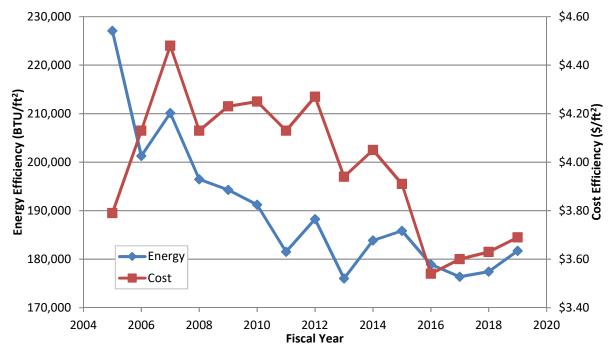


Figure 2.4 below shows the total actual MM energy and utility cost in recent history without normalizing against building area.

Figure 2.4: Total MM Historical Energy Use & Utility Cost

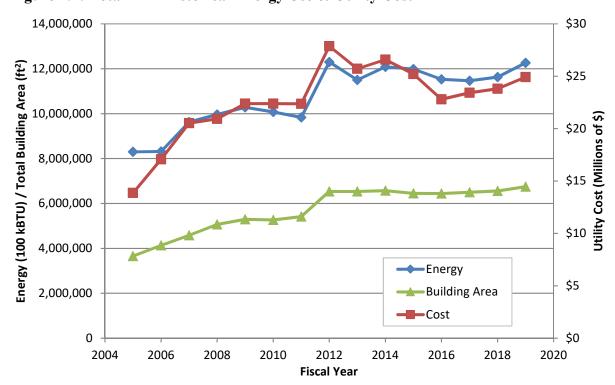


Figure 2.4 below shows the changes in the overall average utility rate across all MM facilities over time.

Figure 2.4: Total MM Historical Average Utility Rates

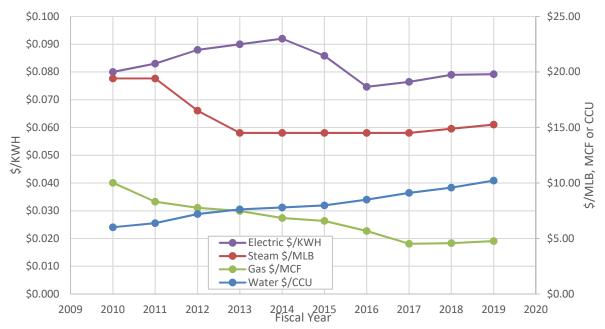
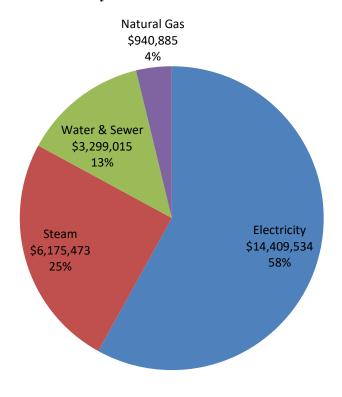


Figure 2.5 below illustrates the distribution and total costs of each of the four primary utilities included in MM facilities for fiscal year 2019.

Figure 2.5: Total FY2019 Utility Cost Distribution



3. ENERGY CONSERVATION

Energy Conservation is a combined effort of numerous groups and departments throughout Michigan Medicine (MM). These efforts primarily fall into the following categories:

• New Construction

Efficient design and construction practices for new capital construction.

• Energy Conservation Measures (ECMs)

Projects in existing facilities designed to improve energy performance.

• Operations & Maintenance

Maintain, manage, and optimize building operational efficiency.

• GreenIT

Manage power consumption from UMHS computers and IT equipment.

New Construction

MM strives to incorporate energy efficient strategies and practices in all new capital construction projects. This first includes participation and compliance with the University's energy & water conservation standard (SID-D), including several standardized efficiency practices, compliance with the ASHRAE 90.1-2013 energy standard, and achieving energy improvements beyond baseline compliance for projects over \$10 Million in construction whenever possible. Every MM capital construction project is now reviewed for compliance with these energy and water requirements, and for opportunities to implement other energy conserving design innovations where feasible.

Whenever possible, MM also follows the University's sustainability in facility design and construction standard (SID-K). Among other sustainable practices, this standard includes specifications for maintaining air quality, tracking and management of construction and demolition materials waste, and guidelines for pursing certification under the Leadership in Energy and Environmental Design (LEED) system managed by the United States Green Building Council (USGBC) where applicable. This LEED program and rating/certification system is designed to encourage sustainable design practices, covering numerous disciplines including site selection & protection during construction, energy & water efficiency, material selection & sourcing, indoor environmental quality, and more. This program offers building certification awards; base certification, silver, gold and platinum.

Energy Conservation Measures (ECMs)

In fiscal year 2019, there were no dedicated energy conservation projects. However, several energy conservation measures were included in other major infrastructure upgrade projects. In total, it is estimated that projects completed in fiscal year 2019 will provide a total estimated energy savings of approximately \$96,000/year. This is summarized in Figure 3.2 below.

Figure 3.2: ECM Projects Completed in FY2019

Building	Building Project Description Cost										
East Ann Arbor Health	Replacement of roof, AHU's and upgrades to building management system controls (*Included as component of larger capital project)	\$3,500,000	\$25,000								
Brehm Building	Replacement of instantaneous domestic hot water heaters (*Included as component of larger capital project)	\$600,000	\$15,000								
Chelsea Health Center	Replacement of roof top units, exhaust fans and water heaters (*Included as component of larger capital project)	\$900,000	\$8,000								
Taubman Health Care Center	Replacement of system return fan and airflow measuring stations (*Included as component of larger capital project)	\$2,500,000	\$40,000								
University Hospital Replace domestic hot water heater with new 1,000,000 Building (*Included as component of larger capital project)											
Total Annual Savings:											

Operations & Maintenance

Michigan Medicine Operations & Maintenance teams are continuously working to maintain equipment at peak efficiency, to improve and optimize operations wherever possible, and resolve operational issues at all 6.7 million ft² of MM buildings. This includes several key tasks for an extensive body of equipment and instruments. Examples of key equipment are listed below:

- Building automation systems
- Environmental controls & instruments
- Room temperature controls
- Air handling units
- Pumps
- Chillers
- Boilers
- Steam Traps

GreenIT

The GreenIT initiative began in 2009 with the goal of reducing desktop computer power consumption to over 15,000 workstations across the health system. This initiative seeks to set automatic on and off times and enable power saving standby modes for system computers when feasible. This initiative has resulted in more than a 40% reduction in health system computer power consumption.

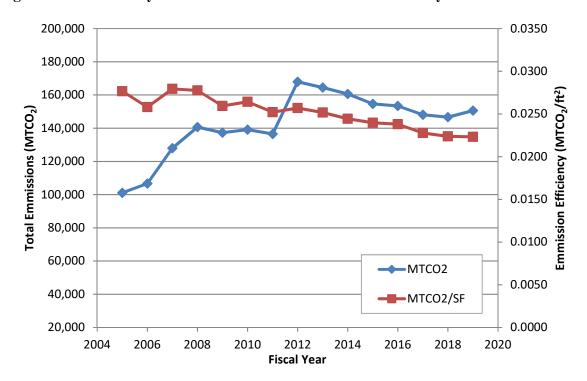
GreenIT teams are continuously working to further improve computer and IT system power management and to maintain energy performance amidst continuous changes to the Health System equipment and software, which now includes approximately 20,000 workstations. GreenIT teams are currently working to identify and update energy management of remaining departments and workstations unnecessarily operating computers and IT equipment continuously.

4. ENVIRONMENTAL IMPACT

In addition to the benefits of reducing overall energy and utility resource demands, efficiency improvements provide further benefits by reducing the greenhouse gas emissions generated during the production of utilities. Figure 4.1 below shows the total historical Michigan Medicine (MM) greenhouse gas emission quantities and greenhouse gas emission efficiencies, normalized against total MM building area. Emissions are measured in metric tons of carbon dioxide (MTCO₂). Please note that these figures only include greenhouse gas emissions due to the generation of utilities consumed by facilities, and do not include emissions from other institution operations. In fiscal year 2019, MM decreased normalized utility driven emissions by 0.2%. This equates to 317 MTCO₂ reduction of greenhouse gas emissions, which is roughly equivalent to removing 70 automobiles from the road.

In 2011, UM President Coleman announced new sustainability commitments for the University. These commitments include a 25% reduction in total greenhouse gas emissions by FY2025, compared to a FY2006 baseline. It is anticipated that this will be accomplished through improvements to a number of areas of University operations, including major upgrades to onsite utility generation plants, in addition to improvements to existing buildings, University vehicle upgrades, etc. Thus far, MM has increased its total building utility driven emissions by 41% compared to FY2006, however this is across a period of 63% growth in total MM building area in that time. When normalized against total building area, MM has improved its total emission per square foot efficiency by 13% since FY2006, and by 19% since FY2005. Therefore, MM has significantly expanded but has improved total emission efficiency during that time.

Figure 4.1: MM Utility Driven Greenhouse Gas Emission History



5. BUILDING SUMMARY & ENERGY STAR

During fiscal year 2012, a comprehensive profile was created for all Michigan Medicine (MM) facilities within the Energy Star Portfolio Manager benchmarking tool, provided by the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE). This tool organizes facility energy data, normalizes data against building size, weather, geographic location, building use types, occupancy, number of licensed beds, etc., and generates a rating score that can be used for benchmarking. Scores range from 0 to 100. A score of 50 is the national average. A score of 75 qualifies a building for the Energy Star Certification award. In fiscal year 2019, MM facility scores in aggregate calculated to a total portfolio score of 52. This is improved from a baseline score of 25 in fiscal year 2012. Improvements reflect continued efforts in energy management practices. In FY18, new electric sub-metering has also been leveraged to more appropriately associate consumed electric utility to applicable facilities, which has also contributed to overall score improvements. Figure 5.1 below illustrates MM's Energy Star rating progress towards national average and Energy Star Award levels.

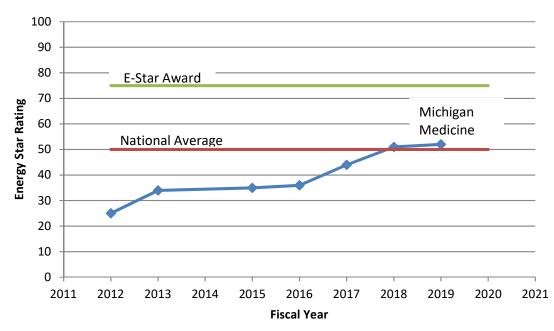


Figure 5.1: MM Energy Star Portfolio Rating

Figure 5.2 indicates the most efficient MM buildings in fiscal year 2019, sorted by the primary Energy Star building type. Due to combined metering and shared utilities between facilities, several buildings are not included in this list because the available utility data does not represent the total utility consumed by the building, and therefore does not provide an accurate measure of efficiency. It should be noted, that energy and efficiency data provided within this report and the table below are based on "site" energy use, which is used for billing. Energy Star ratings are based on "source" energy use which incorporates the efficiency of the utility plant supplying the facility.

Figure 5.2: FY2019 MM Most Energy Efficient Buildings

Rank	ID	Building	Efficiency (kBTU/ft²)	Energy Star Rating	Total Utility Cost							
<u>Hospitals</u>												
1.	5239	Brighton Center for Specialty Care	178.8	N/A	\$705,774							
2.	5173	Children's & Women's Hospital	191.1	62	\$4,826,691							
3.	5109	Cardiovascular Center	204.7	N/A	\$2,021,610							
4.	0316	University Hospital Building	216.3	71	\$8,017,561							
		<u>Medical Office Build</u>	<u>lings</u>									
1.	8042	Briarwood 4	55.2	62	\$28,029							
2.	8149	Dexter Family Practice	64.7	49	\$15,385							
3.	8065	Briarwood 3	72.5	53	\$23,792							
	General Office Buildings											
1.	5011	Burlington Office Center	34.9	70	\$94,819							
2.	8162	Traverwood 1	42.6	78	\$10,522							
3.	8137	Michigan House	57.3	74	\$131,705							

Figure 5.3 (attached) shows fiscal year 2019 information vs. fiscal year 2018 including energy and utility cost comparison data. Please note that data is not directly comparable since data for several buildings does not include total consumed utility due to combined meters and shared utilities.

Figure 5.3: FY2019 vs. FY2018 Michigan Medicine Building Utility Summary

December Laboratory Soft Cost BTUS Soft Cost STUS Soft Cost Cost STUS Soft				F	/18		FY19				FY Comparison					
200 Earl Rechercon Elegy MA	ID Name	E-Star Bldg Type	SQFT	Cost	BTU/SF	kBTU	SQFT	Cost	BTU/SF	kBTU	SQFT		-		kBTU	kBTU %
393 Mar March Ma	301 Rogel Cancer Center	Laboratory	136,120	\$931,021	340,804	46,390,240	136,120	\$958,636	345,500	47,029,460	0	\$27,615	3%	4,696	639,220	1%
350 His Sauch Unit Medical Offine 67 464 \$109,000 34,01 39,08,000 67,044 \$100,000 57,045 20,000 57,042 20,000 31,000	306 East Mechanical Bldg	N/A	8,006	\$227,358	1,180,311	9,449,570	8,006	\$235,642	1,194,080	9,559,804	0	\$8,284		13,769	110,235	1%
321 UH South Lin 2											_					5%
131 University Recipal Building	1										_					-5%
371 Tradhoms-Nephrelin Clearer Mondacid Office Mondacid Offi																23%
317 Euriphornal Health Center Medical Office 450,038 50,052,538 12,030 40,032 50,004,75 75,000 42,045 73,000 42,045 73,000 42,045 73,000 42,045 73,000 42,00																-2%
319 U-M Medical Office	, , ,															-0.3%
301 Medical Privisors Inlustring Office 37.268 \$8.005 \$1.269 \$1.0000 \$1.0000 \$1.0000 \$1.0000 \$1.0000 \$1.0000 \$1.																-14%
220 Parling - MIZE Simpson Circle NA	1															16%
237 101 Fuller Bullstring	ľ					0,400,070				0,000,040	_					
332 ON Ingells					51,780	432,311			56,253	469,656				4,473	37,345	9%
390 EAA Health Center		Office									151		5%	10,164		7%
380 FLACE	348 Chelsea Family Practice	Medical Office	25,136	\$64,524	121,640	3,057,543	25,136	\$65,022	122,465	3,078,280	0	\$498	1%	825	20,737	1%
399 NACAC Office 129,114 \$228,802 161,688 20,716,777 129,114 \$228,598 160,831 19,474,394 0 \$43,098 60,898,891 17,178 63,903 20,973 50 60 60 60 60 60 60 60																48%
441 Lauraby																-23%
SEAR Provinger 1322 Wilmott N/A	1											. ,				-6%
830 Agus Building						51,116,293				54,083,598						6%
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\$600 \$600 \$600 \$600 \$600 \$7,000 \$7	5070 Eisenhower CP	Warehouse	37,606	\$60,648	85,201	3,204,069	37,606	\$51,868	66,605	2,504,748	0	-\$8,780	-14%	-18,596	-699,321	-22%
510g Cardiovascular Center Hospital 429,289 \$1,854,479 206,596 88,888,961 429,289 \$2,021,610 204,698 87,874,600 0 \$167,131 9% -1,887 -814,381 -1716 -8 5151 Tuyenword II Office 27,836 \$123,829 269,995 7,515,891 7,776 37,0399 38,476 117,097 37,0399 38,376 39,3799	5079 Eisenhower Commerce Center 2		3,401	\$6,223	45,401	154,409	2,748	\$6,241	56,916	156,405	-653	\$18	0%	11,515	1,996	1%
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5153 Traverwood II		•									_					-1%
5153 Traverwood II										10,827,960	_	. ,				-6%
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S269 Howell Teen Clinic						0					297,554					#DIV/0!
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5344 River Place Offices 7,124 \$17,992 92,406 658,300 7,124 \$18,157 102,398 72,9483 0 \$165 1% 9,992 71,183 11 5341 Northyille Health Center Medical Office 102,228 \$257,588 124,493 12,726,670 102,228 \$258,881 122,684 12,541,740 0 \$1,293 1% -1,809 -184,930 -17 5388 West Ann Arbor Health Center New S393 Kellogg Eye Center - Grand Blanc Medical Office 9,378 \$34,391 24,871 129,48	5296 Howell Teen Clinic	N/A	0	\$0	0	0	0	\$0	0	0	0	\$0	#DIV/0!	0	0	#DIV/0!
5341 Northville Health Center Medical Office 102,228 \$287,588 124,493 12,726,670 102,228 \$288,881 122,684 12,541,740 0 \$1,293 1% -1,809 -184,930 -1 5353 719 Elisworth Rd											_					17%
5353 719 Ellsworth Rd																11%
5388 West Ann Arbor Health Center New Medical Office 75,026 \$107,313 78,466 5,886,990 75,026 \$157,314 110,251 8,271,692 0 \$50,001 47% 31,785 2,384,701 41,5393 Kellogg Eye Center - Grand Blanc Medical Office 8,021 \$24,871 128,994 1,034,661 8,021 \$24,156 129,387 1,037,613 0 \$75,026 315,201 393 3,152 0.3 306 31,520 33,348,844 30,600 31,901 32,600 31,000 31	1															-1%
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8036 Survival Flight Ann Arbor Airport N/A 10,000 \$13,734 \$204,137 \$2,041,370 \$10,000 \$12,614 \$178,005 \$1,780,050 \$0 \$1,120 \$-8% \$-26,132 \$-261,320 \$-13 \$8039 RP Housing 1011 Cornwell Place N/A \$2,879 \$6,226 \$120,771 \$347,700 \$2,879 \$7,020 \$126,811 \$365,089 \$0 \$794 \$13% \$6,040 \$17,389 \$5 \$8042 Brianwood 4 Medical Office \$14,063 \$26,408 \$61,436 \$863,974 \$14,063 \$28,029 \$5,212 \$76,446 \$0 \$1,621 \$6% \$-6,224 \$87,528 \$-10 \$8060 \$101 Simpson Rd N/A \$2,791 \$77 \$8,108 \$22,629 \$2,791 \$1,075 \$11,898 \$33,207 \$0 \$998 \$1291% \$3,700 \$10,578 \$47 \$8065 Briarwood 3 Medical Office \$10,611 \$26,792 \$84,285 \$894,348 \$10,611 \$23,792 \$72,529 \$769,605 \$0 \$3,300 \$-11% \$-11,756 \$-124,743 \$-14 \$8072 Eisenhower Corporate Park West Medical Office \$76,726 \$254,407 \$139,053 \$10,668,980 \$76,726 \$267,678 \$133,179 \$10,218,292 \$0 \$133,271 \$5% \$-5,874 \$450,689 \$-4 \$8076 Briarwood 1 Medical Office \$76,726 \$254,407 \$139,053 \$10,668,980 \$76,726 \$267,678 \$133,179 \$10,218,292 \$0 \$13,271 \$5% \$-5,874 \$450,689 \$-4 \$8076 Briarwood 1 Medical Office \$46,637 \$142,980 \$182,713 \$8,521,186 \$46,637 \$142,980 \$82,278 \$70,435 \$2,981,654 \$46,637 \$155,014 \$186,738 \$8,708,900 \$0 \$12,684 \$4,013 \$-541,576 \$-18 \$110 West Ann Arbor Health Center Medical Office \$0,131 \$9,459 \$62,871 \$385,462 \$0 \$3,410 \$0 \$0 \$-6,131 \$6,049 \$-64, 62,871 \$385,462 \$-100 \$111 Howell Pediatrics Medical Office \$9,020 \$25,192 \$148,085 \$1,335,727 \$9,020 \$24,464 \$124,510 \$1,123,080 \$0 \$-\$728 \$-3% \$-23,575 \$-212,647 \$-16 \$116 Ann Arbor Lec Cube N/A \$8,672 \$2,842 \$66,407 \$578,882 \$8,672 \$2,458 \$58,988 \$511,544 \$0 \$3,345 \$6% \$-4,880 \$-85,083 \$-3 \$810 Briarwood 1 Medical Office \$125,908 \$226,138 \$77,651 \$9,776,882 \$125,908 \$20,071 \$76,121 \$0 \$9,584,243 \$0 \$-\$26,667 \$-124,743 \$-138 \$120,100 \$10 \$10 \$10 \$10 \$10 \$10,400 \$10 \$10 \$10 \$10,400 \$10 \$10 \$10,400 \$10 \$10 \$10 \$10,400 \$10 \$10 \$10 \$10,400 \$10 \$10 \$10,400 \$10,400 \$10,400 \$10 \$10 \$10 \$10,400 \$10 \$10 \$10 \$10,400 \$10 \$10 \$10,400 \$10 \$10 \$10,400 \$10 \$10 \$10,400 \$10,400 \$10 \$10 \$10,400 \$10 \$10,400 \$10 \$10,400 \$10,400 \$10,400 \$10,400 \$10,400 \$10 \$10,400	1															5%
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8060 101 Simpson Rd	8039 RP Housing 1011 Cornwell Place	N/A	2,879	\$6,226	120,771	347,700	2,879	\$7,020	126,811	365,089	0	\$794	13%	6,040	17,389	5%
8065 Briarwood 3 Medical Office 10,611 \$26,792 \$4,285 \$894,348 10,611 \$23,792 72,529 769,605 0 \$3,000 -11% -11,756 -124,743 -14 8072 Eisenhower Corporate Park West Medical Office 76,726 \$254,407 139,053 10,668,980 76,726 \$267,678 133,179 10,218,292 0 \$13,271 5% -5,874 -450,689 -4 8076 Briarwood 1 Medical Office 17,699 \$74,117 268,282 4,748,323 17,699 \$69,281 232,659 4,117,832 0 \$		Medical Office						\$28,029			_					-10%
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																-2%
1 8137 Michigan House Office 1 74.710 \$154.458 66.149 4.941.992 74.710 \$131.705 57.321 4.282.452 0 -\$22.753 -15% -8.828 -659.540 -13																-3%
	8137 Michigan House	Office	74,710	\$154,458	66,149	4,941,992	74,710	\$131,705	57,321	4,282,452	0	-\$22,753		-8,828	-659,540	-13%
8142 Briarwood 9 Medical Office 5,287 \$26,332 276,419 1,461,427 5,287 \$23,606 239,714 1,267,368 0 -\$2,726 -10% -36,705 -194,059 -13	8142 Briarwood 9	Medical Office	5,287	\$26,332	276,419	1,461,427	5,287	\$23,606	239,714	1,267,368	0	-\$2,726	-10%	-36,705	-194,059	-13%

Figure 5.3: FY2019 vs. FY2018 Michigan Medicine Building Utility Summary

				F	Y18		FY19				FY Comparison					
ID	Name	E-Star Bldg Type	SQFT	Cost	BTU/SF	kBTU	SQFT	Cost	BTU/SF	kBTU	SQFT	Cost	Cost %	BTU/SF	kBTU	kBTU %
8149 Dex	xter Family Practice	Medical Office	10,065	\$17,492	73,149	736,245	10,065	\$15,385	64,734	651,548	0	-\$2,107	-12%	-8,415	-84,697	-12%
8155 Live	onia Health Center	Medical Office	11,130	\$18,494	73,251	815,284	11,130	\$18,670	82,641	919,794	0	\$176	1%	9,390	104,511	13%
8161 Kell	logg Eye Center - Brighton	Medical Office	6,803	\$9,865	61,083	415,548	7,074	\$6,176	53,240	376,620	271	-\$3,689	-37%	-7,843	-38,928	-9%
8162 Tra	verwood 1	Office	10,508	\$10,516	44,485	467,448	10,169	\$10,522	42,565	432,843	-339	\$6	0%	-1,920	-34,605	-7%
9599 UM	IH Sign 1525 Fuller St	N/A	0	\$201	0	0	0	\$299	0	0	0	\$98	49%	0	0	#DIV/0!
9601 Hos	spital Chilled Water Loop	N/A	0	\$162,999	0	0	0	\$210,473	0	0	0	\$47,474	29%	0	0	#DIV/0!
5173T C&\	W Trailer	N/A	0	\$0	0	0	0	\$8,773	0	0	0	\$8,773	#DIV/0!	0	0	#DIV/0!