



**University of Michigan  
Hospitals and Health Centers**

**Energy Management  
Annual Report – Fiscal Year 2015**

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## **1. EXECUTIVE SUMMARY**

In fiscal year 2015, energy management teams continued to expand energy conservation efforts in University of Michigan Hospital and Health Centers (UMHHC) facilities and as a result, UMHHC continues to show improvements in energy efficiency.

### **Energy Performance**

In fiscal year 2015, UMHHC facilities consumed over \$25 Million in utilities. Typical annual reporting metrics were unique in 2015 due to significant adjustments in utility rates and building area, and due to activation of the new Northville facility. Core UMHHC facilities improved their energy efficiency by 1% compared to the previous year, resulting in approximately \$450,000 of avoided utility cost. For further details, see section 2, “Energy Performance” of this report.

### **Energy Conservation**

Fiscal year 2015 continued energy conservation efforts by various energy teams, and continue to show improvements to the overall UMHHC building portfolio. During this year, 2 energy conservation projects were completed in existing facilities which are anticipated to save \$215,000 annually. These projects cost \$308,237 to implement, yielding a 1.4 year overall payback period. 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 1% compared to fiscal year 2014, yielding approximately 1,700 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 UMHHC facilities, categorized by building type:

- Hospital Building: Cardiovascular Center – 186.1 kBTU/ft<sup>2</sup>
- Medical Office Building: Briarwood 4 – 55.7 kBTU/ft<sup>2</sup>
- General Office Building: Traverwood 1 – 53.7 kBTU/ft<sup>2</sup>

In total, on a scale of 0 to 100 (100 being the most efficient) the UMHHC building portfolio has earned a score of 35 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 2015, the total utility cost for all UMHHC facilities was \$25.2 Million. When compared to fiscal year 2014, this represents \$1.4 Million in utility cost savings (5% savings). Conversely, total UMHHC facilities' building area normalized energy efficiency was 1% less efficient than 2014. There were several key factors which contributed to these figures:

- Electric utility rates were reduced which resulted in a total average electric rate reduction of 6%, therefore providing \$1.0 Million in electric utility cost savings.
- The 2014 portfolio energy report included a significant amount of building area with little or no associated energy consumption. These areas were not included in the 2015 portfolio energy report which reduced total portfolio building area by 2%, therefore driving the energy per unit area efficiency figure to indicate less efficiency.
- The 2014 portfolio energy report included the new Northville Health Center facility, but did not accrue significant utility consumption in that year. In 2015, this facility consumed nearly \$250,000 in utilities, therefore driving the overall energy per unit area efficiency figure to indicate less efficiency.

In all facilities besides Northville and the building area removals, energy efficiency improved by 1%, resulting in approximately \$450,000 in total avoided utility cost. Figure 2.1 below illustrates comparative energy performance in several of the top UMHHC energy consuming buildings.

**Figure 2.1: Key Building Utility vs. FY2014**

Building	FY2015 Energy Consumption	Energy Change from FY2014	Percent Change from FY2014	Avoided Utility Cost
316 University Hospital	413,222 MMBtu	-2,379 MMBtu	-1%	\$50,000
5173 C&W Hospital	213,421 MMBtu	-5,124 MMBtu	-2%	\$110,000
5109 Cardiovascular	82,795 MMBtu	-5,100 MMBtu	-6%	\$110,000
317 Taubman Center	52,027 MMBtu	-2,091 MMBtu	-4%	\$45,000
350 EAA Health Center	42,176 MMBtu	1,656 MMBtu	+4%	-\$35,000
301 Cancer Center	46,746 MMBtu	-4,631 MMBtu	-9%	\$100,000

Since utility cost rates and the UMHHC portfolio of building area are continually changing, it is important to normalize utility figures for comparison and evaluation of efficiency and performance from year to year. Figure 2.2 illustrates the recent history of total UMHHC building energy efficiency (measured in BTU/ft<sup>2</sup>) and utility cost efficiency (measured in \$/ft<sup>2</sup>). 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. UMHHC facility efficiency has improved 18% since fiscal year 2005.

**Figure 2.2: Total UMHC Historical Energy & Cost Efficiency**

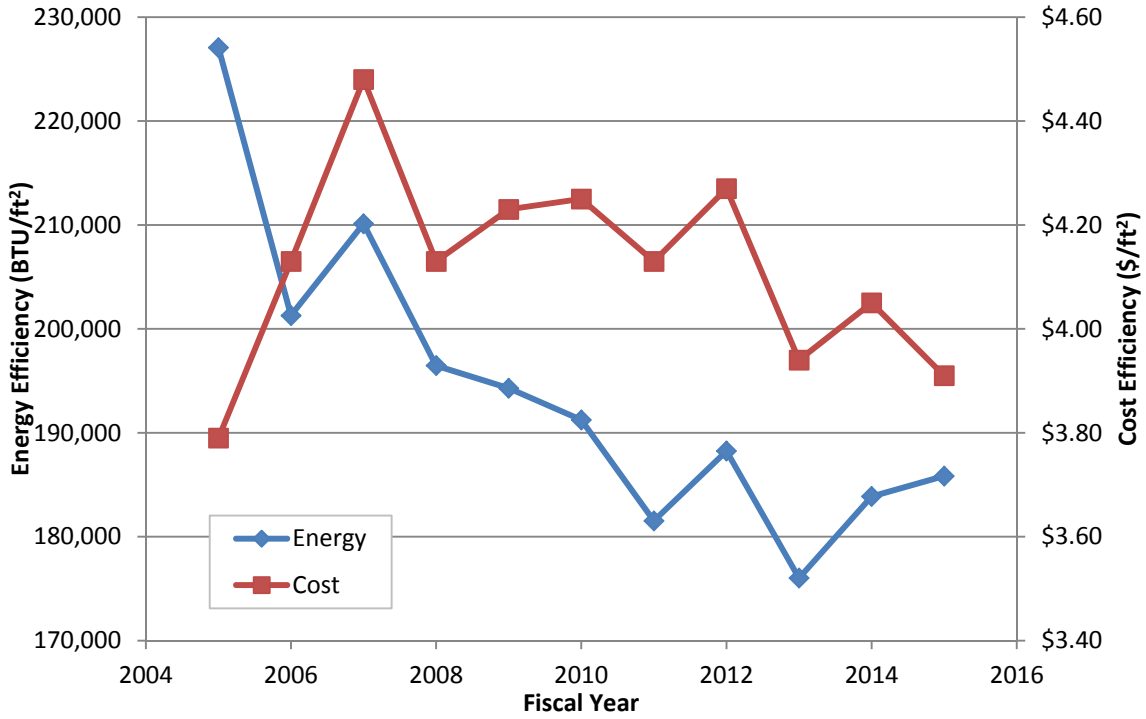


Figure 2.3 below shows the total UMHC energy and utility cost in recent history without normalizing against building area.

**Figure 2.3: Total UMHC Historical Energy Use & Utility Cost**

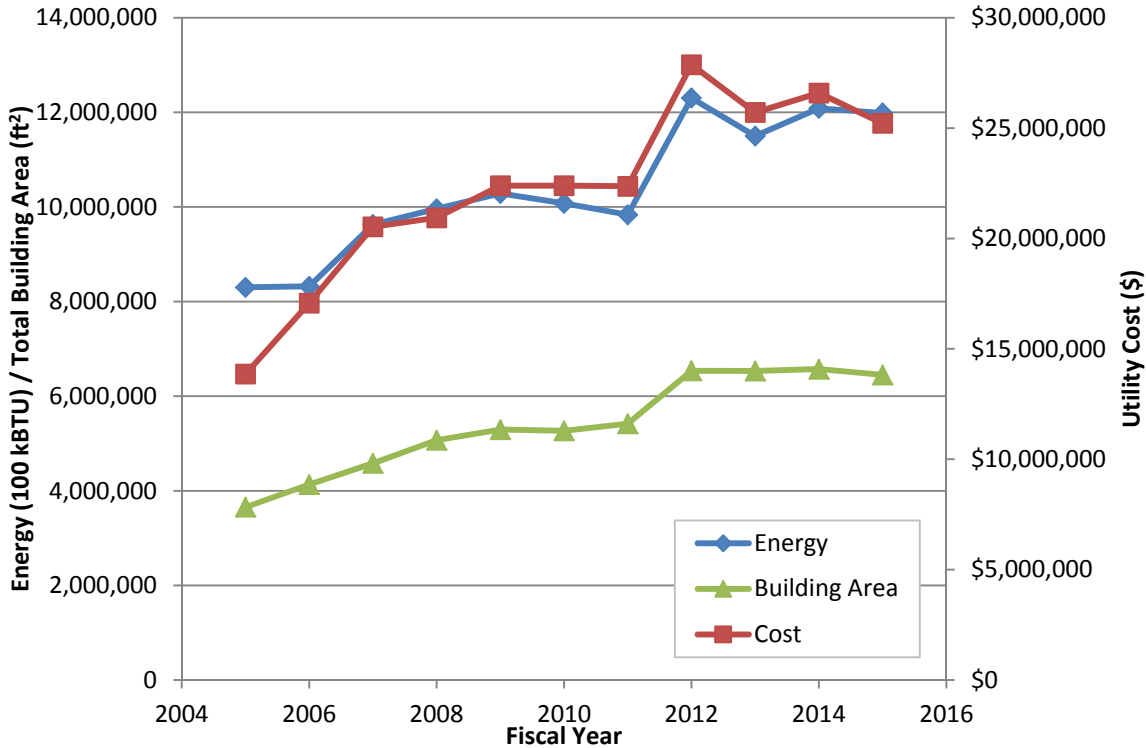
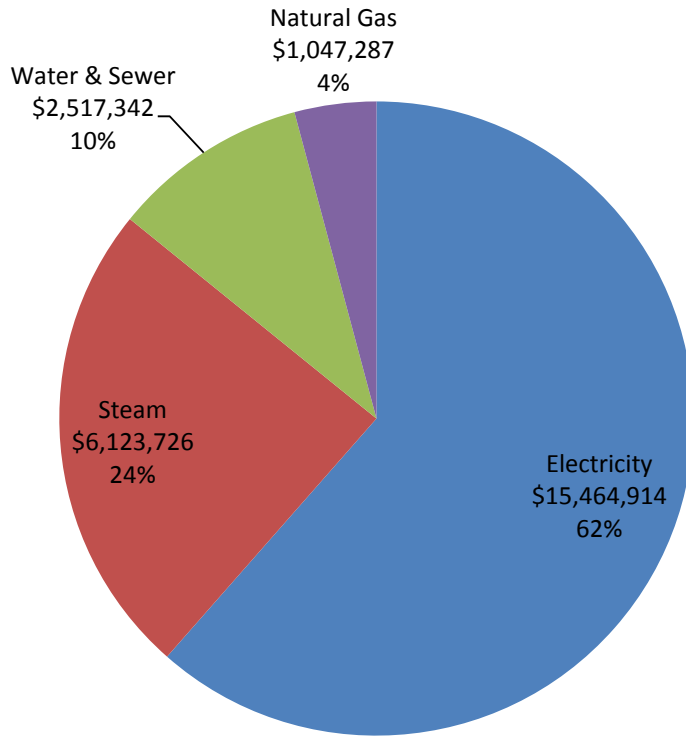


Figure 2.4 below illustrates the distribution and total costs of each of the four primary utilities included in UMHHC facilities for fiscal year 2015.

**Figure 2.4: Total FY2015 UMHHC Utility Cost Distribution**



### **3. ENERGY CONSERVATION**

Energy Conservation is a combined effort of numerous groups and departments throughout UMHHC. 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**

UMHHC 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 90.1-2007 energy standard, and achieving 30% energy improvement from baseline compliance for projects over \$10 Million in construction whenever possible. Every UMHHC 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, UMHHC also follows the University's sustainability in facility design and construction standard (**SID-K**). Among other sustainable practices, this standard also includes a requirement that all new buildings and building addition projects with over \$10 Million in associated construction costs, are required to achieve Silver certification under the Leadership in Energy and Environmental Design (LEED) system managed by the United States Green Building Council (USGBC). 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 2015, 2 new energy conservation projects were completed in existing facilities which are anticipated to provide approximately \$215,000/year in incremental energy savings. These cost \$308,237 to implement, yielding a 1.4 year overall payback period. This is summarized in Figure 3.2 below.

**Figure 3.2: ECM Projects Completed in FY2015**

<b>Building</b>	<b>Project Description</b>	<b>Project Cost</b>	<b>Estimated Savings</b>	<b>Payback (Years)</b>
Children's & Women's Hospital	Install new occupancy sensors in 4 <sup>th</sup> floor Operating Rooms and ventilation unit controls to allow automatic turndown of airflow during unoccupied periods, and to optimize HVAC system controls.	\$194,929	\$190,000	1.0
University Hospital Building	Replace cafeteria lighting with new high efficiency LED fixtures.	\$113,308	\$25,000	4.5
<b>Totals:</b>		<b>\$308,237</b>	<b>\$215,000</b>	<b>1.4</b>

**Operations & Maintenance**

UMHHC Operations & Maintenance teams are continuously working to maintain equipment at peak efficiency, to improve and optimize operations wherever possible, and to quickly respond and resolve operational issues at all 6.5 million ft<sup>2</sup> of UMHHC 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.

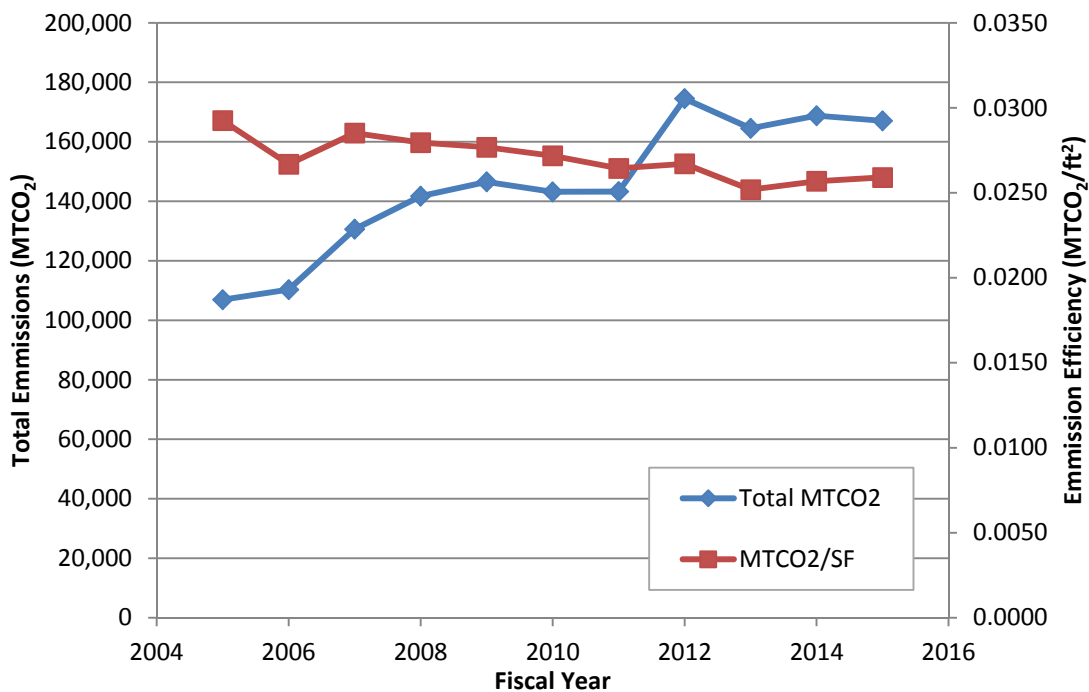


## 4. ENVIRONMENTAL IMPACT

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 UMHHC greenhouse gas emission quantities and greenhouse gas emission efficiencies, normalized against total UMHHC building area. Emissions are measured in metric tons of carbon dioxide (MTCO<sub>2</sub>). 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 2015, UMHHC decreased utility driven emissions by 1%. This equates to nearly 1,700 MTCO<sub>2</sub> of avoided greenhouse gas emissions, which is equivalent to removing over 300 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, UMHHC has increased its total building utility driven emissions by 51% compared to FY2006, however this is across a period of 56% growth in total UMHHC building area in that time. When normalized against total building area, UMHHC has improved its total emission per square foot efficiency by 3% since FY2006. Therefore, UMHHC has significantly expanded but has improved total emission efficiency during that time.

**Figure 4.1: UMHHC Utility Driven Greenhouse Gas Emission History**



## 5. BUILDING SUMMARY & ENERGY STAR

During fiscal year 2012, a comprehensive profile was created for all UMHHC 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 2015, UMHHC facility scores in aggregate calculated to a total portfolio score of 35. This is improved from a baseline score of 25 in fiscal year 2012. Figure 5.1 below illustrates UMHHC’s Energy Star rating progress towards national average and Energy Star Award levels.

**Figure 5.1: UMHHC Energy Star Portfolio Rating**

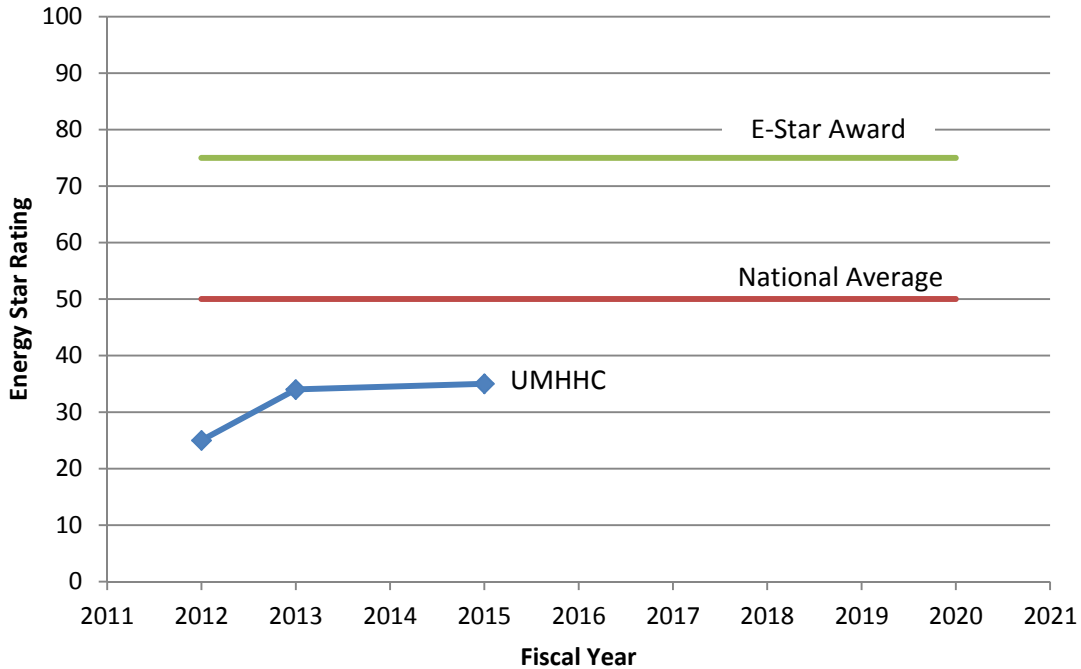


Figure 5.2 indicates the most efficient UMHHC buildings in fiscal year 2015, sorted by the primary Energy Star building type. Due to combined metering and shared utilities between facilities, several buildings are not included in this list because the available utility data does not represent the total 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: FY2015 UMHHC Most Energy Efficient Buildings**

<b>Rank</b>	<b>ID</b>	<b>Building</b>	<b>Efficiency (kBTU/ft<sup>2</sup>)</b>	<b>Energy Star Rating</b>	<b>Total Utility Cost</b>
<i>Hospitals</i>					
1.	5109	Cardiovascular Center	186.1	N/A	\$1,992,391
2.	5173	Children's & Women's Hospital	187.3	57	\$4,879,724
3.	0316	University Hospital Building	240.0	10	\$8,809,420
<i>Medical Office Buildings</i>					
1.	8042	Briarwood 4	55.7	54	\$27,004
2.	8161	Kellogg Eye Center – Brighton	66.7	54	\$10,590
3.	8149	Dexter Family Practice	70.2	55	\$14,192
4.	8065	Briarwood 3	72.8	46	\$24,734
5.	8111	Howell Health Center	75.9	N/A	\$6,032
<i>General Office Buildings</i>					
1.	8162	Traverwood 1	53.7	81	\$14,401
2.	5153	Traverwood 3	66.6	77	\$52,252
3.	8137	Michigan House	70.9	70	\$171,057
4.	8100	2101 Commonwealth	76.1	77	\$68,473
5.	8126	KMS Fusion Building	80.7	72	\$240,107

Figure 5.3 (attached) shows fiscal year 2015 information vs. fiscal year 2014 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: FY2015 vs. FY2014 UMHHC Building Utility Summary

ID	Name	E-Star Bldg Type	FY14				FY15				FY Comparison					
			SQFT	Cost	BTU/SF	kBTU	SQFT	Cost	BTU/SF	kBTU	SQFT	Cost	Cost %	BTU/SF	kBTU	kBTU %
8130 Briarwood 10	Medical Office		17,435	\$78,203	203,425	3,546,715	17,435	\$74,634	211,073	3,680,058	0	-\$3,569	-5%	7,648	133,343	4%
8137 Michigan House	Office		101,758	\$178,608	53,812	5,475,801	74,710	\$171,057	70,884	5,295,744	-27,048	-\$7,551	-4%	17,072	-180,058	-3%
8142 Briarwood 9	Medical Office		5,287	\$37,819	269,195	1,423,234	5,287	\$32,939	278,376	1,471,774	0	-\$4,880	-13%	9,181	48,540	3%
8149 Dexter Family Practice	Medical Office		8,020	\$15,197	73,292	587,802	8,020	\$14,192	70,188	562,908	0	-\$1,005	-7%	-3,104	-24,894	-4%
8155 Livonia Health Center	Medical Office		11,130	\$25,723	75,940	845,212	11,130	\$22,895	83,765	932,304	0	-\$2,828	-11%	7,825	87,092	10%
8160 Kellogg Eye Center - W Bloom	Medical Office		1,246	\$245	1,314	1,637	0	\$0	0	0	-1,246	-\$245	-100%	-1,314	-1,637	-100%
8161 Kellogg Eye Center - Brighton	Medical Office		6,647	\$11,736	69,963	465,044	6,696	\$10,590	66,684	446,516	49	-\$1,146	-10%	-3,279	-18,528	-4%
8162 Travenwood	Office		9,964	\$15,047	45,362	451,987	10,027	\$14,401	53,693	538,380	63	-\$646	-4%	8,331	86,393	19%
9598 UMH Sign 1050 Maiden Lane	N/A		0	\$37	0	0	0	\$0	0	0	0	-\$37	-100%	0	0	#DIV/0!
9599 UMH Sign 1525 Fuller St	N/A		0	\$410	0	0	0	\$427	0	0	0	\$17	4%	0	0	#DIV/0!
9601 Hospital Chilled Water Loop	N/A		0	\$149,549	0	0	0	\$158,521	0	0	0	\$8,972	6%	0	0	#DIV/0!
5173T C&W Trailer	N/A		0	\$11,886	0	0	0	\$10,089	0	0	0	-\$1,797	-15%	0	0	#DIV/0!
<b>Totals:</b>			<b>6,572,173</b>	<b>\$26,591,316</b>	<b>183,391</b>	<b>1,205,275,411</b>	<b>6,449,479</b>	<b>\$25,216,094</b>	<b>185,255</b>	<b>1,194,797,340</b>	<b>-122,694</b>	<b>-\$1,375,222</b>	<b>-5.2%</b>	<b>1,864</b>	<b>-10,478,071</b>	<b>-0.9%</b>