



# **Energy Management**

## **Annual Report – Fiscal Year 2019**

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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/ft<sup>2</sup>
- Medical Office Building: Kellogg Eye Center Brighton – 53.2 kBTU/ft<sup>2</sup>
- General Office Building: Burlington Office Center – 34.9 kBTU/ft<sup>2</sup>

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 <sup>2</sup>   | 26.96 KWH/ft <sup>2</sup>  | \$0.079/KWH                 | \$227,569            |
| Steam         | 0.0607 MLB/ft <sup>2</sup> | 0.0600 MLB/ft <sup>2</sup> | \$15.26/MLB                 | \$75,228             |
| Natural Gas   | 0.0228 MCF/ft <sup>2</sup> | 0.0292 MCF/ft <sup>2</sup> | \$4.77/MCF                  | -\$205,015           |
| Water/Sewer   | 0.0469 CCF/ft <sup>2</sup> | 0.0479 CCF/ft <sup>2</sup> | \$10.22/CCF                 | -\$63,791            |
| <b>Total:</b> |                            |                            |                             | <b>\$33,990</b>      |

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/ft<sup>2</sup>), and weather normalized efficiency (BTU/ft<sup>2</sup>, 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/ft<sup>2</sup> 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**

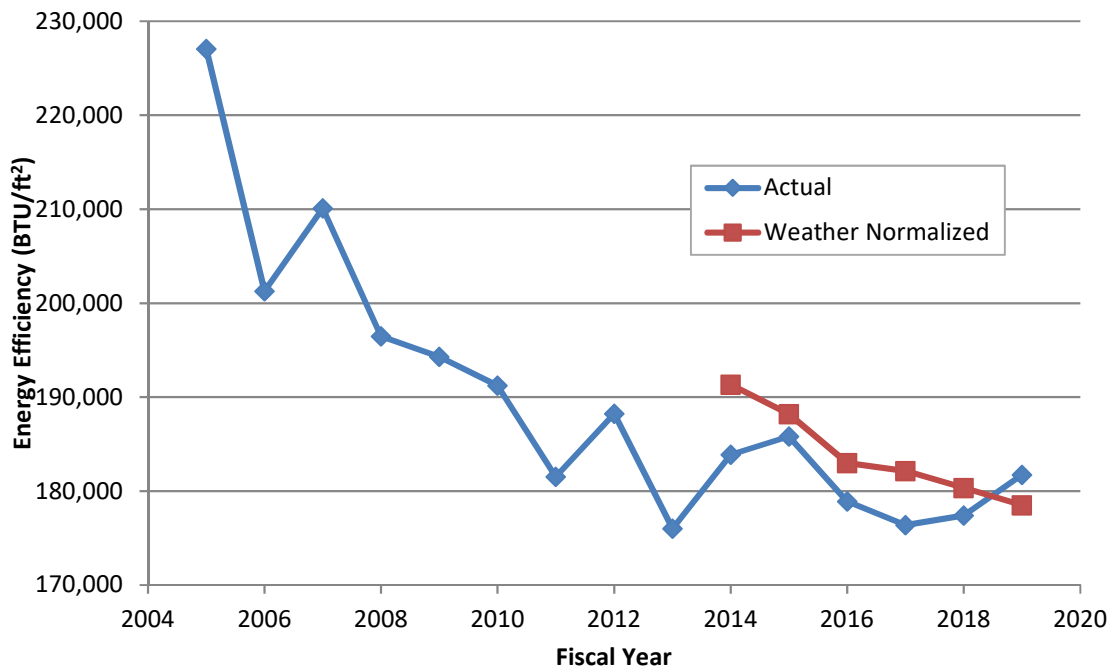


Figure 2.3 illustrates the recent history of total actual MM building energy efficiency (measured in BTU/ft<sup>2</sup>) and utility cost efficiency (measured in \$/ft<sup>2</sup>).

**Figure 2.3: Total MM Historical Energy & Cost Efficiency**

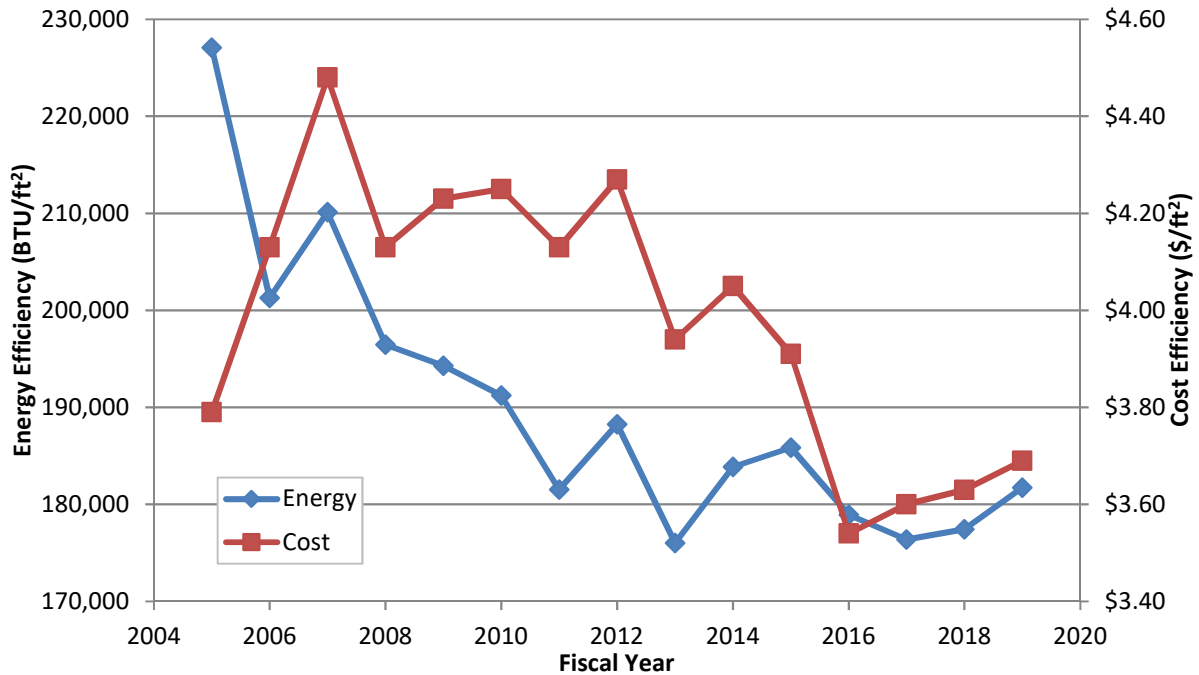


Figure 2.4 below shows the total actual MM energy and utility cost in recent history without normalizing against building area.

**Figure 2.4: Total MM Historical Energy Use & Utility Cost**

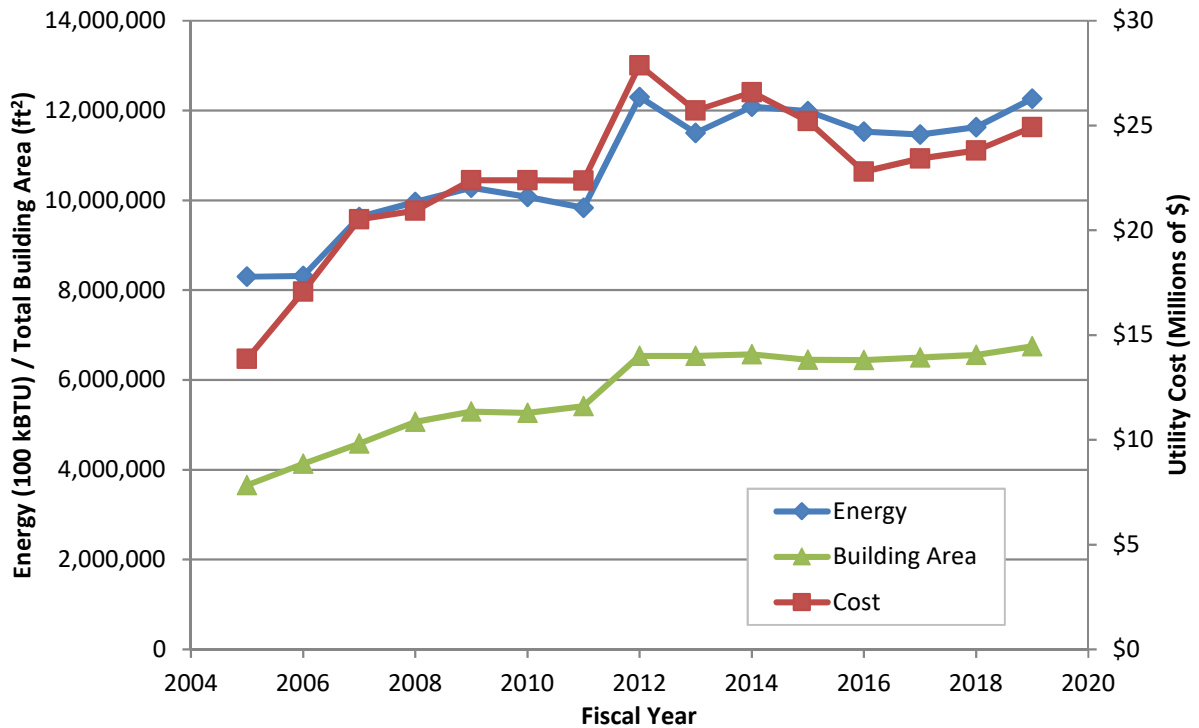


Figure 2.4 below shows the changes in the overall average utility rate across all MM facilities over time.

**Figure 2.4: Total MM Historical Average Utility Rates**

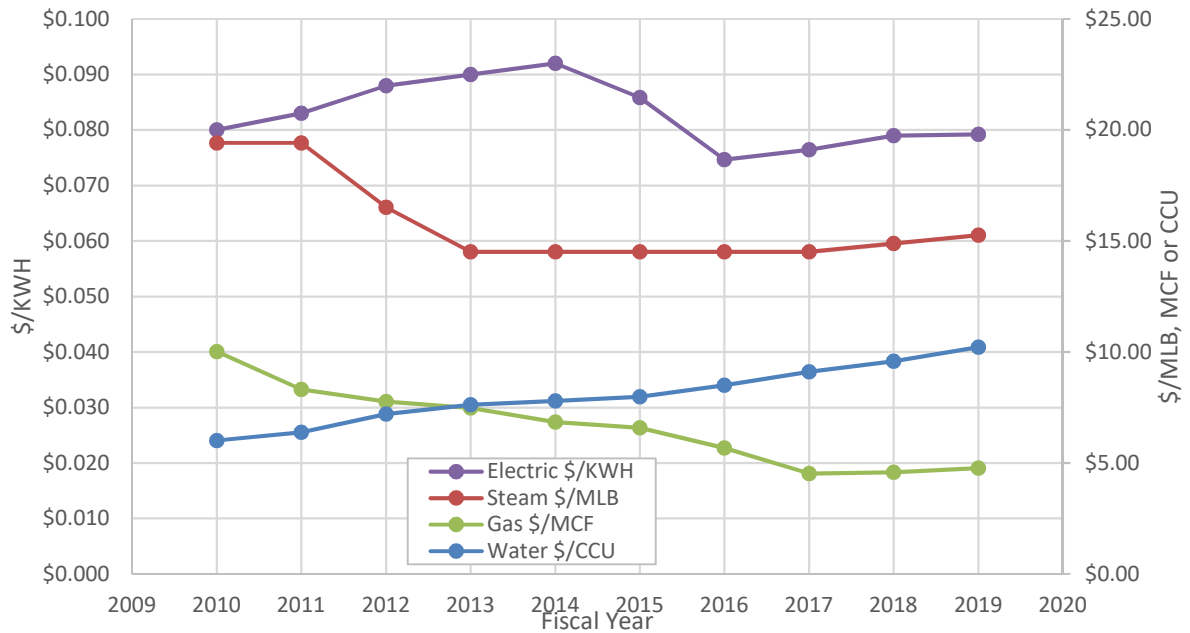
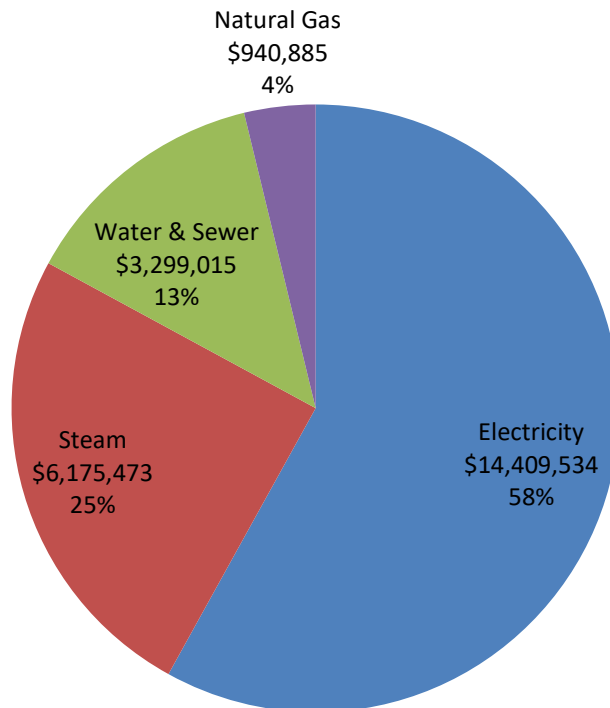


Figure 2.5 below illustrates the distribution and total costs of each of the four primary utilities included in MM facilities for fiscal year 2019.

**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 pursuing 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**

| <b>Building</b>              | <b>Project Description</b>                                                                                                        | <b>Project Cost</b> | <b>Estimated Savings</b> |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------|
| 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 Building | Replace domestic hot water heater with new (*Included as component of larger capital project)                                     | 1,000,000           | \$8,000                  |
| <b>Total Annual Savings:</b> |                                                                                                                                   |                     | <b>\$96,000</b>          |

**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 ft<sup>2</sup> 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.

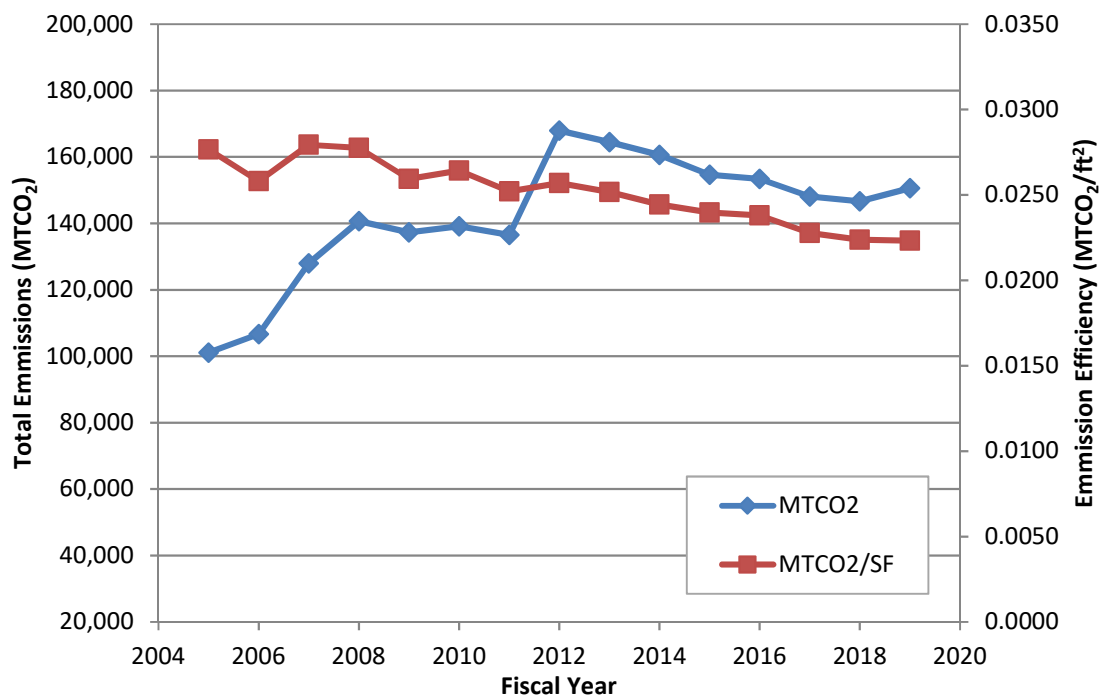


## 4. ENVIRONMENTAL IMPACT

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 (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 2019, MM decreased normalized utility driven emissions by 0.2%. This equates to 317 MTCO<sub>2</sub> 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**

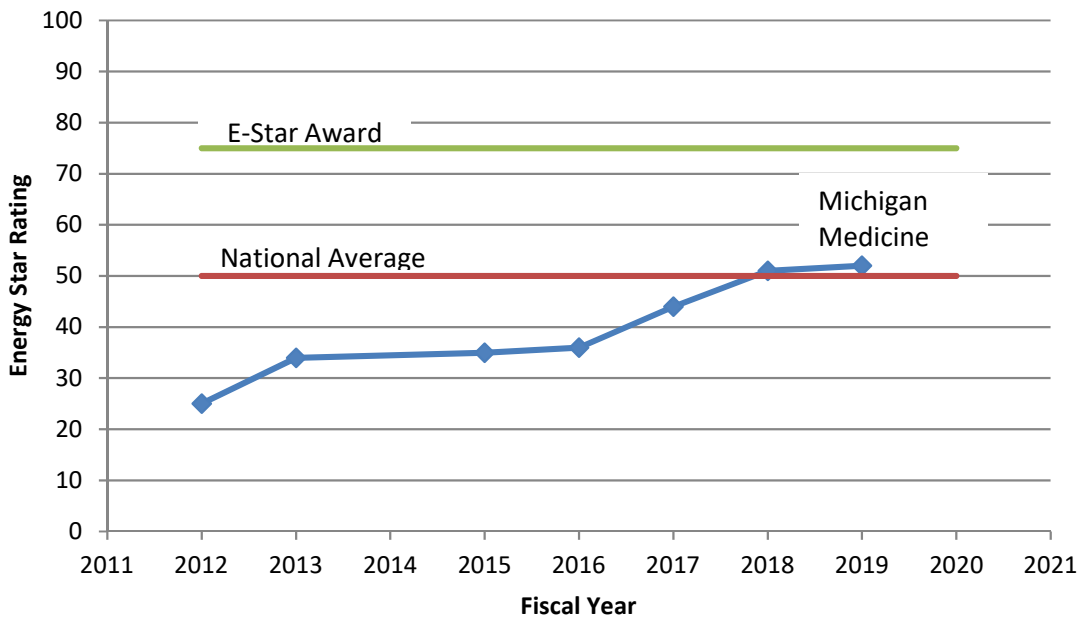


Figure 5.2 indicates the most efficient MM buildings in fiscal year 2019, sorted by the primary Energy Star building type. Due to combined metering and shared utilities between facilities, several buildings are not included in this list because the available utility data does not represent the total 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**

| <b>Rank</b>                     | <b>ID</b> | <b>Building</b>                    | <b>Efficiency<br/>(kBTU/ft<sup>2</sup>)</b> | <b>Energy<br/>Star Rating</b> | <b>Total<br/>Utility<br/>Cost</b> |
|---------------------------------|-----------|------------------------------------|---------------------------------------------|-------------------------------|-----------------------------------|
| <i>Hospitals</i>                |           |                                    |                                             |                               |                                   |
| 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                       |
| <i>Medical Office Buildings</i> |           |                                    |                                             |                               |                                   |
| 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                          |
| <i>General Office Buildings</i> |           |                                    |                                             |                               |                                   |
| 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

| ID    | Name                          | E-Star Bldg Type | FY18   |           |        |         | FY19   |           |        |         | FY Comparison |                 |         |        |         |         |
|-------|-------------------------------|------------------|--------|-----------|--------|---------|--------|-----------|--------|---------|---------------|-----------------|---------|--------|---------|---------|
|       |                               |                  | SQFT   | Cost      | BTU/SF | kBTU    | SQFT   | Cost      | BTU/SF | kBTU    | SQFT          | Cost            | Cost %  | BTU/SF | kBTU    | kBTU %  |
| 8149  | Dexter Family Practice        | Medical Office   | 10,065 | \$17,492  | 73,149 | 736,245 | 10,065 | \$15,385  | 64,734 | 651,548 | 0             | <b>-\$2,107</b> | -12%    | -8,415 | -84,697 | -12%    |
| 8155  | Livonia 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  | Kellogg Eye Center - Brighton | Medical Office   | 6,803  | \$9,865   | 61,083 | 415,548 | 7,074  | \$6,176   | 53,240 | 376,620 | 271           | <b>-\$3,689</b> | -37%    | -7,843 | -38,928 | -9%     |
| 8162  | Traverwood 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  | UMH Sign 1525 Fuller St       | N/A              | 0      | \$201     | 0      | 0       | 0      | \$299     | 0      | 0       | 0             | \$98            | 49%     | 0      | 0       | #DIV/0! |
| 9601  | Hospital 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! |