



UMH - Energy Management

Annual Report – Fiscal Year 2021

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1. EXECUTIVE SUMMARY

In fiscal year 2021, energy management teams continued to expand energy conservation efforts in University of Michigan Health (UMH) facilities and work to align efforts towards the newly established University carbon neutrality goals. As a result, UMH continues to show improvements in energy efficiency and carbon emission reduction.

Energy Performance

In fiscal year 2021, the total utility cost for all University of Michigan Health (UMH) facilities was \$25.15 Million. Overall, actual facilities site energy usage per square foot was 0.2% lower than fiscal 2020 and 4.4% lower when compared to fiscal 2019. Energy savings coupled with increasing utility rates resulted in over \$81 Thousand in total avoided utility cost compared to fiscal 2020 and \$1.6M when compared to fiscal 2019. Some of the savings was likely due to partial occupancy due to the COVID pandemic. Weather normalized site energy usage per square foot was 2.0% more efficient than fiscal 2020 and 5.8% more efficient when compared to fiscal 2019. For further details, see section 2, “Energy Performance” of this report.

Energy Conservation

Fiscal year 2021 continued energy conservation efforts by various teams and continue to show improvements to the overall UMH building portfolio. During fiscal year 2021 energy conservation measures were incorporated into larger infrastructure projects and recommissioning effort conducted on existing systems. These efforts are anticipated to save an estimated \$51,000 annually. For further details, see section 3, “Energy Conservation” of this report.

Environmental Impact

Fiscal year 2021 was also a big year of goal setting for the University of Michigan. The President of the University announced University wide carbon neutrality goals in May of 2021. 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. UMH facilities improved total utility driven greenhouse gas emission (scope 1 & 2) efficiency by 0.84% compared to fiscal 2020 and an improvement of 6.39% compared to fiscal 2019. For further details, see section 4, “Environmental Impact” of this report.

Building Summary & Benchmarking

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

- Hospital Building: Children's & Women's Hospital – 183.5 kBTU/ft²
- Medical Office Building: Kellogg Eye Center Milford – 41.4 kBTU/ft²
- General Office Building: Traverwood 1 – 36.8 kBTU/ft²

In total, on a scale of 0 to 100 (100 being the most efficient) the UMH building portfolio has earned a score of 61 in the U.S. EPA Energy Star rating system. For further details and a complete listing of UMH building performance, see section 5, “Building Summary & Energy Star” of this report.

2. ENERGY PERFORMANCE

In fiscal year 2021, the total utility cost for all University of Michigan Health (UMH) facilities was \$25.15 Million. Overall, facilities site energy usage per square foot was 0.2% lower than fiscal 2020 and 4.4% lower when compared to fiscal 2019. Energy savings coupled with increasing utility rates resulted in over \$81 Thousand in total avoided utility cost compared to fiscal 2020 and \$1.6M when compared to fiscal 2019. This is detailed in Figure 2.1 below.

Figure 2.1: Breakdown of Avoided Utility Cost vs. FY2020

Utility	FY2019 Efficiency	FY2020 Efficiency	FY2021 Efficiency	FY2021 Average Utility Rate	Avoided Utility Cost vs FY20
Electric	26.96 KWH/ft ²	26.05 KWH/ft ²	26.27 KWH/ft ²	\$0.084/KWH	-\$122,494
Steam	0.0600 MLB/ft ²	0.0555 MLB/ft ²	0.0611 MLB/ft ²	\$15.64/MLB	-\$589,486
Natural Gas	0.0292 MCF/ft ²	0.0292 MCF/ft ²	0.0225 MCF/ft ²	\$5.31/MCF	\$236,927
Water/Sewer	0.0479 CCF/ft ²	0.0414 CCF/ft ²	0.0414 CCF/ft ²	\$12.94/CCF	\$556,705
				Total:	\$81,653

Since the UMH 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 UMH buildings 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 FY21 BTU/ft² efficiency was 0.2% more efficient than FY20 and when weather normalized to account for weather conditions, normalized performance was 2.0% more efficient than FY20. The efficiency comparison to FY19 shows an improvement of 4.4% and a 5.8% improvement when comparing weather normalized efficiency. Actual UMH facility efficiency has improved 23.5% since fiscal year 2005.

Figure 2.2: Total UMH Actual & Weather Normalized Energy Efficiency

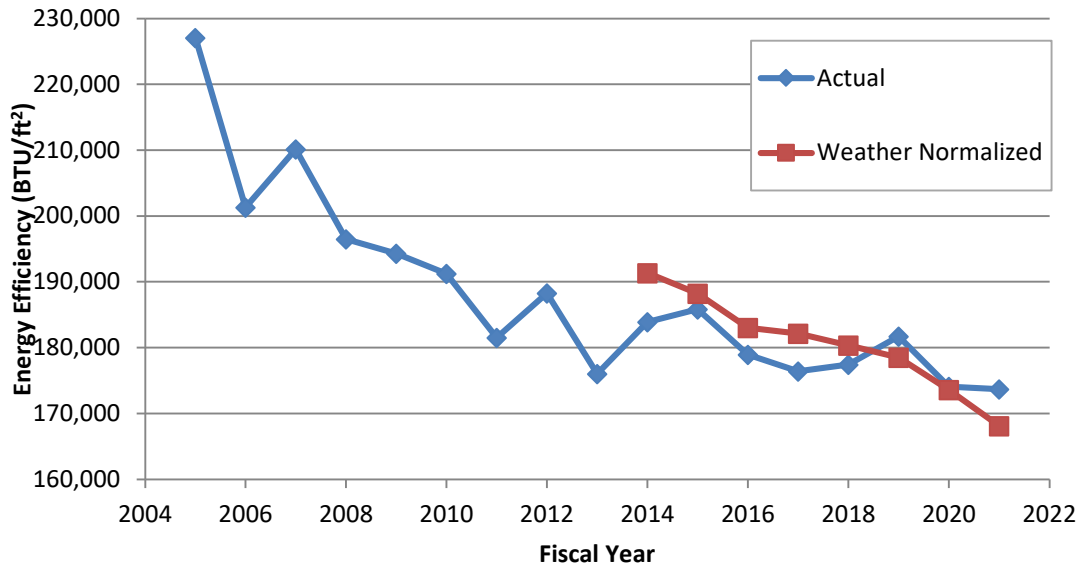


Figure 2.3 illustrates the recent history of total actual UMH building energy efficiency (measured in BTU/ft²) and utility cost efficiency (measured in \$/ft²).

Figure 2.3: Total UMH Historical Energy & Cost Efficiency

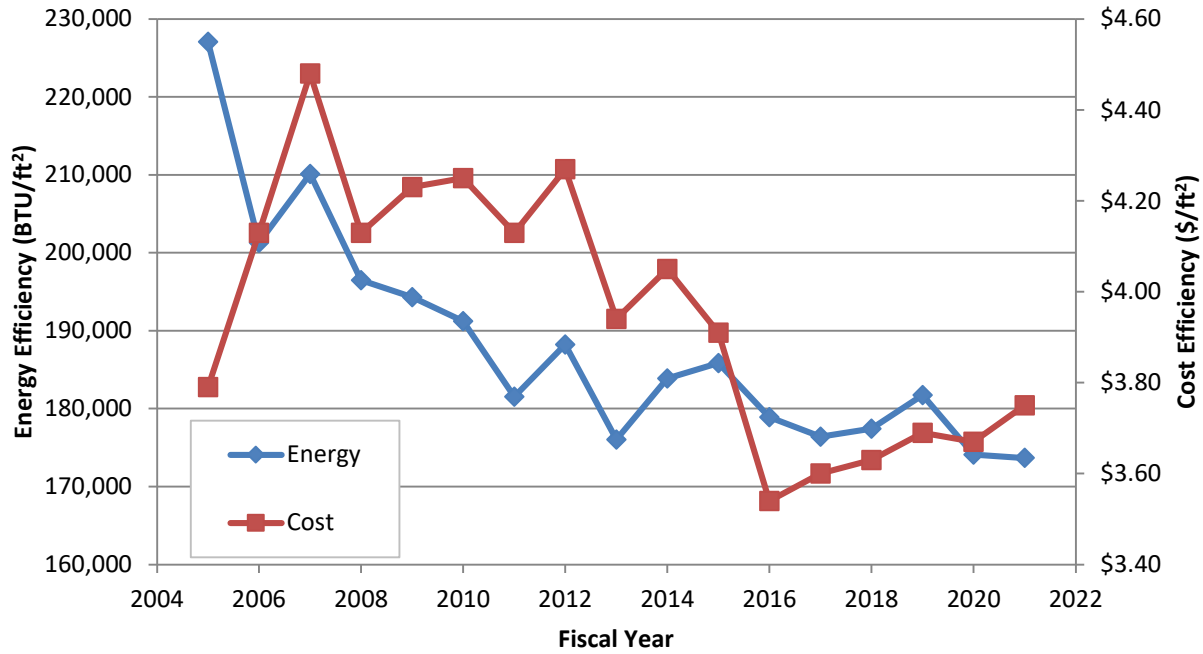


Figure 2.4 below shows the total actual UMH energy, utility cost and square footage growth in recent history without normalizing against building area.

Figure 2.4: Total UMH Historical Energy, Utility Cost and Growth

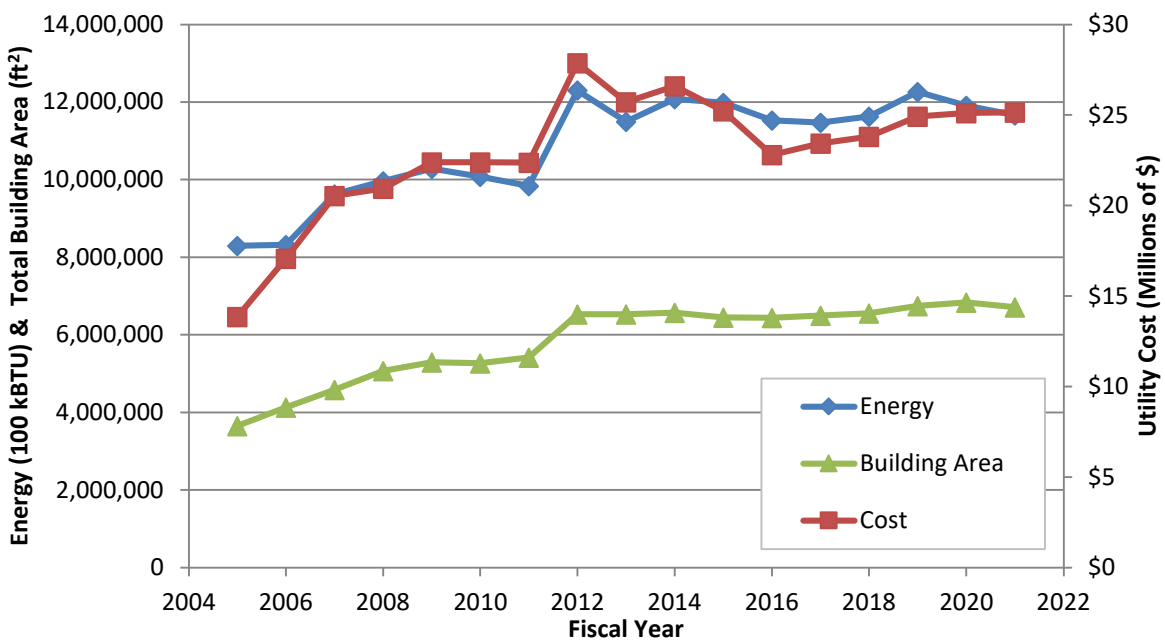


Figure 2.5 below shows the changes in the overall average utility rate across all UMH facilities over time.

Figure 2.5: Total UMH Historical Average Utility Rates

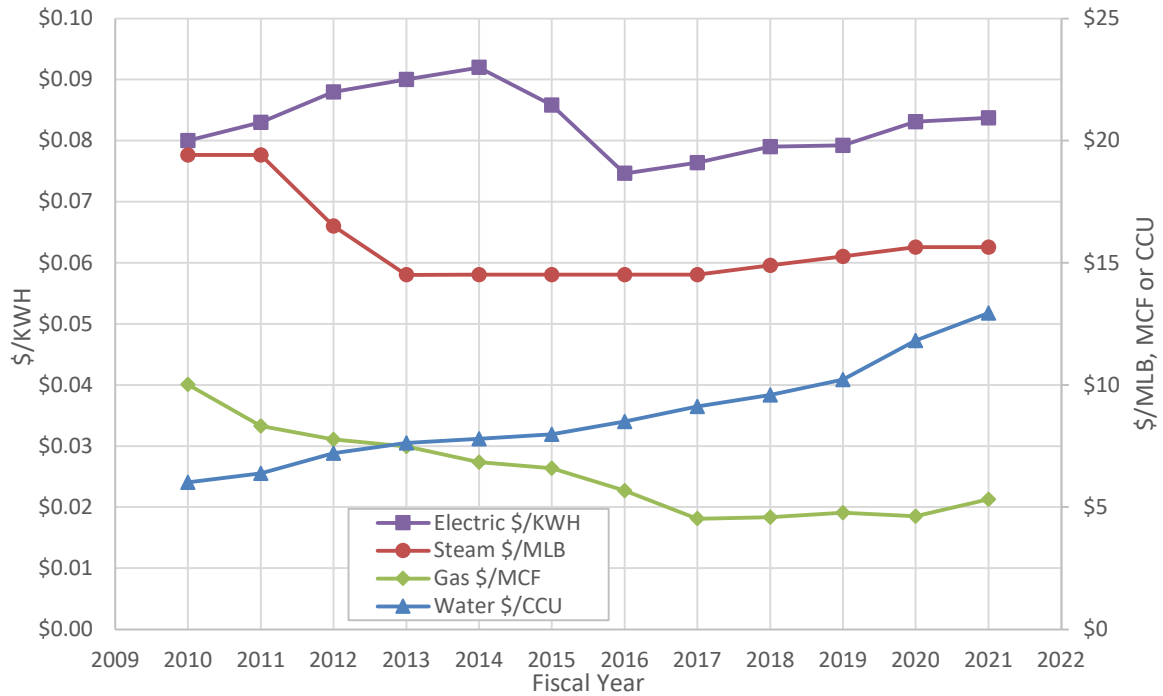
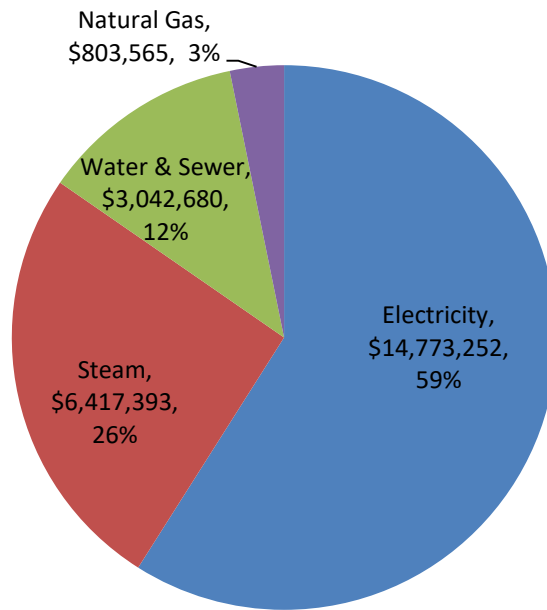


Figure 2.6 below illustrates the distribution and total costs of each of the four primary utilities included in UMH facilities for fiscal year 2021.

Figure 2.6: Total UMH FY2021 Utility Cost Distribution



3. ENERGY CONSERVATION

Energy Conservation is a combined effort of numerous groups and departments throughout UMH. These efforts primarily fall into the following categories:

- **New Construction**
Efficient design and construction practices for new capital construction.
- **Operations & Maintenance Recommissioning**
Maintain, manage, and optimize building operational efficiency.
- **Energy Conservation Measures (ECMs)**
Projects in existing facilities designed to improve energy performance.
- **Utility Rebates**
Rebates from DTE on projects and facility maintenance tasks

New Construction

UMH strives to incorporate energy efficient strategies and practices in all new capital construction projects. This first includes participation and compliance with the University's sustainability design guidelines ([3.2 Energy & Water Conservation](#)), including several standardized efficiency practices, compliance with the ASHRAE 90.1 energy standard, and achieving energy improvements beyond baseline compliance for projects over \$10 Million in construction whenever possible. Every UMH 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, UMH also follows the University's sustainability in facility design and construction standard ([3.1 Sustainable Design & LEED Requirements](#)). 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.

Operations & Maintenance Recommissioning

Michigan Medicine 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 6.7 million ft² of UMH buildings. This includes several key tasks for an extensive body of equipment and instruments. Examples of key equipment are building automation systems, environmental controls & instruments, room temperature controls, air handling units, pumps, chillers, boilers, and steam traps.

Energy Conservation Measures (ECMs)

In fiscal year 2021, there were no dedicated energy conservation projects with UMH in an economic recovery mode. However, several energy conservation measures were included in other major infrastructure upgrade projects, and several improve efficiency through equipment replacement. In total, it is estimated that projects and recommissioning efforts completed in fiscal year 2021 will provide an estimated energy savings of approximately \$51,000/year. See below for a sample of projects summarized in Figure 3.1.

Figure 3.1: ECM Projects Completed in FY2021

Building	Project Description	Project Cost	Estimated Savings
University Hospital	Process chilled water Improvement project <i>(*Savings as component of larger capital project)</i>	\$475,000	\$10,000
West Ann Arbor	RTU 4 Replacement project <i>(*Savings as component of larger capital project)</i>	\$360,000	\$5,000
Children's & Women's Hospital	Helipad roof lighting improvement <i>(*Savings as component of larger capital project)</i>	\$140,000	\$3,000
Brehm Building	AHU & Exhaust recommissioning project	\$5,000	\$18,000
300 North Ingalls Building	AHU recommissioning project	\$3,000	\$15,000
Total Annual Savings:			\$51,000

Utility Rebates

The University of Michigan has a contract with DTE Energy for utilities. DTE Energy offers an energy efficiency rebate program to its customers for many common energy efficiency measures and custom incentives for other energy efficiency improvements. Rebates from DTE on projects and maintenance activities for FY2021 are summarized in figure 3.2.

Figure 3.2: DTE Project Rebates FY2021

Building	Project Description	Estimated Rebate
Brehm	Boiler tune-up	\$600
NCRC Pathology	Steam trap Replacement	\$500
Total Utility Rebate:		\$1,100

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 University of Michigan Health (UMH) greenhouse gas emission by scope and greenhouse gas emission efficiencies, normalized against total UMH 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 (scope 1 & 2 emissions), and do not include emissions from other institution operations (scope 3 emissions). In fiscal year 2021, UMH decreased utility driven emissions by 0.84% when compared to FY20 and 6.4% when compared to FY19. The fiscal 2021 reduction equates to 1,305 MTCO₂ of greenhouse gas emissions, which is equivalent to the removal 284 car from the road.

New Carbon Neutrality Goals

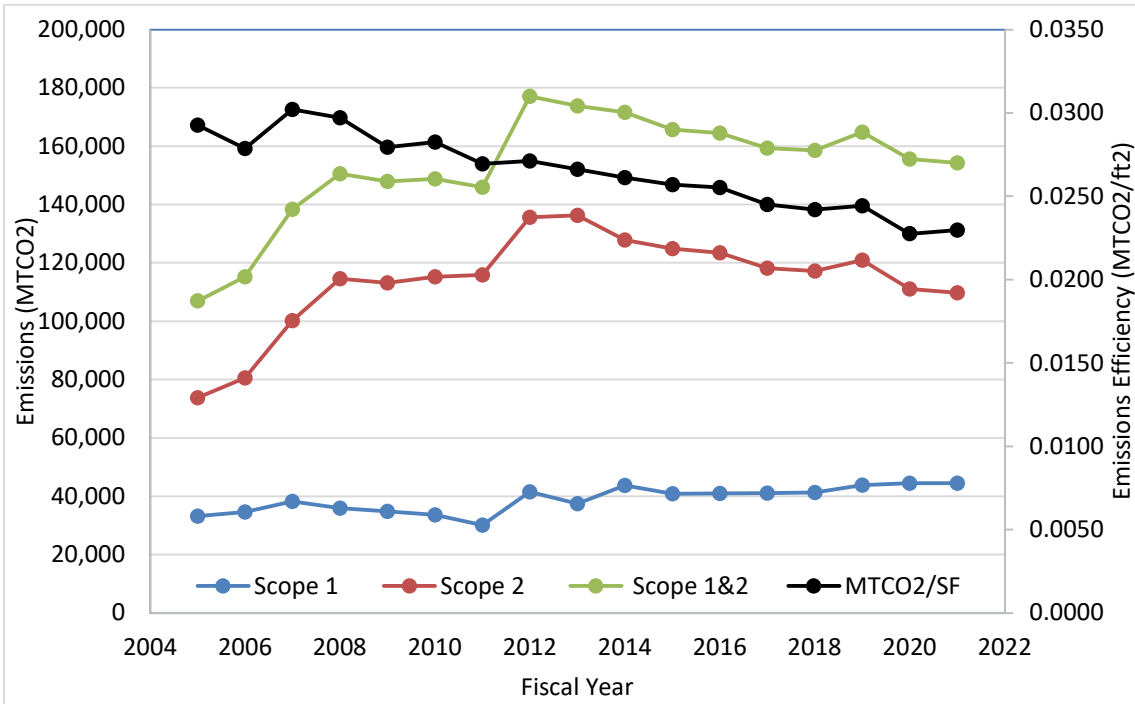
After the release of the final recommendations of the President's Commission on Carbon Neutrality (PCCN), U-M announced a series of commitments and initial steps that place carbon neutrality at the center of U-M's mission. Following the commission's guidance, U-M will eliminate Scope 1 emissions (resulting from direct, on-campus sources) by 2040, achieve carbon neutrality for Scope 2 emissions (resulting from purchased electricity) by 2025, and establish net-zero goals for Scope 3 emissions categories (resulting from indirect sources like commuting, food procurement, and university-sponsored travel) by 2025. These and other strategies are the first of more to come in a comprehensive climate action plan and cover the entire university, including 40 million square feet in buildings, three campuses, an expansive athletics complex and the Michigan Medicine health system.

Previous Emission Goals

While University of Michigan reviews recommendations outlined by the President's Commission on Carbon Neutrality, the university continues to progress toward its 2025 sustainability goals, established in 2011 by former UM President Coleman. These commitments include a 25% reduction in total greenhouse gas emissions by FY25, compared to a FY2006 baseline. It is anticipated that this will be accomplished through improvements to several 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, UMH has increased its total building utility driven emissions by 33.9% compared to FY2006, however this is across a period of 62.5% growth in total UMH building area in that time. When normalized against total building area, UMH has improved its total emission per square foot efficiency by 17.5% since FY2006, and by 21.5% since FY2005. Therefore, UMH has significantly expanded but has improved total emission efficiency during that time. Figure 4.1 below shows the changes in the emissions across all UMH facilities over time.

Figure 4.1: UMH Utility Driven Greenhouse Gas Emission History



5. BUILDING SUMMARY & BENCHMARKING

During fiscal year 2012, a comprehensive profile was created for all UMH 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 2021, UMH facility scores in aggregate calculated to a total portfolio score of 61. 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 UMH's Energy Star rating progress towards national average and Energy Star Award levels.

Figure 5.1: UMH Energy Star Portfolio Rating

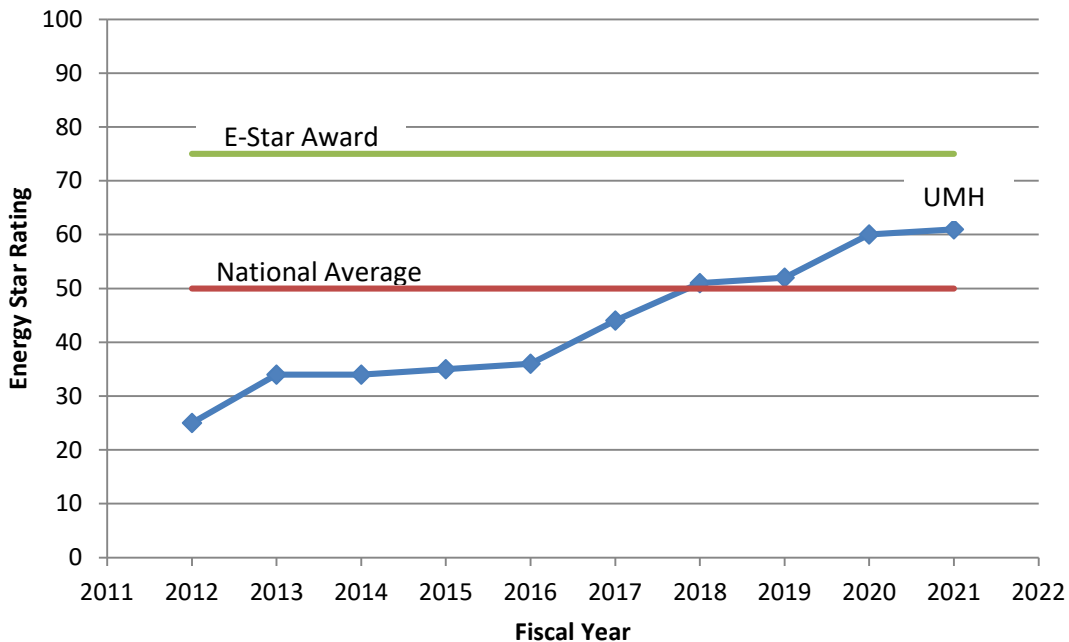


Figure 5.2 indicates the most efficient UMH buildings in fiscal year 2021, sorted by the primary Energy Star building type. Due to combined metering and shared utilities between facilities, several buildings are not included in this list because the available utility data does not represent the total 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: FY2021 UMH Most Energy Efficient Buildings

Rank	ID	Building	Efficiency (kBTU/ft ²)	Energy Star Rating	Total Utility Cost
<i>Hospitals</i>					
1.	5173	Children's & Women's Hospital	183.5	67	\$4,746,766
2.	5239	Brighton Center for Specialty Care	203.5	N/A	\$902,543
3.	5109	Cardiovascular Center	219.6	N/A	\$2,137,366
4.	0316	University Hospital Building	220.3	75	\$8,351,813
<i>Medical Office Buildings</i>					
1.	5098	Kellogg Eye Center - Milford	41.4	N/A	\$2,372
2.	8042	Briarwood 4	53.7	61	\$30,967
3.	8149	Dexter Family Practice	55.2	53	\$13,899
<i>General Office Buildings</i>					
1.	8162	Traverwood 1	36.8	75	\$11,119
2.	8137	Michigan House	55.3	74	\$124,452
3.	8100	Plymouth Park	56.5	N/A	\$29,216

Figure 5.3 (attached) shows fiscal year 2021 information vs. fiscal year 2020 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.

