



Energy Conservation at the University of Michigan Hospitals & Health Centers (UMHHC)



Hi I'm Colin

- Mechanical Engineering background
- Licensed Professional Engineer
- Certified Energy Manager
- 10 years in facility energy conservation
- 3 years as the UMHHC Energy Conservation Engineer

Agenda

- Discuss process for finding & capturing savings
 - Define current status
 - Set goals
 - Where's the energy & opportunity
 - Key energy focus points in hospitals
 - Build, commission, and report

-  3 rules for energy conservation in healthcare
- The patient comes first
 - The patient comes first
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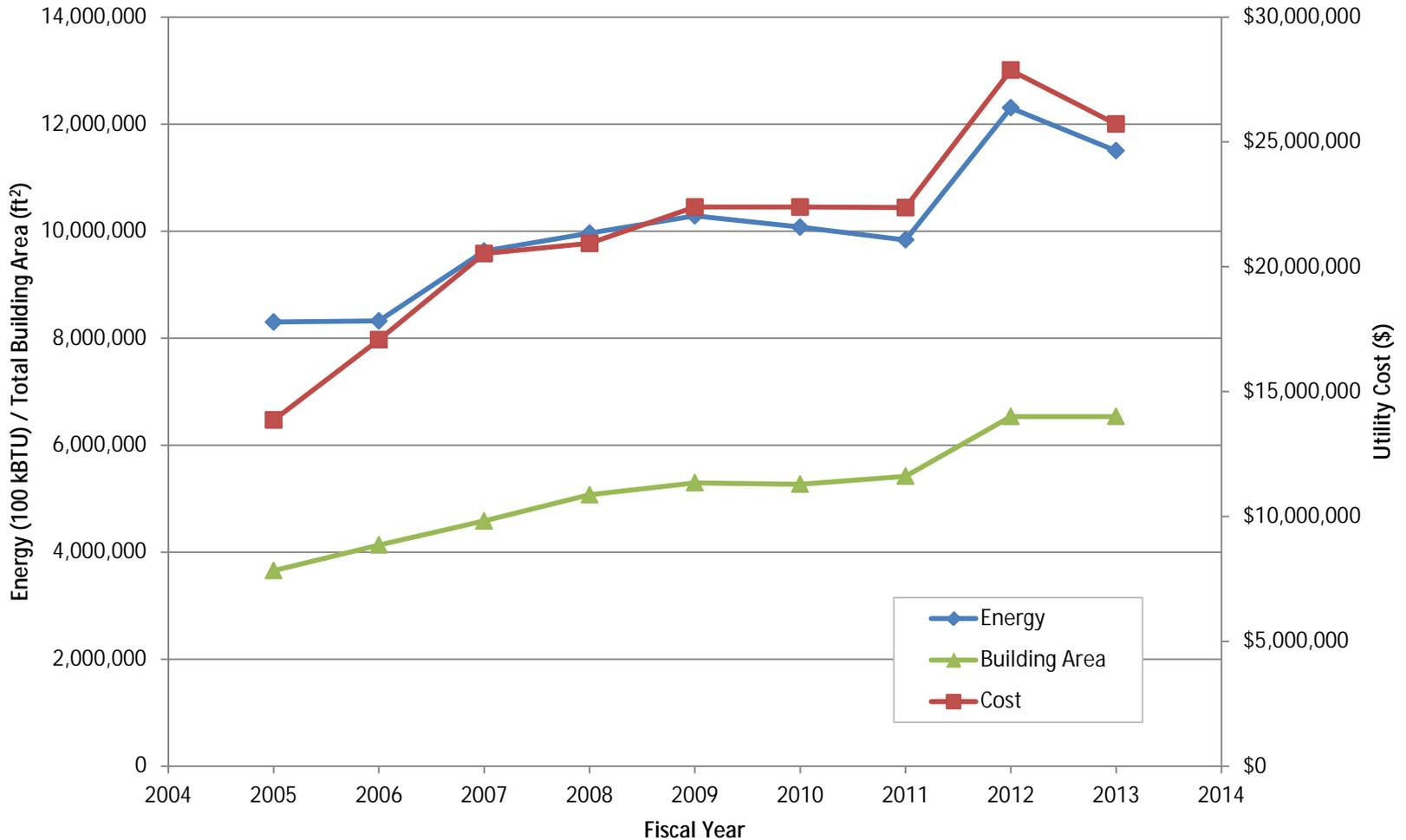
UMHHC at a Glance

- 67 Buildings
- 6.5 Million square feet
- \$26 Million in utilities last fiscal year
- 22% improvement in BTU/ft² energy efficiency since 2005



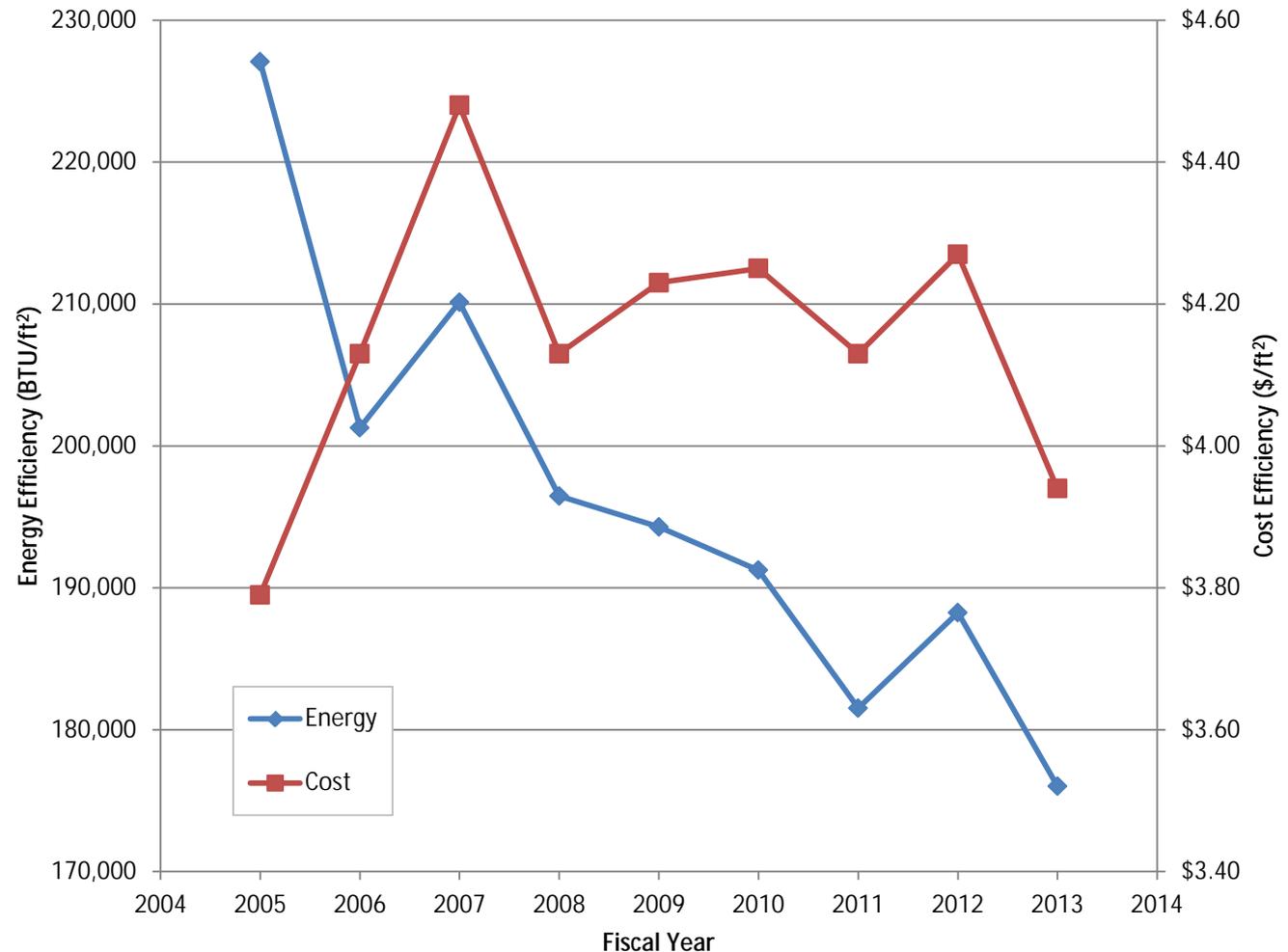
Where Are We Now?

Total UMHHC Energy



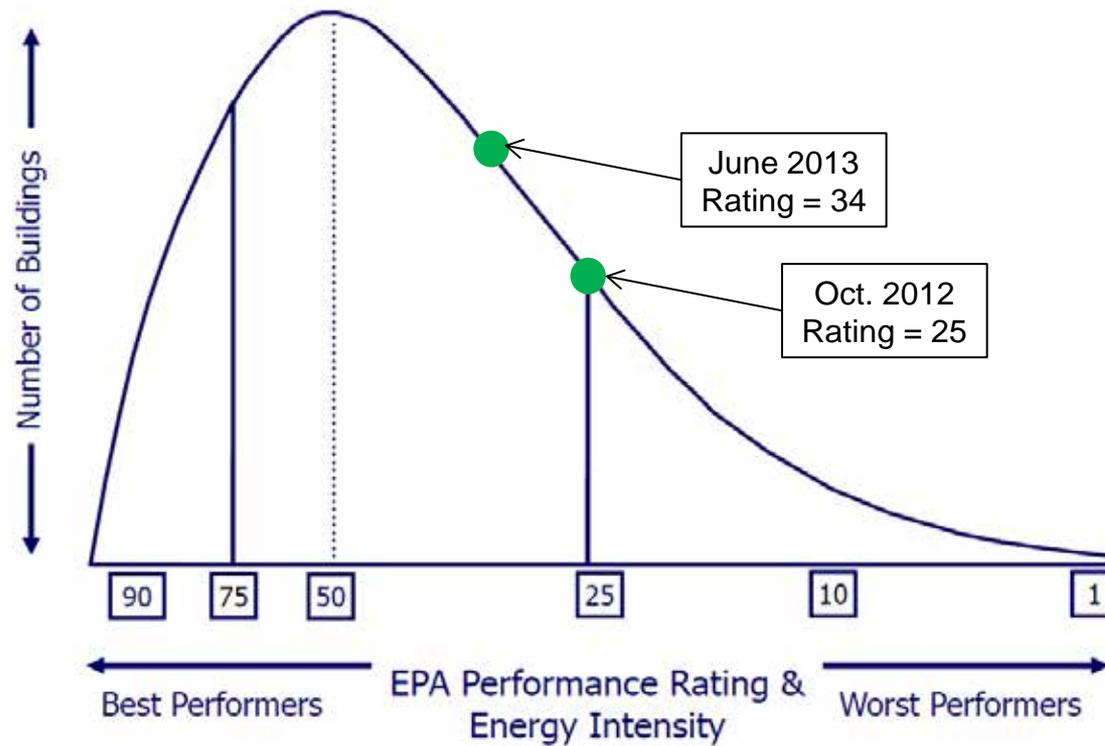
Energy & Cost per Square Foot

- 22% BTU/SF improvement since 2005
- 6% improvement in the last year yielding **\$1.8 Million** in new avoided utility cost.

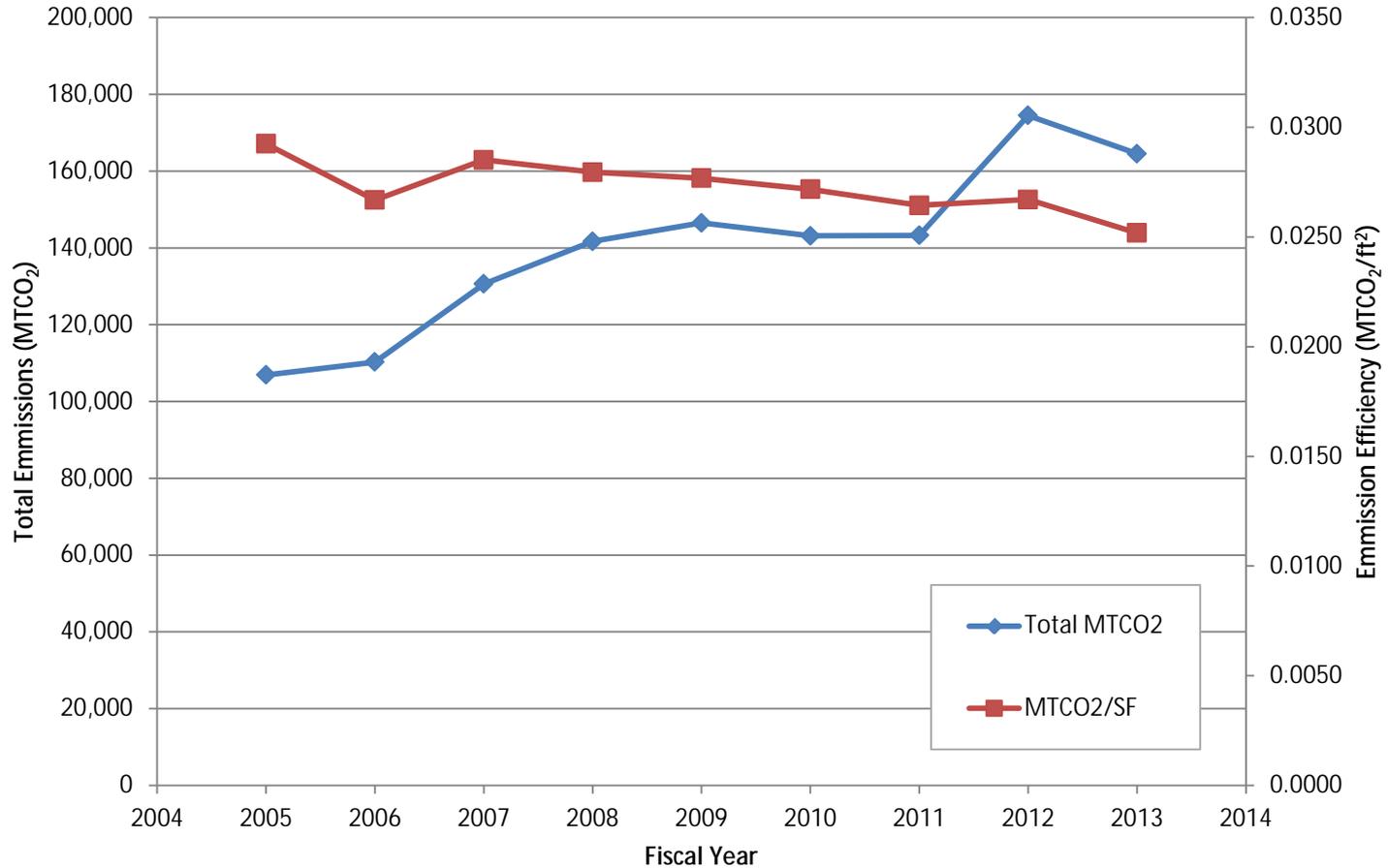


Energy Star

EPA Rating Distribution



Greenhouse Gasses





Goals

Overall UofM Goals

- 25% reduction in total greenhouse gas emissions by 2025
- New buildings:
 - 30% more efficient than minimum ASHRAE 90.1-2007 requirements
 - Minimum LEED Silver Certification

Additional UMHHC Goals

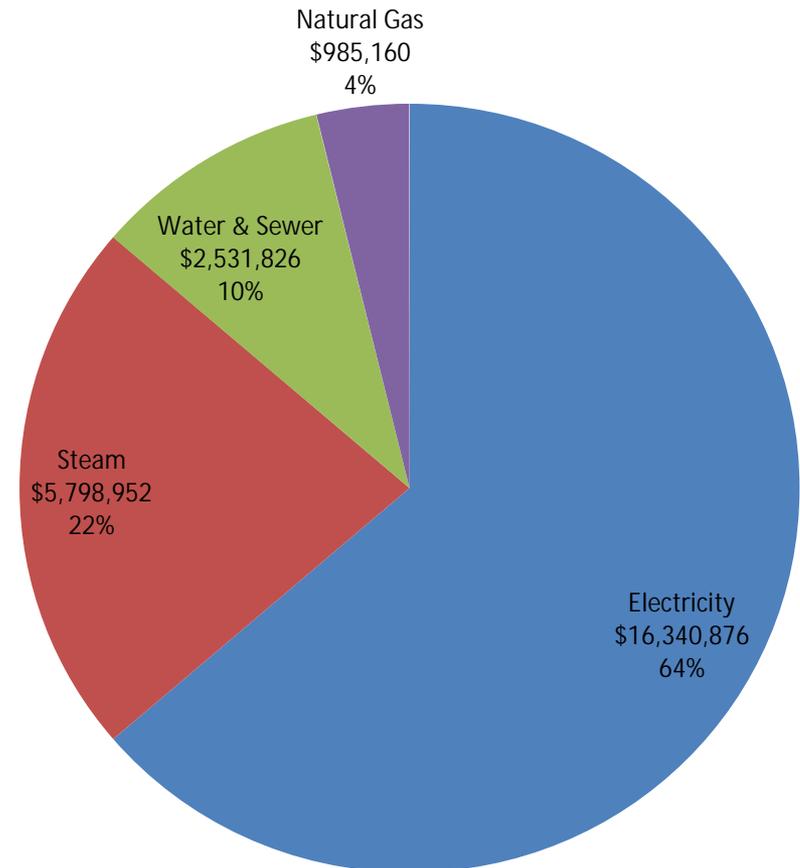
- At least \$100k/year in new savings from ECM projects each year
- Energy Star rating of 50 or higher
- Achieve HHI Level 3 Leaner Energy Challenge of 10% normalized energy improvement in hospital buildings



Where Do I Look First?

Looking Top Down

- ❏ \$26 Million total utility cost/year
- ❏ 75% of total energy is consumed on main HHC campus
- ❏ 63% of total energy is consumed by our 3 main hospital buildings



Hospital Buildings

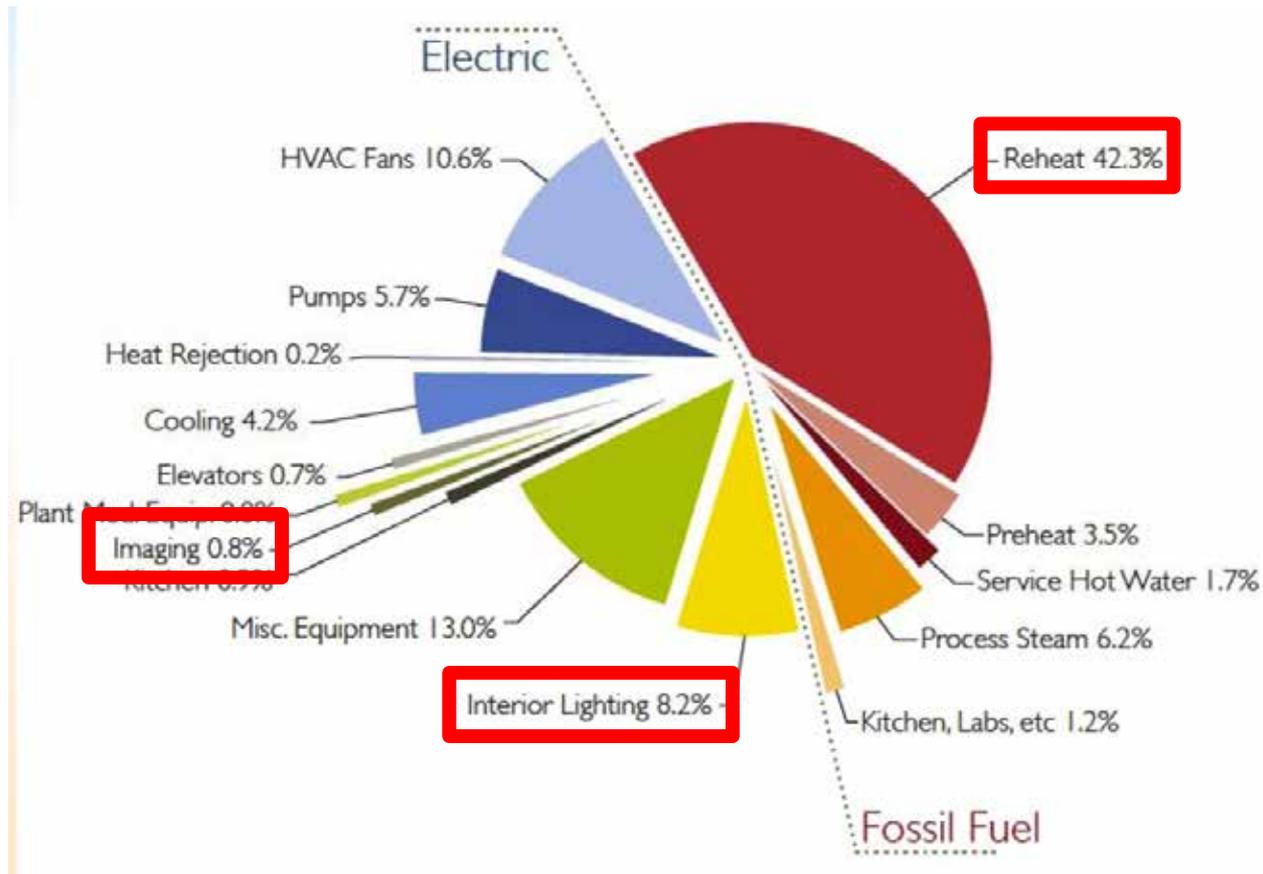
Building	ft ²	Total Cost per Year	\$/ft ²	Current Site EUI (kBtu/ft ²)	E-Star Rating	Electric KWH/SF	Steam LB/SF
CVC	445 k	\$1.8 Million	\$4.03	186	25	29.7	85.1
C&W	1.1 M	\$4.5 Million	\$3.93	190	56	27.6	91.6
UH	1.8 M	\$9.7 Million	\$5.66	224	11	43.7	82.7

Property Name	Floor Area (ft²)	ENERGY STAR Score	Site Energy Use (kBtu)	Site EUI (kBtu/ft²)	Primary Property Type - Self Selected
5223 North Campus Auxiliary Support	53,530	Not Available	26,473,515	495	Data Center
0316 University Hospitals Complex	1,805,077	11	403,957,589	224	Hospital (General Medical & Surgical)
5109 Cardiovascular Center	444,952	25	82,726,971	186	Hospital (General Medical & Surgical)
5173 Children's & Women's Hospital	1,116,649	56	211,620,700	190	Hospital (General Medical & Surgical)
8121 Saline Health Center	5,211	1	875,371	168	Medical Office
5029 Brighton Health Center	41,500	5	9,929,227	239	Medical Office
8112 Occupational Medicine Building	9,020	6	1,333,104	148	Medical Office
0000 East Ann Arbor Complex	264,161	13	57,436,912	217	Medical Office
0000 Briarwood Complex	90,608	19	16,165,872	178	Medical Office
8072 Eisenhower Park West	76,726	21	11,226,536	146	Medical Office
8110 West Ann Arbor Health Center	6,131	35	484,827	79	Medical Office
0348 Chelsea Family Pracice	26,239	50	2,491,526	95	Medical Office
8161 Kellogg Eye Center - Brighton	6,210	53	500,033	81	Medical Office
8155 Livonia Health Center	11,130	57	822,171	74	Medical Office
8149 Dexter Family Practice	8,020	60	559,080	70	Medical Office
5019 Canton Health Center	51,552	64	3,506,296	68	Medical Office
5056 New Hope Geriatric Center	866	Not Available	96,674	112	Medical Office
5098 Kellogg Eye Center - Milford	2,523	Not Available	286,384	114	Medical Office
8111 Howell Pediatrics	2,835	Not Available	219,926	78	Medical Office
8160 Kellogg Eye Center - West Bloomfield	1,246	Not Available	64,079	51	Medical Office
5070 Eisenhower Park Warehouse	37,606	4	3,077,841	82	Non-Refrigerated Warehouse
0000 Traverwood Complex	94,971	1	33,120,815	349	Office
0399 North Campus Administrative Complex	133,741	31	22,754,204	170	Office
8126 KMS Fusion Building	125,908	65	10,473,156	83	Office
0327 University Hospital Education Center	8,349	67	471,567	57	Office
0332 North Ingalls Building	325,677	73	37,881,584	116	Office
8100 Commonwealth Bldg	43,423	76	3,385,856	78	Office
5011 Burlington Office Center 1	57,944	84	2,662,649	46	Office
8137 Michigan House	101,758	88	4,998,457	49	Office
5058 Michigan Visiting Nurses	836	Not Available	30,299	36	Office
8060 101 Simpson Trailer	2,791	Not Available	98,535	35	Office
0301 Cancer Center	277,795	Not Available	102,521,148	369	Other
0390 Child Care Center	14,850	Not Available	1,580,950	107	Other
0419 Laundry Building	48,521	Not Available	39,883,192	822	Other
0829 RP Housing 1322 Wilmott	1,819	Not Available	188,828	104	Other
8036 Survival Flight Airport	10,000	Not Available	1,222,274	122	Other
8039 RP Housing 1011	2,879	Not Available	345,026	120	Other
8116 Ice Cube	8,672	Not Available	351,513	41	Other
8096 Livonia Specialty Care	46,607	Not Available	7,278,481	156	Outpatient Rehabilitation/Physical Therapy
0000 NH, THC, etc., (EMB CHW Loop Bldgs)	1,252,908	Not Available	130,573,679	104	Urgent Care/Clinic/Other Outpatient



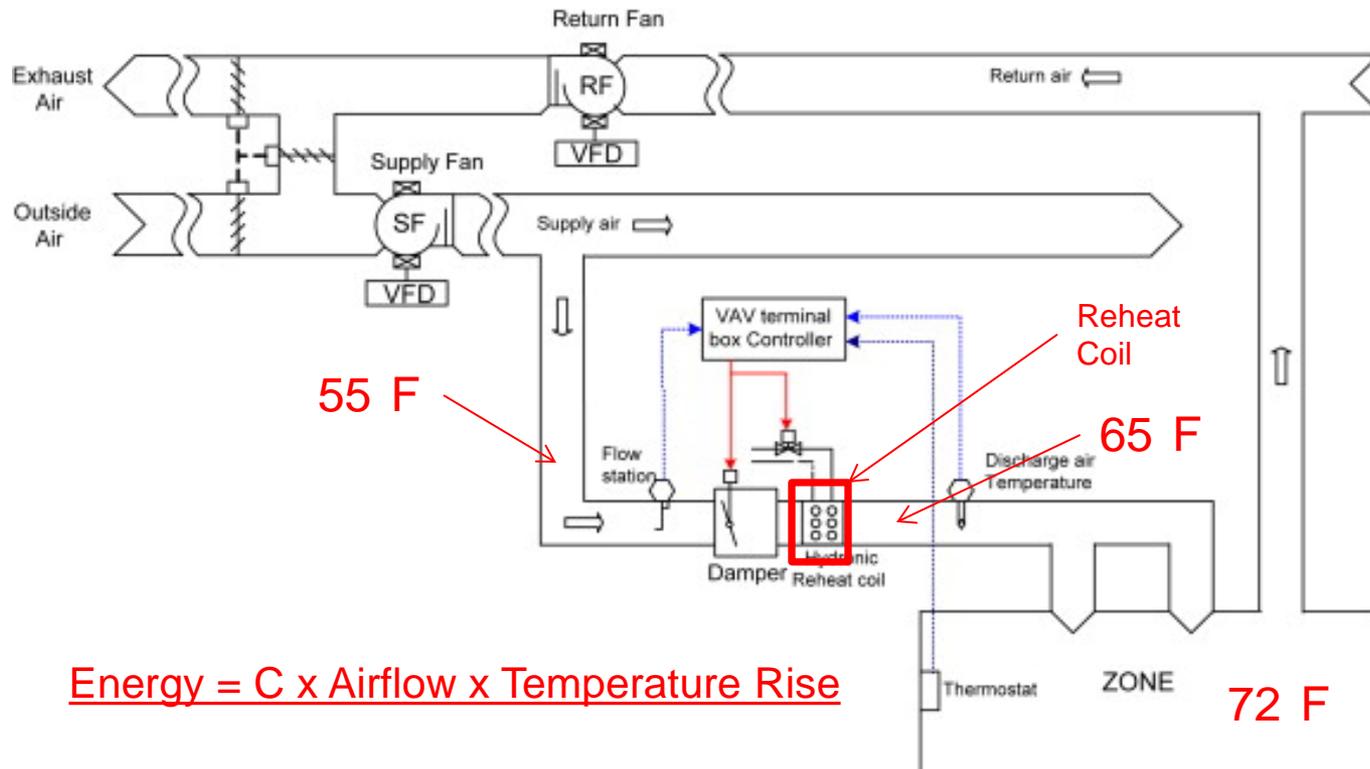
Where's the Energy & Savings?

Typical Hospital Energy Breakout



**Figure from "Targeting 100!" by University of Washington & Solarc, study of Vancouver hospital.*

VAV with Reheat System



Key Energy Project Concepts

Fight reheat energy waste

- Control air handler discharge temperatures
- Reduce ventilation rates where feasible
- Stop the thermostat fighting
- Turn off ventilation to unoccupied areas when feasible

Key Energy Project Concepts

Building designers in healthcare are CONSERVATIVE

- Common practice is to design and set everything for worst case conditions (1% of the time), and let the building run under those conditions continuously.
- Check for lightly loaded equipment out of efficient range.
- Check for excessive or constant airflow levels.
- Check for overly conservative temperature setpoints.
- New buildings are not necessarily efficient!!!

Key Energy Project Concepts

- Take control of your controls!!!
 - DDC Controls – dream it and do it
 - Once your DDC control system is installed, system changes are very low cost and ECM projects are frequently less than 1 year payback.
 - Effective control system management and maintenance is your ticket to slam dunk energy savings!!!



Go Get Your Savings!

Energy Conservation Teams

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, & optimize building operational efficiency

GreenIT

Manage power consumption from UMHS computers & IT equipment

Our ECM Project Process

Identify

- Engineering, operations, and maintenance teams identify opportunities

Evaluate & Quantify

- Investigate concept feasibility. Estimate savings. Estimate capital and ancillary costs, and determine ROI. Our current criteria is 5 year payback or better.

Validate

- Energy Team of engineers, operations & finance reviews ECM project proposals

Fund

- Submit project proposal to Facilities Director and CEO Cabinet for funding

Execute Project

Commission and Report!!!

- Verify energy saving features are saving as intended
- Quantify actual energy savings and share results with team & staff

Completed ECM Project Examples



Project	Savings	Cost	Payback
Occupancy Controls for VAV & Lighting	\$18,000/year	\$80,000	4.4 years
Auditorium HVAC Controls	\$32,000/year	\$27,000	0.9 years
Airflow Rebalance	\$52,000/year	\$50,000	1.0 years
Process Cooling Water Conservation	\$70,000/year	\$144,000	2.1 years
VAV Box Operation Schedules	\$160,000/year	\$21,000	0.1 years
Lighting Retrofits	\$225,000/year	\$900,000	4.0 years
New Building DDC Control Optimization	\$1.6 Million/year	\$50,000	0.03 years

Website

 <http://sustainability.umich.edu/envsteward/conservation>

 Website includes:

- Energy program summary for previous fiscal year
- Current energy consumption trends

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