

Energy Conservation in Health Care Facilities

**Minnesota Health Care Engineers
Association**

Fall Seminar

Presenters

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Agenda

- Why Healthcare Managers Should Care about Energy
- Energy Audits and Recommissioning
- Energy Benchmarking
- Case Studies
- Financing the project

Energy Used by Healthcare in the United States

- In 2007, health care organizations spent over \$8.3 billion on energy expenses
 - Increased by approximately 10% over the last 3 years
 - Expected to rise an additional 3-5% in 2011

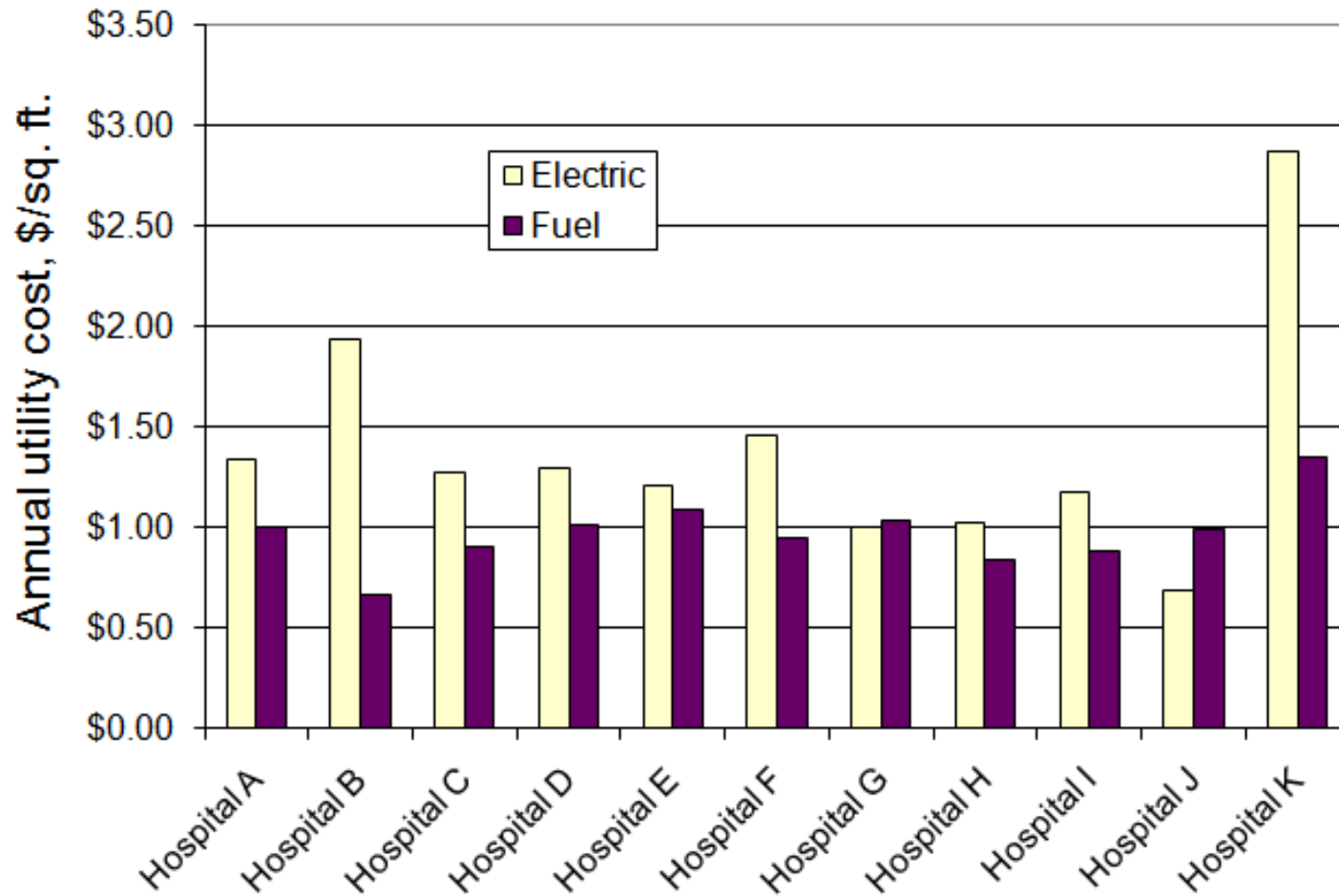
Energy used by Healthcare

- Health care facilities use 9% of all commercial energy consumption in the U.S.
- Energy intensity (Btu/sq. ft./year) of inpatient health care facilities are second only to fast food establishments!

Energy Conservation Fiscal Impact

- Non-profit healthcare organizations:
Every \$1 saved on energy = new revenues of:
\$20 for hospitals and \$10 for medical offices
- For-profit hospitals, medical offices, & nursing homes:
A 5% reduction in energy costs =
Earnings are boosted a penny per share

Minnesota Healthcare 2010 Utility Costs



Health Care Facilities

- Hospital
 - Acute Care, Rehabilitative, Critical Access
- Nursing Home
- Supervised Living Facility
- Ambulatory Surgery Center
- Residential Hospice
- Medical Office Building (not licensed by MDH)

Energy Auditing

- An energy audit is:
 - an inspection, survey and analysis ...
 - of energy flows ...
 - for energy conservation in a building, process or system ...
 - to reduce the amount of energy input into the system ...
 - without negatively affecting the outputs.

Why Energy Audits?

- Building systems accumulate problems over time:
 - Change in uses
 - Adjustments made to minimize complaints
 - that end up wasting energy
 - Past retrofits that misalign with the existing plant operation

Energy Auditing Outcomes

- Locate problems due to differed maintenance
- Locate causes of comfort complaints
- Identify systems that may be working at cross purposes (simultaneous heating and cooling)
- Identify the budget for needed improvements
- Correct operations problems can yield:
 - 5-20% savings in annual energy spending
 - Typical payback period of 6 – 24 months

Different Levels of Energy Audits

Audit Levels:

Walk-Through Audit

Site Audit

Comprehensive Audit (Recommissioning)

Energy Audit Comparison

Audit Level	Complexity
Walk-Through Audit	Basic – minimal time, detail, relative energy performance identified
Site Audit	Moderate – energy measures specified and paybacks calculated
Comprehensive Audit (Recommissioning)	High-complete documentation and equipment modifications

Audit Comparisons: Approximate Cost

Audit Level	Approximate Cost
Walk-Through Audit	\$0.01 to \$0.08 per Sq. Ft.
Site Audit	\$0.05 to \$0.15 per Sq. Ft.
Comprehensive Audit (Recommissioning)	Most expensive & most benefits \$0.10 to \$0.30 per Sq. Ft.

Compare to 2010 fuel & electric costs of \$2.50 to \$4.50 per sq. ft. on the earlier slide!

Energy Audit Outcomes

Audit Level	Outcomes
Walk-Through Audit	<ul style="list-style-type: none">✓ Identify major problem areas✓ Find quick payback solutions✓ Identify which buildings to do first
Site Audit	<ul style="list-style-type: none">✓ Estimates of costs and savings for energy saving opportunities
Comprehensive Audit (Recommissioning)	<ul style="list-style-type: none">✓ Implement most cost effective priority projects✓ Cost savings dividends realized

The Comprehensive Audit: Recommissioning

- A systematic process to improve the operation of your building systems so that they:
 - Actually meet your needs

AND

- Use only as much energy as is really necessary to do so

Recommissioning Outcomes

- Identifying and fix equipment problems before they become failures
- Reduce energy costs!
- Improve indoor air quality and comfort
- Solve persistent building problems
- Improve building conditioning system troubleshooting

Energy Conservation Opportunities in Healthcare

- Building Envelope
- Mechanical (Heating & Cooling System)
- Building Automation
- Lighting and Other Electrical
- Energy Billing Changes
- Water and Sewer
- Cogeneration & Renewable Energy Systems

Where Do I Start?

- Those buildings with highest energy consumption
 - Normalized to size and compared to other buildings of the same use
- Buildings operated continuously
- Older buildings with multiple renovations or system modifications
- Buildings with HVAC control systems that were not commissioned with installation

Missing Comparative Metrics

- Is 10 MPG high or low for an automobile?



Answer: **Common Knowledge**

- Is 100 Kbtu/SF/YR high or low for a hospital?



Answer: **Even some facility experts don't know**

TWO BENCHMARKING OPTIONS

1. Comparing your building to similar buildings
 - Like an auto MPG label
2. Benchmarking a building against itself over time
 - Like tracking your gas mileage

Energy Conservation Yesterday's Approach

1. Conduct building energy audit
2. Identify capital improvements that might save energy
3. Replace equipment
4. Maybe you save energy and maybe you don't

Energy Conservation Today's Approach

1. Benchmarking your building(s)
2. For your higher performing buildings – keep up the good work!
3. For your poorer performing buildings – identify problems (O&M or capitol) and fix ‘em
4. Maintain benchmarking to sustain performance gains and identify poor performance

Comparison of Approaches

➤ **Yesterday's Approach**

- 5 to 20 year paybacks
- Energy savings gains not sustained
- May or may not improve interior environment

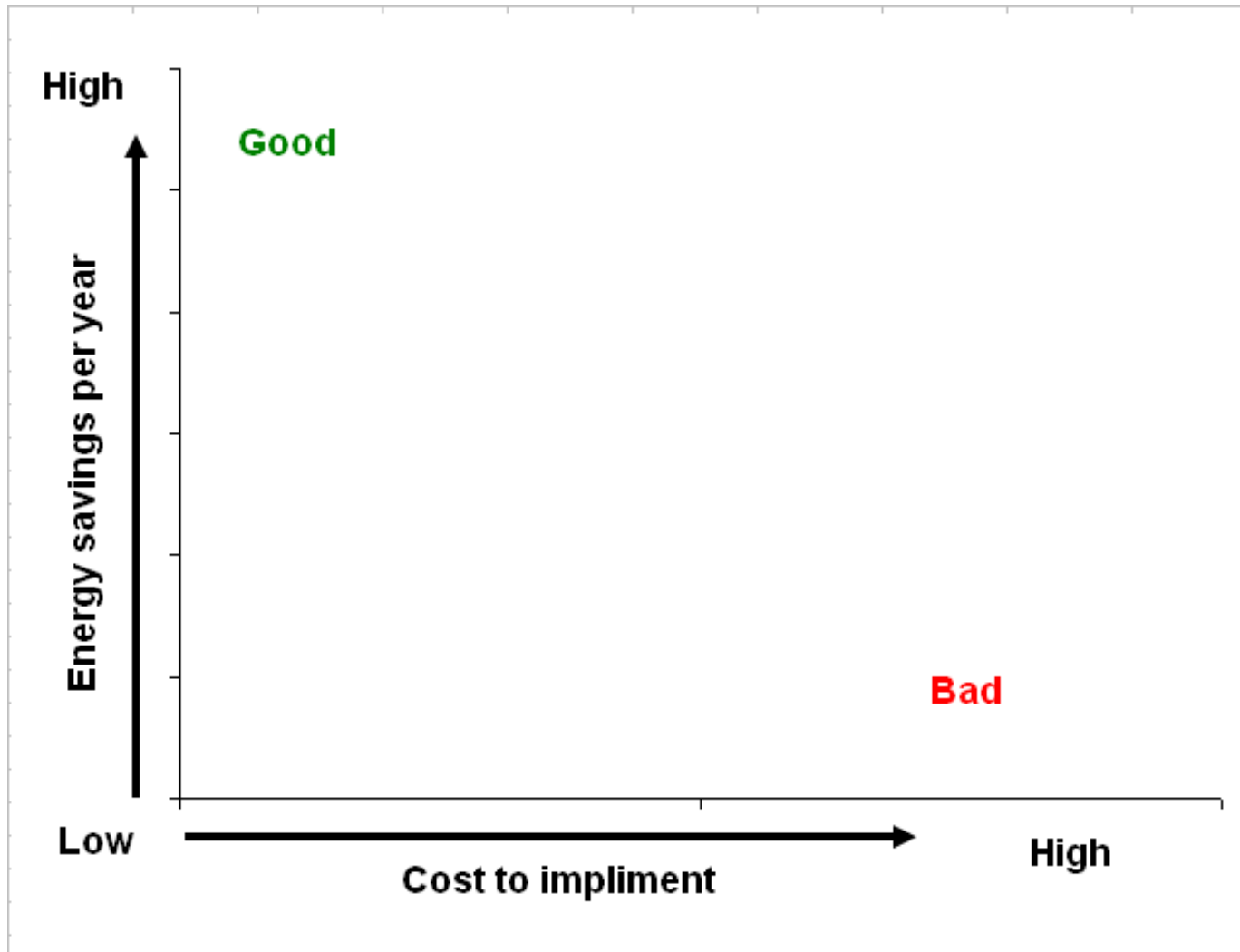
➤ **Today's Approach**

- 0 to 3 year paybacks
- Energy savings sustained
- Improvements to interior comfort & health

Low-hanging Fruit Rule

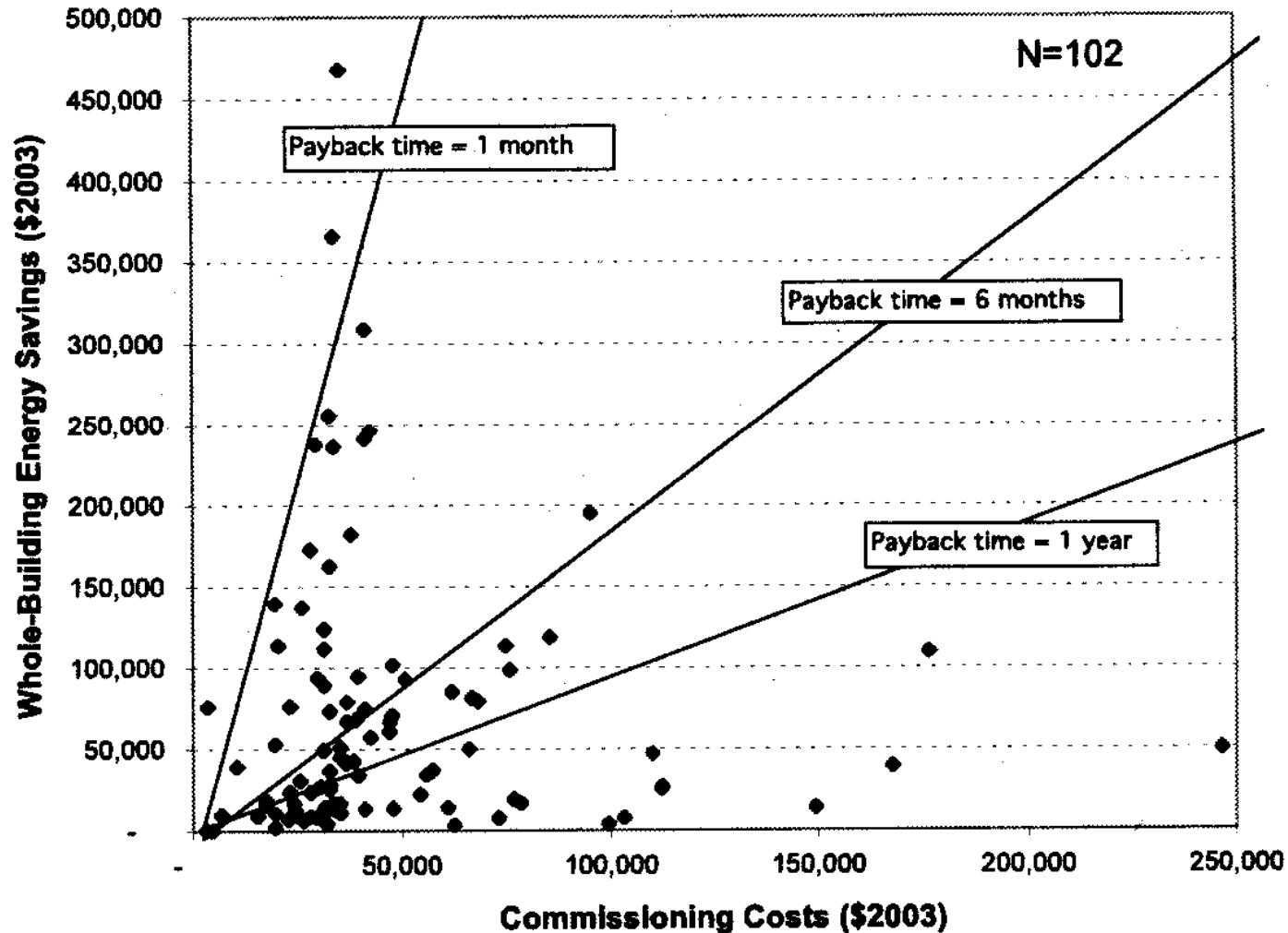
- Cost-effective energy savings are easiest to find in buildings with poor energy performance
- Cost-effective energy savings are hardest to find in buildings with the best energy performance

Value of Energy Savings Project



Value of Recommissioning

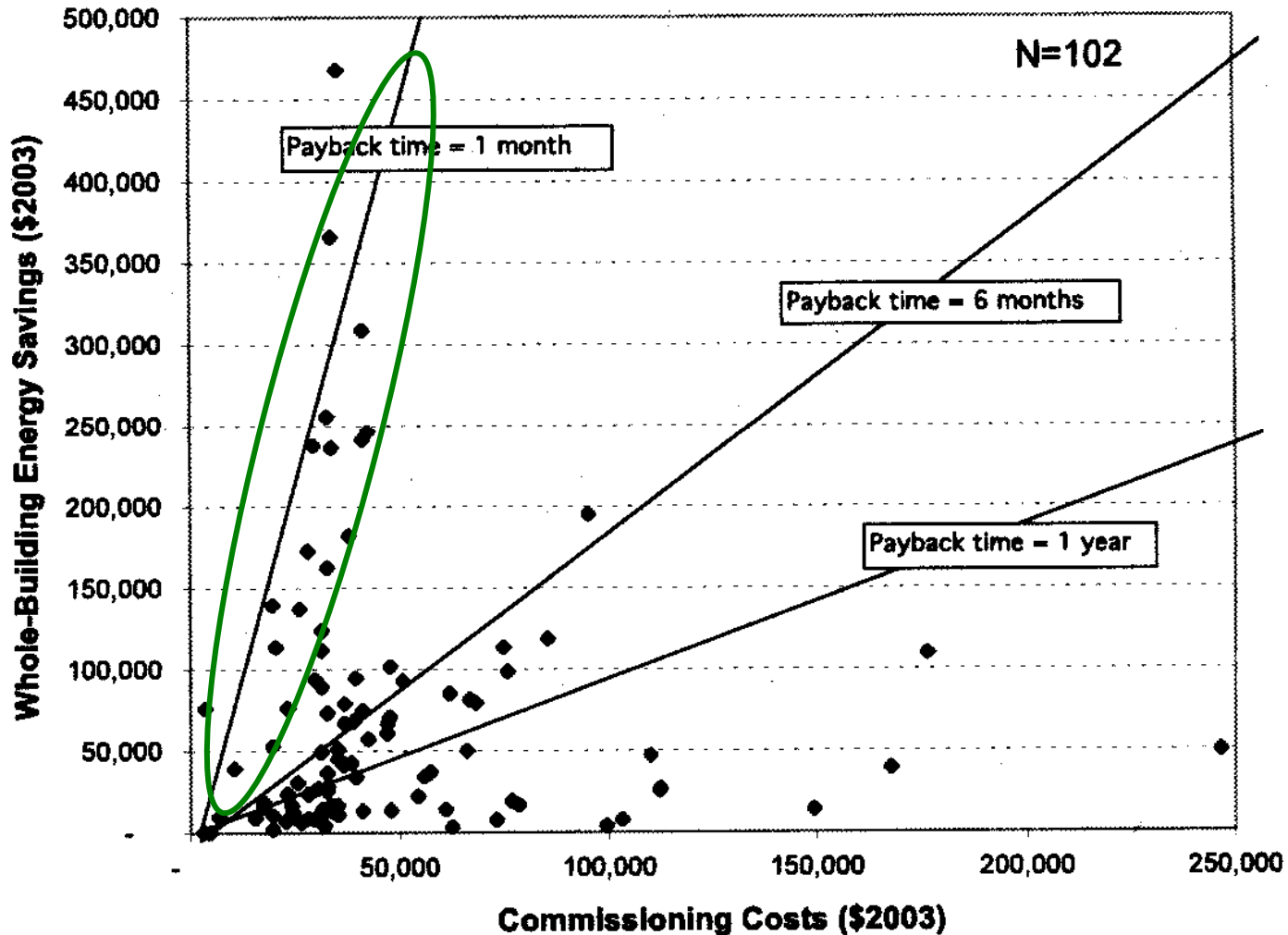
Existing Buildings Commissioning: Costs, Savings, and Payback Times



Source: *The Cost-Effectiveness of Commercial Buildings Commissioning*, Evan Mills, et al, 2004²⁸

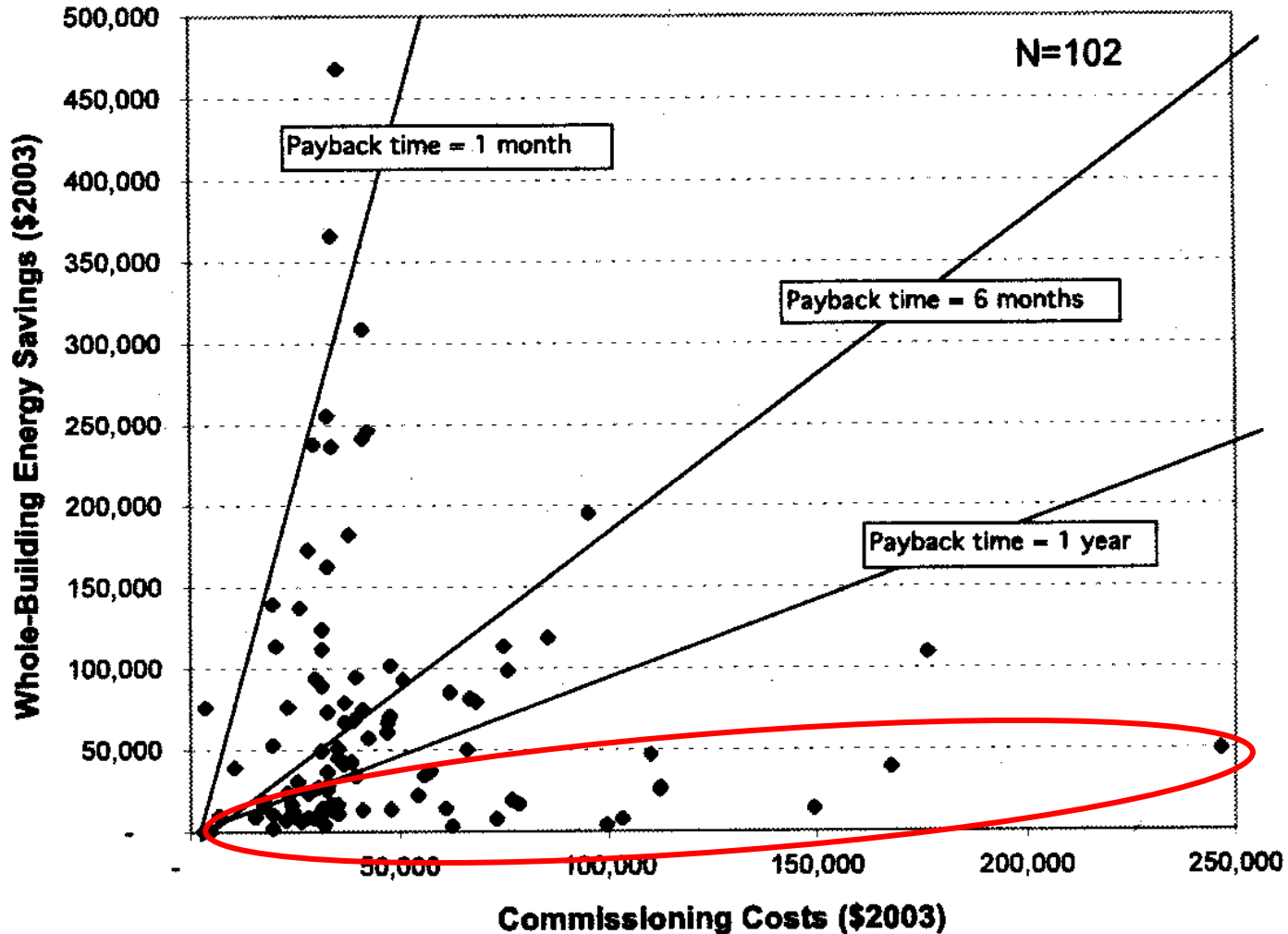
Value of Recommissioning

Existing Buildings Commissioning: Costs, Savings, and Payback Times



Value of Recommissioning

Existing Buildings Commissioning: Costs, Savings, and Payback Times



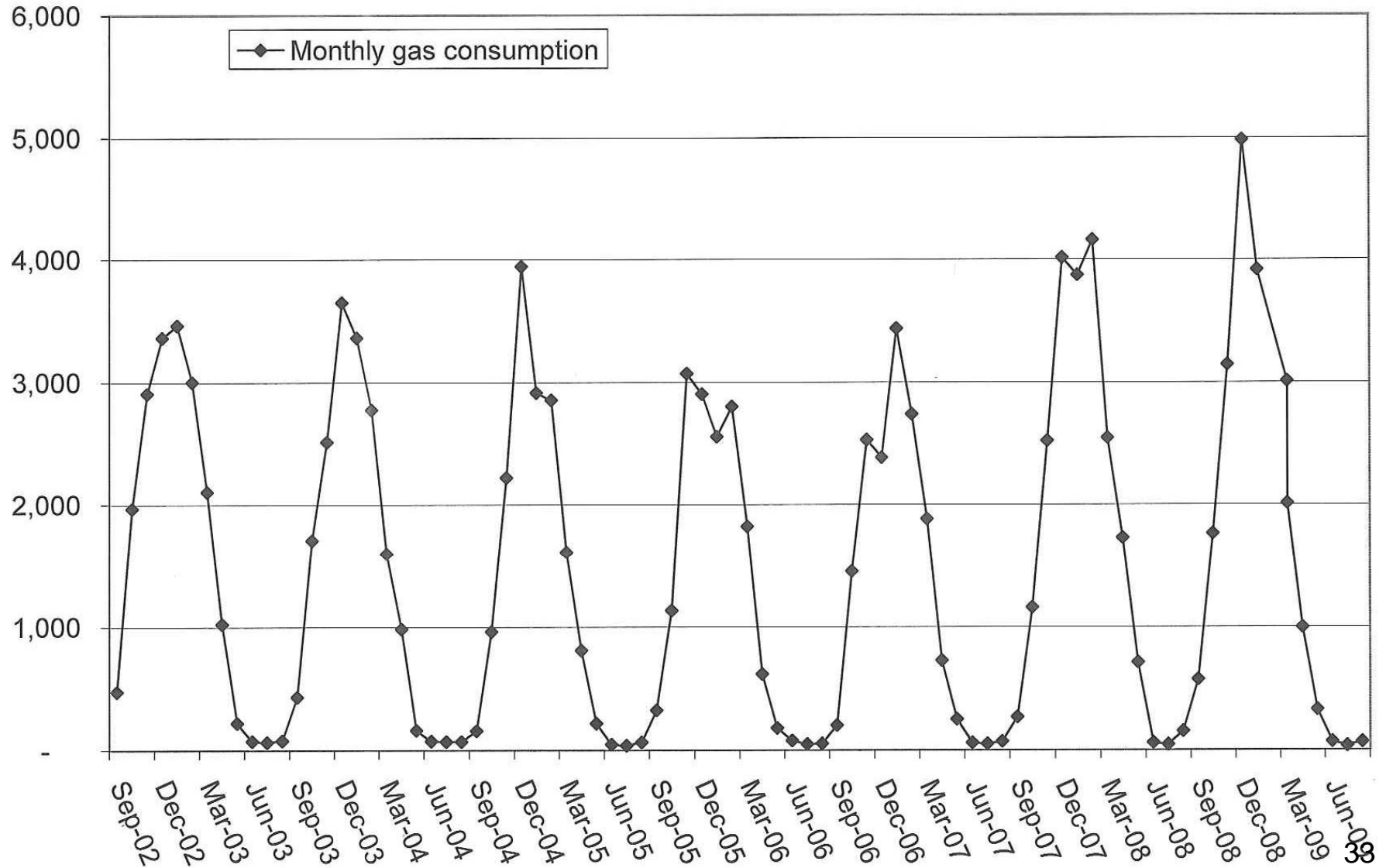
Benchmarking

- The 1st step in energy auditing
- Identify energy performance of whether your building
- If poor performing - conservation efforts will be warranted
- If good performing - keep up the good work!

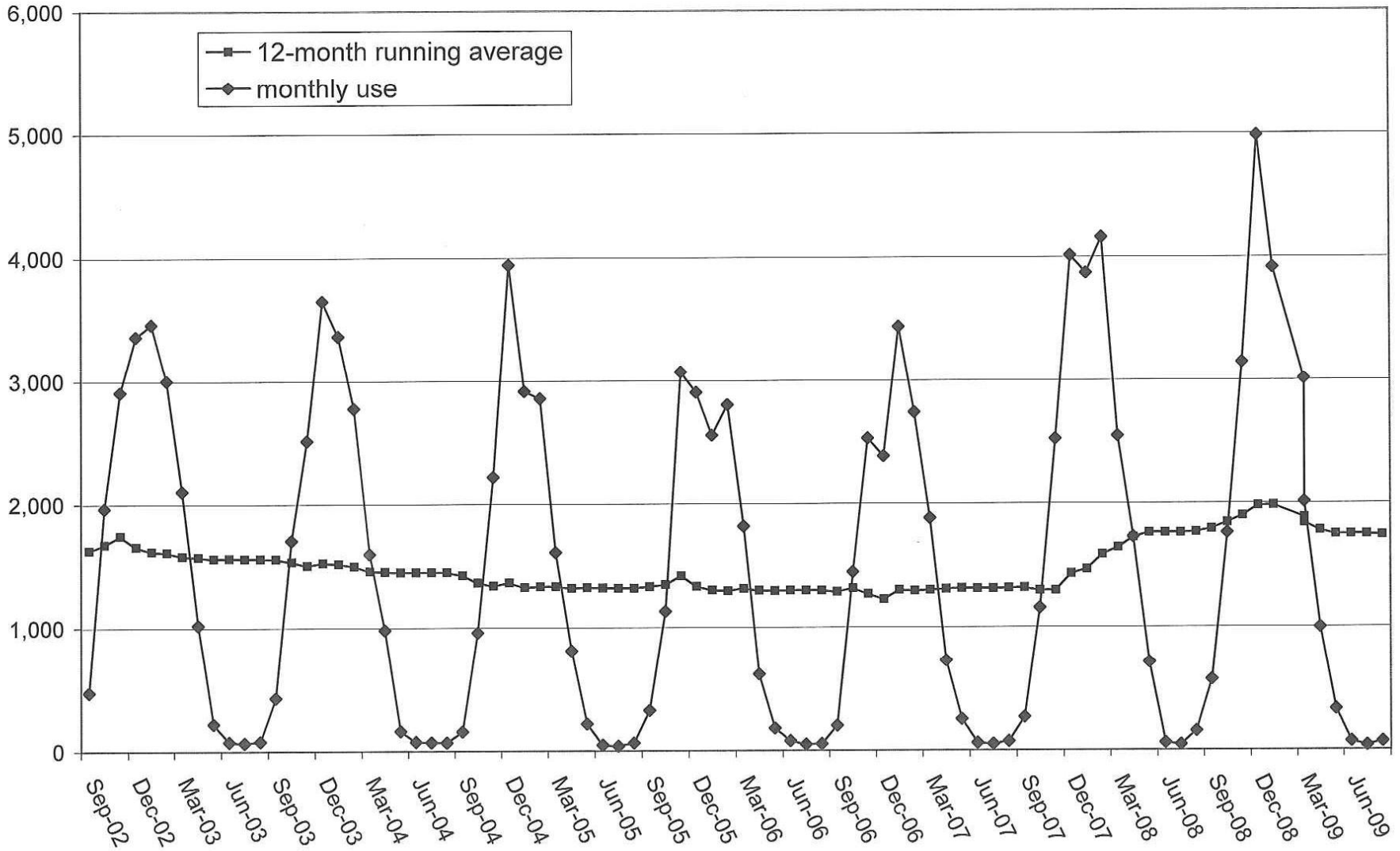
How to Benchmark

Month	Gas use				
Sep-02	473	Mar-05	1,609	Oct-07	1,156
Oct-02	1,966	Apr-05	809	Nov-07	2,521
Nov-02	2,907	May-05	217	Dec-07	4,012
Dec-02	3,363	Jun-05	46	Jan-08	3,871
Jan-03	3,463	Jul-05	38	Feb-08	4,158
Feb-03	3,001	Aug-05	64	Mar-08	2,545
Mar-03	2,104	Sep-05	325	Apr-08	1,728
Apr-03	1,022	Oct-05	1,131	May-08	710
May-03	219	Nov-05	3,070	Jun-08	59
Jun-03	74	Dec-05	2,904	Jul-08	44
Jul-03	65	Jan-06	2,554	Aug-08	154
Aug-03	78	Feb-06	2,802	Sep-08	572
Sep-03	430	Mar-06	1,819	Oct-08	1,762
Oct-03	1,707	Apr-06	617	Nov-08	3,144
Nov-03	2,512	May-06	179	Dec-08	4,981
Dec-03	3,650	Jun-06	79	Jan-09	3,915
Jan-04	3,364	Jul-06	49	Mar-09	3,009
Feb-04	2,774	Aug-06	54	Mar-09	2,011
Mar-04	1,596	Sep-06	201	Apr-09	995
Apr-04	982	Oct-06	1,450	May-09	329
May-04	161	Nov-06	2,528	Jun-09	70
Jun-04	73	Dec-06	2,384	Jul-09	36
Jul-04	69	Jan-07	3,436	Aug-09	66.8
Aug-04	69	Feb-07	2,740		
Sep-04	157	Mar-07	1,883		
Oct-04	961	Apr-07	726		
Nov-04	2,219	May-07	252		
Dec-04	3,942	Jun-07	60		
Jan-05	2,914	Jul-07	51		
Feb-05	2,855	Aug-07	71		
		Sep-07	269		

Monthly gas consumption



Monthly gas consumption



Value of Benchmarking

- Early identification of problems
- Quantify the success/failure of maintenance or operation changes to improve energy performance
- Track effectiveness of capitol improvements or a performance contract to improve energy performance

Benchmarking tools

- Minnesota B3 benchmarking
 - For public buildings
 - Paid for by Minn. utilities
- ENERGY STAR Portfolio Manager
 - For any building
 - Federal EPA & DOE program

Minnesota B3 Benchmarking Tool

- Benchmark value:
 - Compares actual energy use to what the building should use if it met the current Minn. energy code
 - 100% = if built to code
 - Less than 100% is efficient
 - Greater than 100% is less efficient



Welcome to the Minnesota B3 Benchmarking Site

- Home
- My Sites
- FAQ
- Documents
- Contact Us

Welcome to the Minnesota B3 Benchmarking Site.

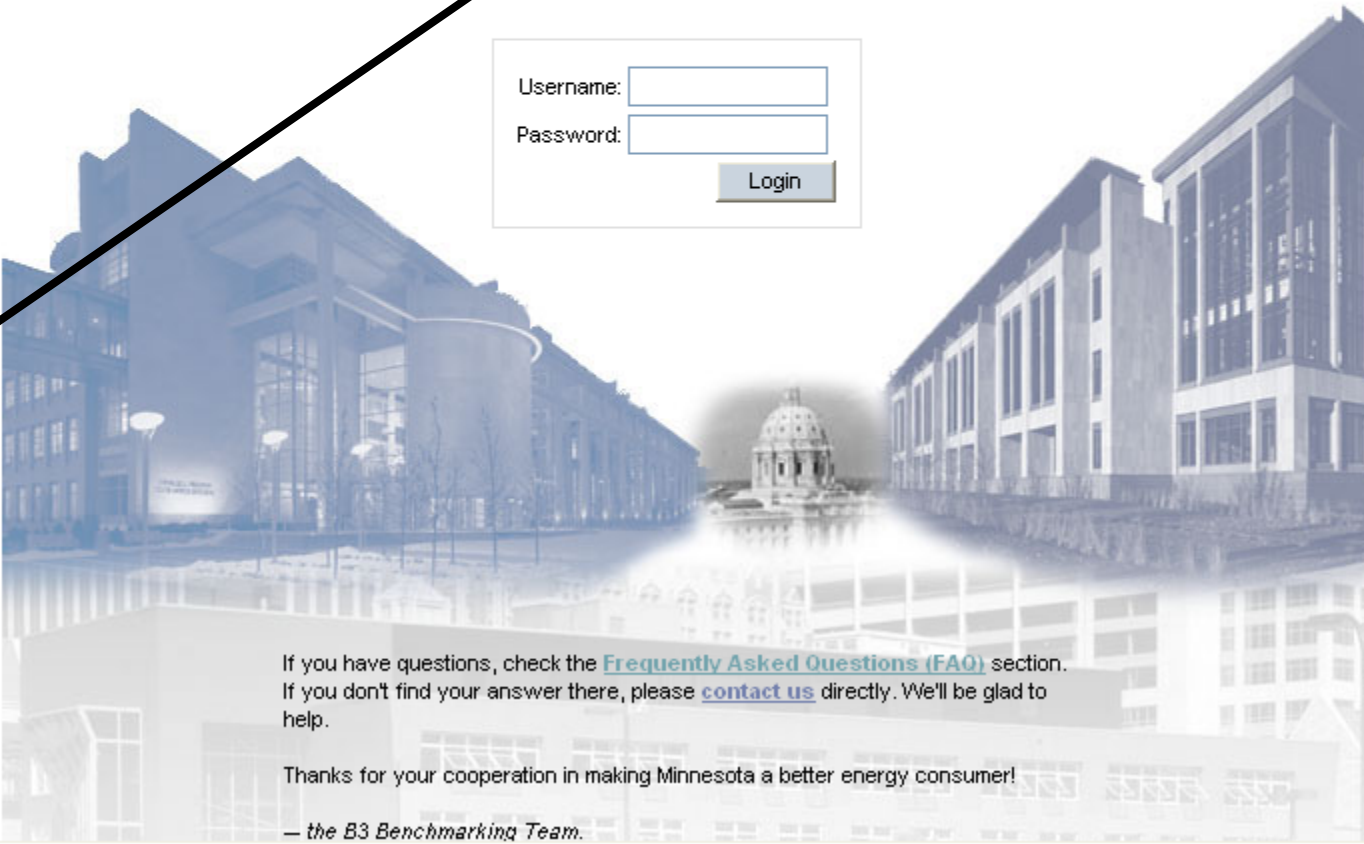
Username:

Password:

Login

If you have questions, check the [Frequently Asked Questions \(FAQ\)](#) section. If you don't find your answer there, please [contact us](#) directly. We'll be glad to help.

Thanks for your cooperation in making Minnesota a better energy consumer!
— the B3 Benchmarking Team.



ENERGY STAR

Portfolio Manager

- Building energy data is normalized for weather & other variables
- Compared to a large number of similar buildings throughout the U.S.
- Rates energy consumption using a 0-100 scale
 - 100 is the best
 - 0 is worst

Portfolio Manager

Buildings & Plants : ENERGY STAR - Windows Internet Explorer

https://www.energystar.gov/index.cfm?c=business.bus_index

File Edit View Favorites Tools Help

Buildings & Plants : ENERGY STAR

ENERGY STAR

THE NATIONAL BUILDING COMPETITION

Mid-Point Results are Unveiled!

The competition is fierce! See which buildings have lost the most waste so far, and who's trying to catch up!

U.S. ENVIRONMENTAL PROTECTION AGENCY

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- Government
- Healthcare
- Higher Education
- Hospitality/ Entertainment
- Industrial
- K-12
- Real Estate/ Multifamily
- Retail

Buildings & Plants

Improving the energy efficiency of the places where we work, play and learn helps us save energy, save money, and fight global warming. Look for facilities that have earned the ENERGY STAR — the national mark of excellence in energy performance — and know with confidence that the facilities are energy efficient and have a smaller carbon footprint.

[View All Labeled Facilities](#)

II. Indiana HCS, Ft. Wayne

2121 Lake Avenue
Fort Wayne, IN 46805

[« prev](#) | [next »](#)

[See next group of facilities](#)

CELEBRATING A DECADE OF ENERGY STAR BUILDINGS 1999-2009

[Read Report](#)

Strategy

[Guidelines for Energy Management](#)

Get started by applying our proven strategy to set performance goals, create and implement action plans, assess performance and progress, and recognize your

Quick Finder

- [Portfolio Manager Login](#)
- [Target Finder](#)
- [ENERGY STAR Challenge](#)
- [ENERGY STAR Leader](#)

Bring Your GREEN TO WORK with ENERGY STAR

MINN DEPARTMENT OF HEALTH

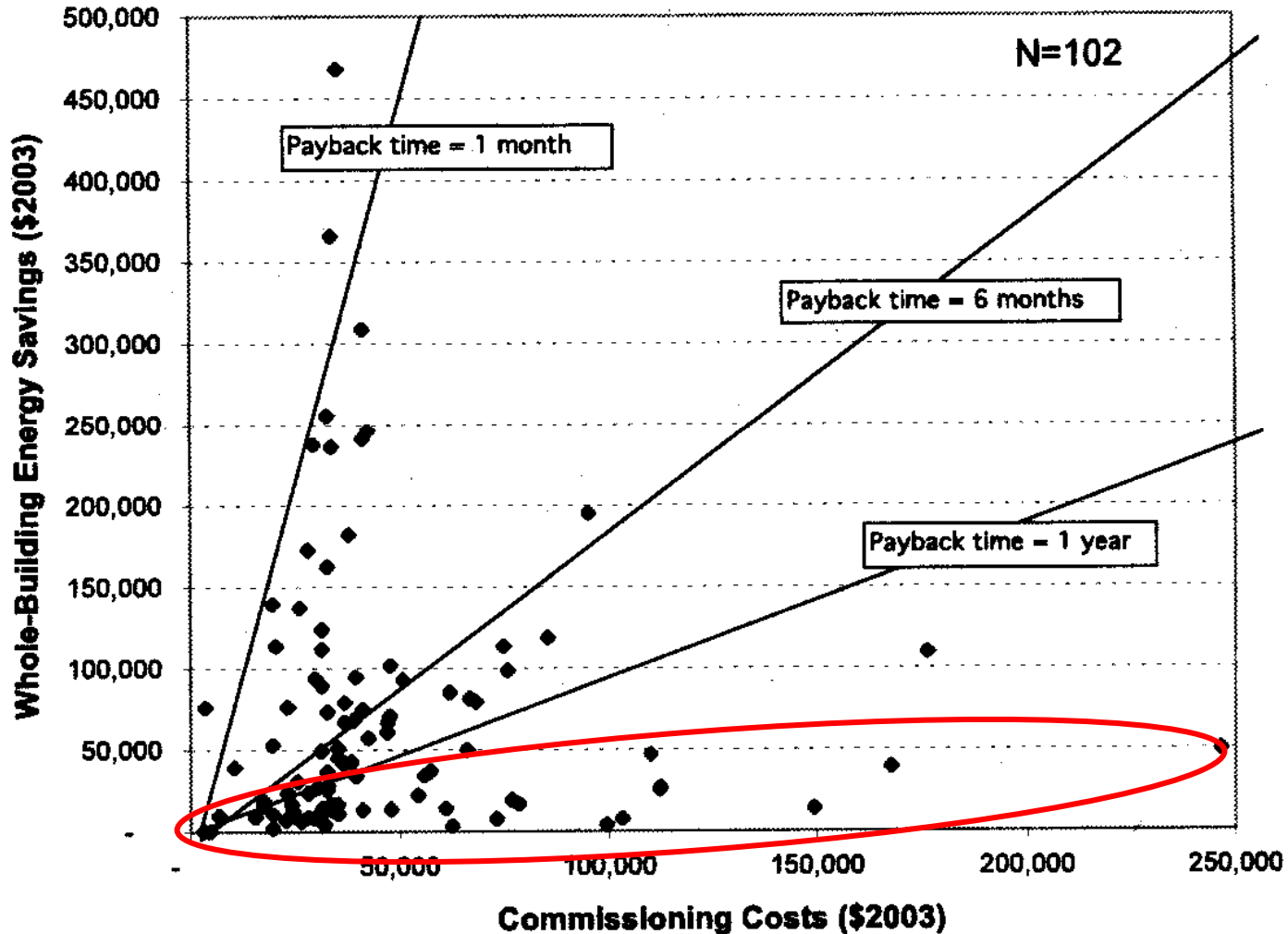
Microsoft Excel Internet 100%

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Final Word on Benchmarking

Existing Buildings Commissioning:
Costs, Savings, and Payback Times



Recommissioning Real Outcomes

➤ Clinics/Surgery Centers

➤ Regional Eye Care

➤ Minnesota Vascular Surgery Center

➤ Medical Advanced Pain Specialists (MAPS)

➤ MN Eye Consultants

➤ North Memorial – MOB & ACC – Maple Grove

➤ Fairview Health Services – ACC & Clinic – Maple Grove

Recommissioning Real Outcomes

➤ Hospitals

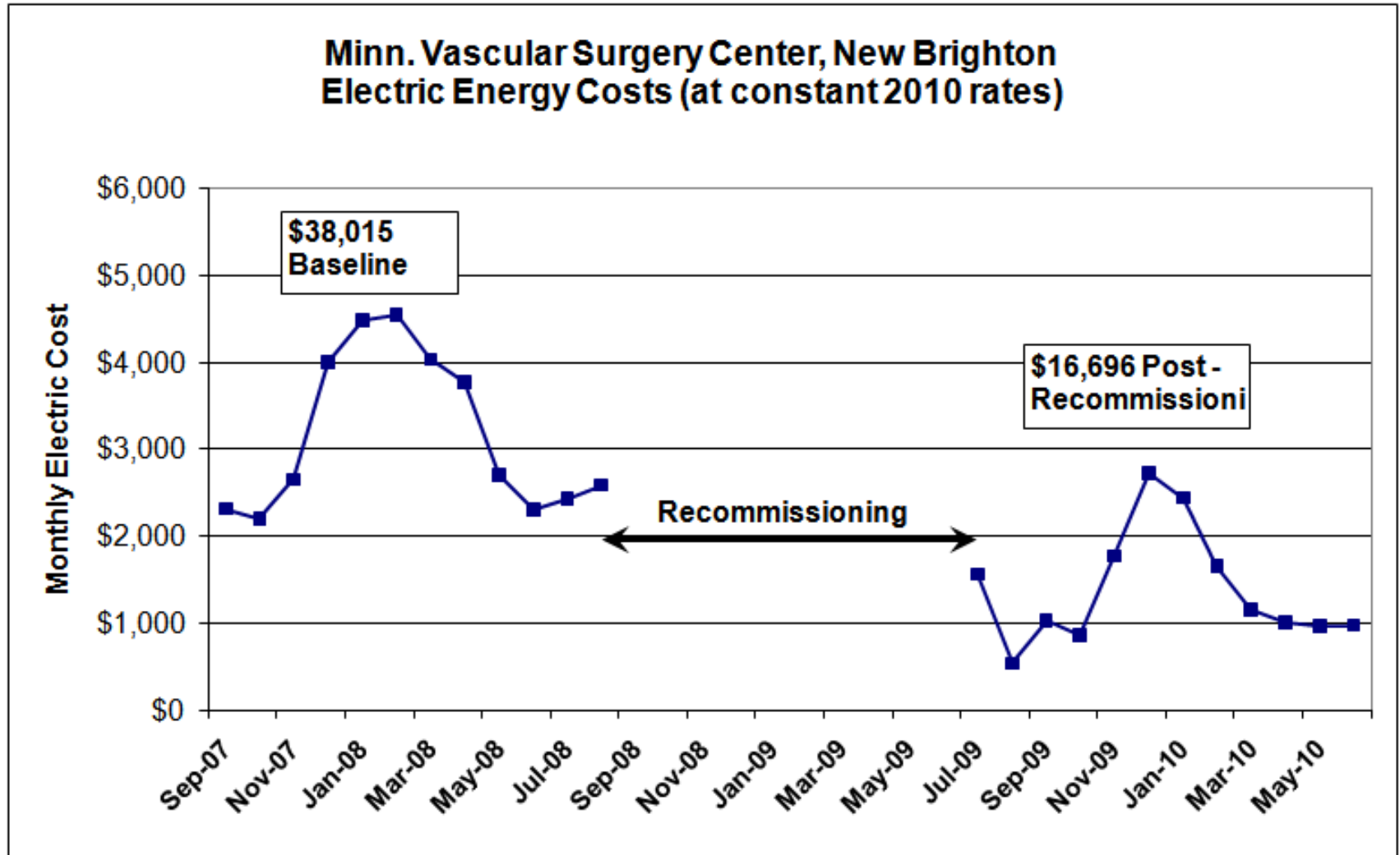
- Fairview Southdale

➤ Nursing Homes

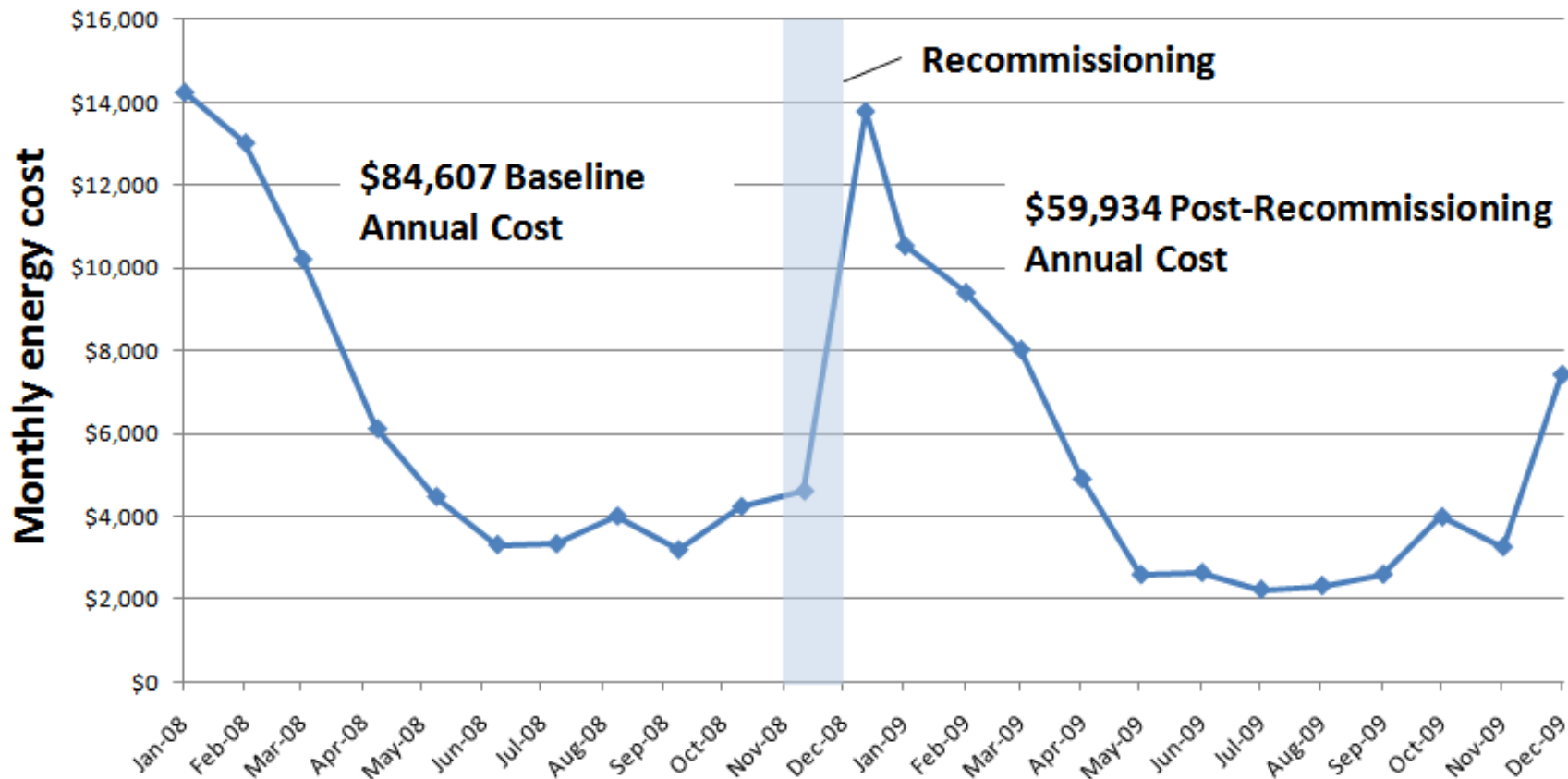
- St. Mary's Assisted Living

- Bismarck Skilled Care Center

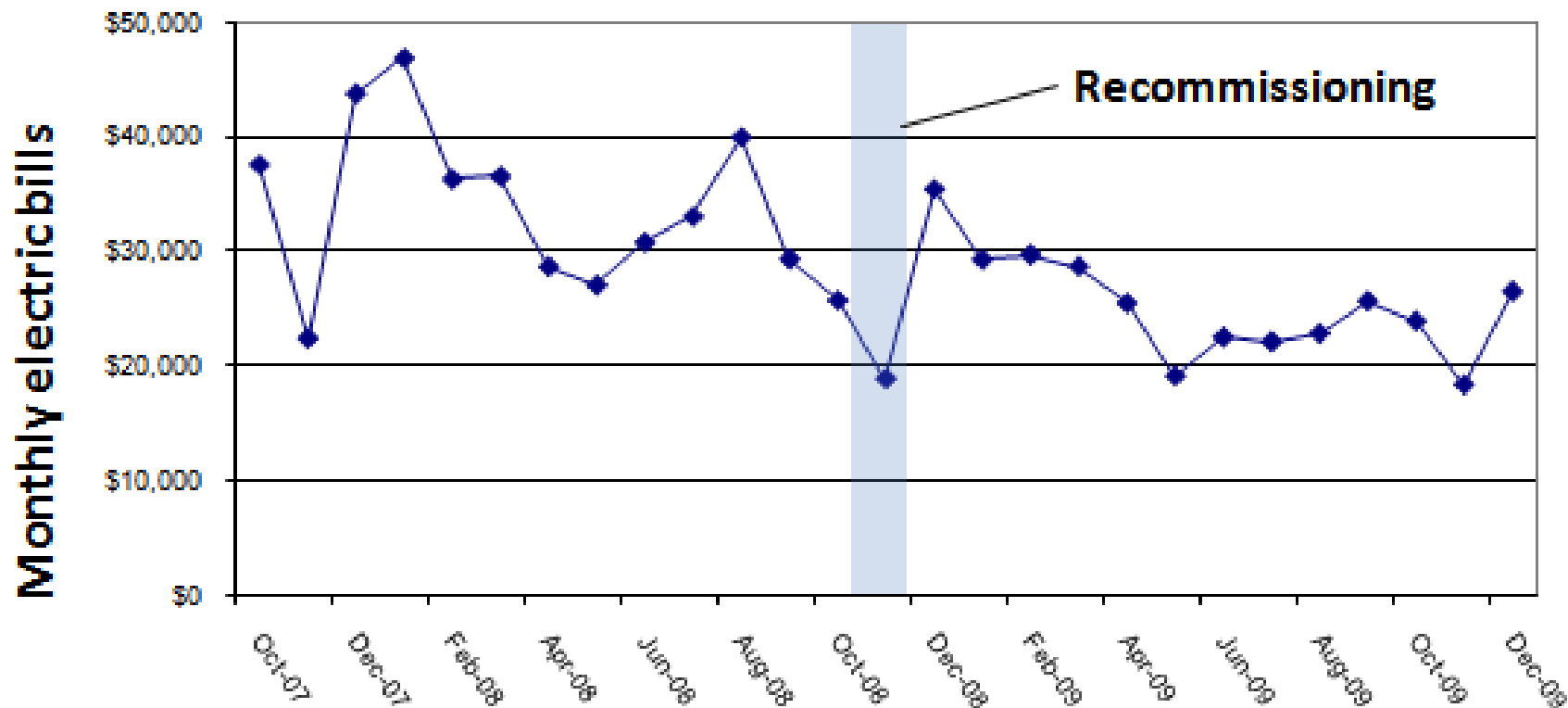
MN Vascular Surgery Center – New Brighton, MN



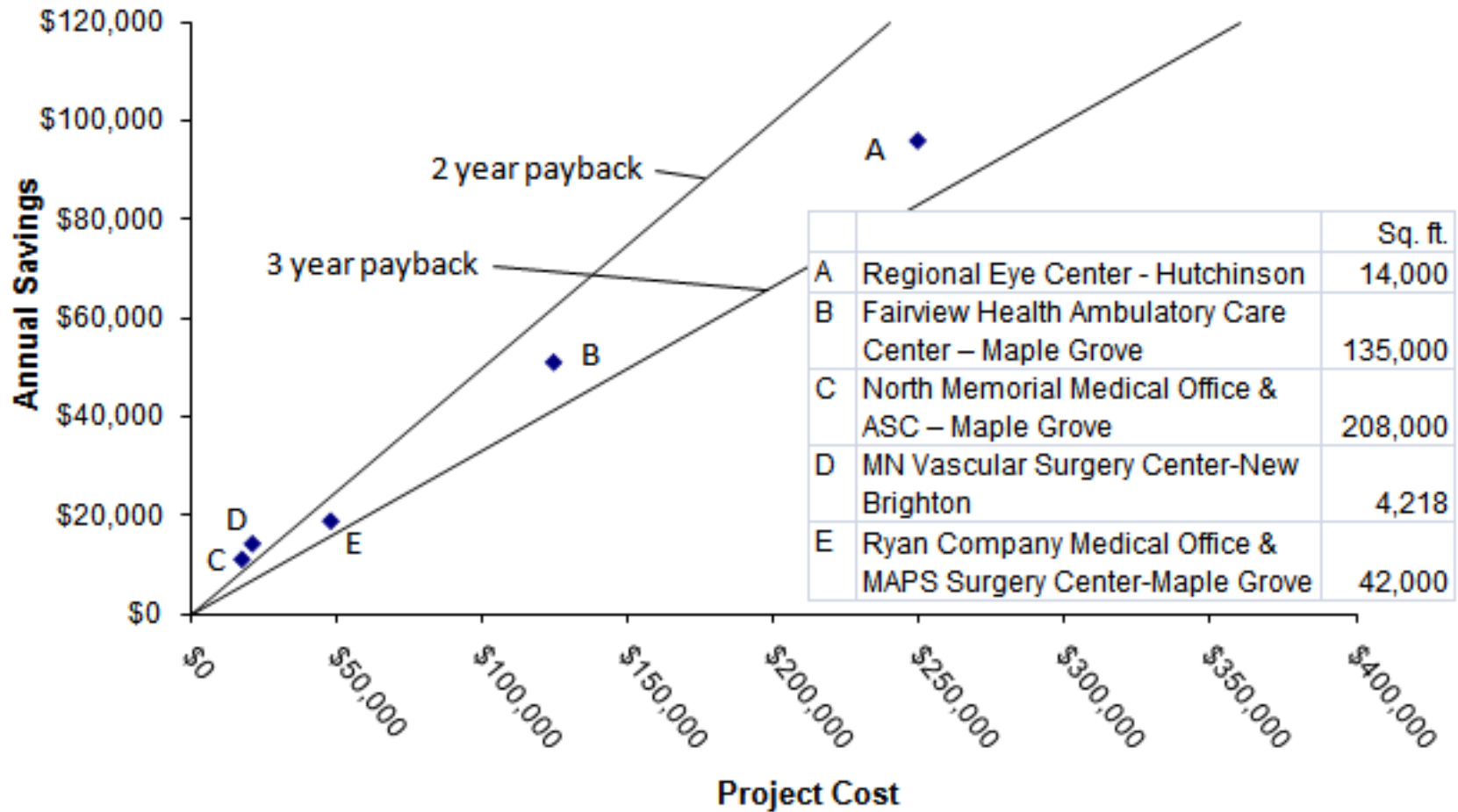
Total Energy Cost - Regional Eye Care



Regional Eye Center monthly electric bills



Recommissioning Savings vs. Cost



Surgery Suites

Opportunities for Savings

- Ventilation:
 - Reduce to amount actually needed
 - Reduce to zero when unoccupied
- Lighting:
 - More efficient lights
 - Improve distribution of lighting where needed
- Setback Temperature when unoccupied

Ambulatory & Surgery Suites

BIG SAVINGS POTENTIAL!

- Rebalance variable air volume boxes
- Temperature setback
- Supply air temperature reset
- Efficient lighting fixtures & controls
- Equipment operation schedule
- Reduce outside air through demand controlled ventilation (CO₂ monitoring)
- Better management of Humidification

Surgical Suite Environmental Conditions

	Past Design	Current Desired
Temperature	68° - 75°F	62°F
Humidity	30% - 60%	50%

Required Procedure

1. Energy Audit to identify opportunities
 - Must consider surgery suite HVAC requirements of the Minnesota Rules and ASHE compliance
 - Must provide drawings and specifications for as built and proposed changes
2. Submit to MDH for design and engineering computations review
3. Work cannot start until MDH approval letter is received

Financing the Project

- Utility CIP (Conservation Improvement Program) rebates
- PBEEEP – Municipal & state facilities
- Federal Tax Credits
- Performance contracting

Utility CIP Rebates

- Rebates for energy audits
- Standard rebates for many equipment items
- New construction design assistance
- Custom rebates for larger projects
- All utilities under state mandate to reduce energy use by 1-1/2% per year!

Public Buildings Enhanced Energy Efficiency Program

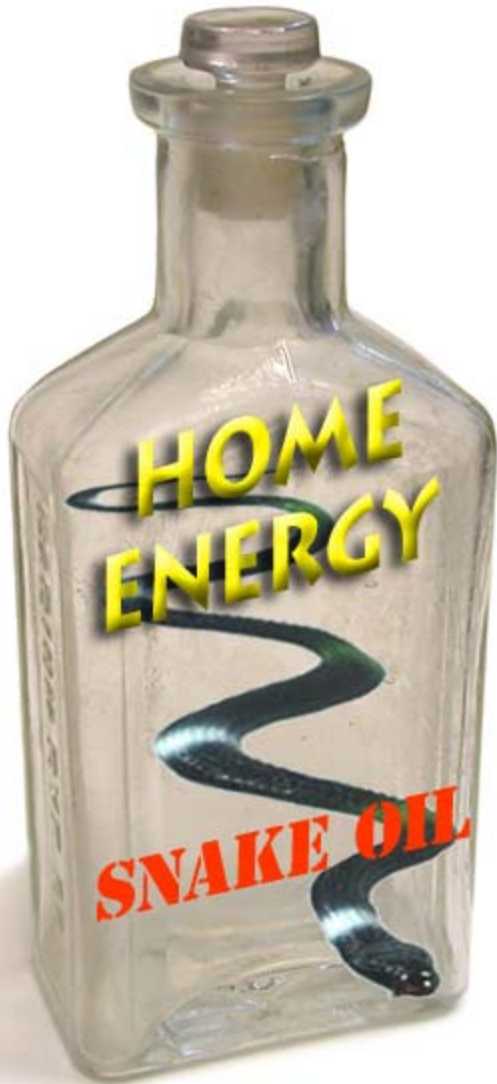
- PBEEEP for public buildings
- Economic feasibility is determined by ability to pay back financing out of savings realized by energy improvement project
- Available late 2010

Federal Tax Credits

- Up to \$1.80/sq. ft. available:
 - Building must save at least 50% of heating and cooling energy
- Partial deductions of up to \$.60/sq. ft. available for measures affecting: the building envelope, lighting, or heating and cooling systems
- Deduction extended through 12/31/13

Performance Contracting

- “Guaranteed Savings”
- U.S. FEMP - 550 projects worth \$3.6 billion awarded as of March 2010
- Expect to pay more for a guarantee
- Carefully examine the “Measurement and Verification” section for what is being guaranteed



- Reflective foil beneath concrete or shingles!
- Swamp coolers
- Energy savings claims for power factor correction & surge suppressors
- Electric (“Amish”!!!) space heaters
- “If it sounds too good to be true, it probably is.”

Resources

- ENERGY STAR Portfolio Manager
- Minnesota B3 benchmarking -- *For state and local government buildings*
- PBEEEP
- U.S. DOE Hospital Energy Alliance
 - Cash Flow Opportunity Calculator
- Minnesota Save Energy Now Industrial Energy Efficiency Workshop - Oct. 20

Energy Conservation in Health Care Facilities

- Entire presentation is posted at:
 - <http://MHCEA.org> and
 - www.health.state.mn.us/divs/fpc/engineering.html

- Thank You!