Roadmap for Success: Strategic Energy Management Planning

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Bottom line thinking on energy.

The Business Case For Energy Upgrades

Terry Egnor, MicroGrid/BetterBricks

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2010 Energy/Facilities Connections Conference

Who is BetterBricks?

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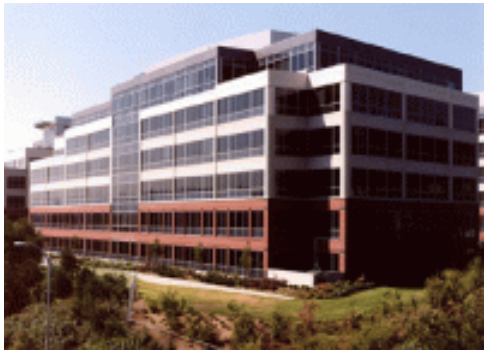
www.BetterBricks.com

A program of the Northwest Energy Efficiency Alliance

A source for tools, training, and technical advisors

A strategic roadmap for energy management



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Roadmap for Success:
Strategic Energy Management Planning

1. Benchmarking Your Building Energy Performance
2. Setting Energy Targets
3. Financial Analysis Tools for Evaluating Projects
4. Tracking Progress for Continuous Energy Performance Improvement

The Roadmap Supports Continuous Improvement

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Excellent firms don't believe in excellence - only in constant improvement and constant change. *Tom Peters*

Today's Topic

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Making the Business Case for Energy Upgrades

1) Follows "Setting Energy Targets"
2) Creating a Financial Frame for the Project
3) Using the Right Tool for the Job
4) Aligning with Organizational Goals
5) What tools and resources are available?

What's UPS Mean?

What's UPS Mean?

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Uninterruptible Power Supply

What's UPS Mean?

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What the CFO may **hear** when you **say** UPS

One CFO Perspective:

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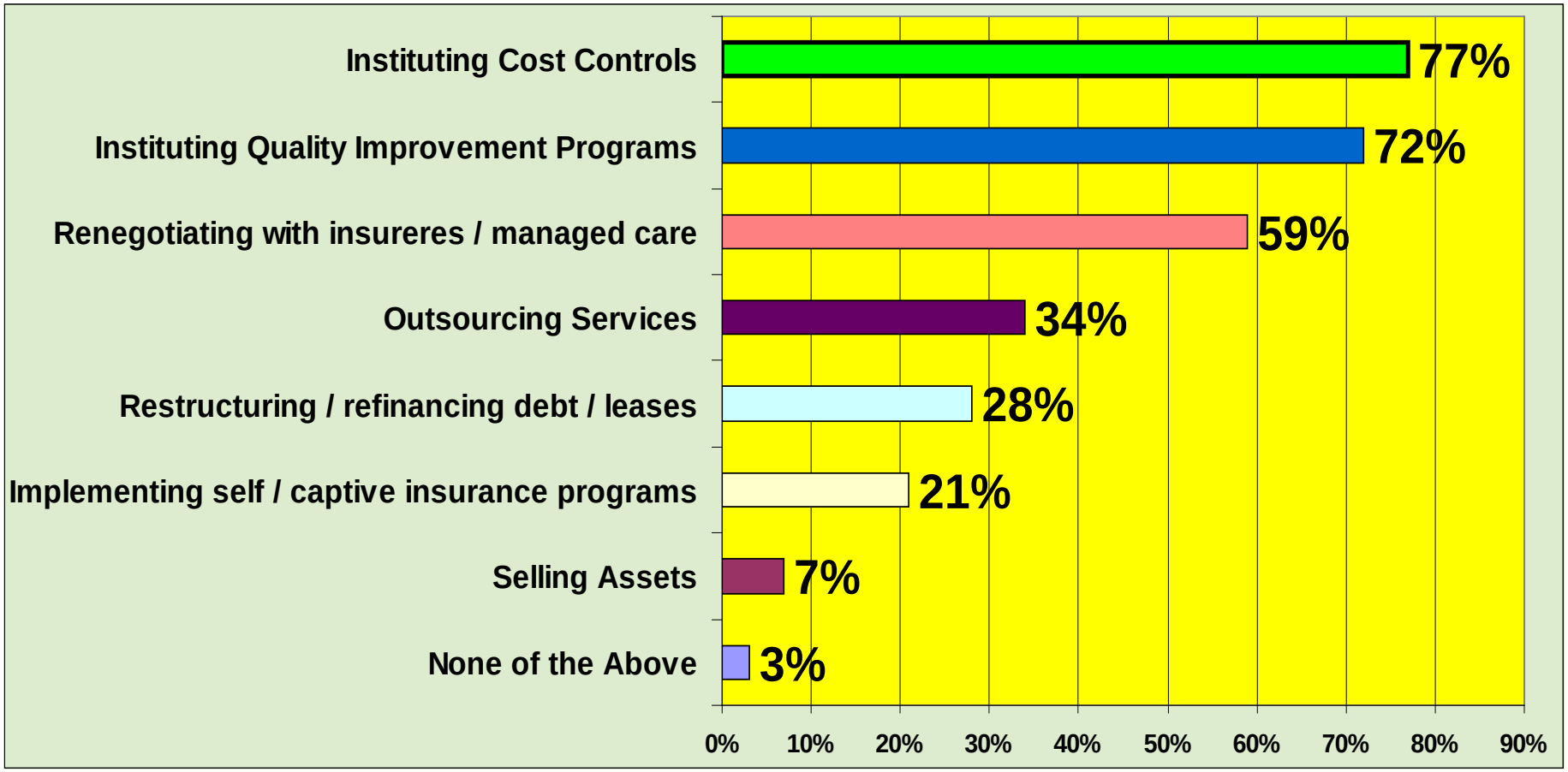
Cost Control is King!



Source: CFO Survey: GE Healthcare Financial Services

Competition for Approval

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Energy management results in *avoided cost*

New products result in *new revenue*

How do you level the playing field?

Energy Efficiency Contributes to Cost Control – But How Is It Counted?

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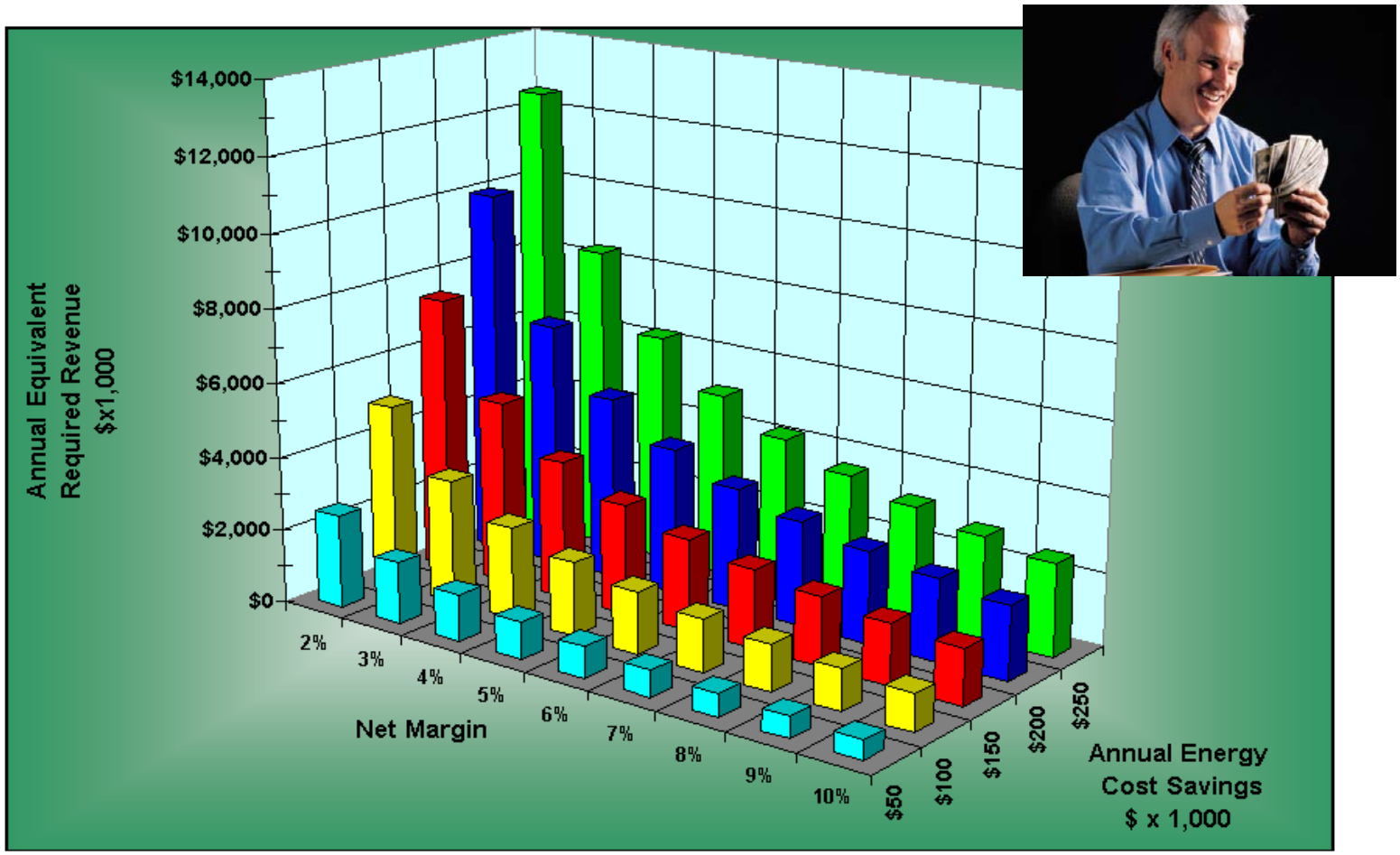

Capital vs. Operating Budgets

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Capital	Operating
Annual or longer cycle	Annual allocation
Little flexibility – sunk cost	Short term adjustment flexibility
Based on projections – may not be empirically supported	Empirical precision
Moderate-to-high risk exposure for the institution	**Low-to-moderate** risk exposure to institution

Translating Energy Projects to CFO-speak

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Create a compelling financial case

- Estimate project costs and benefit streams into the future using time value of money
- Derive either a cost or rate of return number that characterizes the project.

Align the project with corporate goals

- Identify links between project benefits or features and a corporate need
- Document the potential

[More on this later.]

Advantages of Energy Related Projects

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- Project cost estimation can be relatively precise
- Excellent empirical evidence on energy savings and project life is available
- Commodity cost trends are known with reasonable confidence
- Energy cost uncertainty is tied to volatility, thereby enhancing the value of avoided cost strategies

Built-In Advantages of Energy Related Projects

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- **Project cost estimation can be relatively precise**
- **Excellent empirical evidence on energy savings and project life is available**
- **Commodity cost trends are known with reasonable confidence**
- **Energy cost uncertainty is tied to volatility, thereby enhancing the value of avoided cost strategies**

Can you say RISK MANAGEMENT !

Analyzing Energy Management Investment Opportunities

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Economic Efficiency

Tools of the trade

- The simplicity of payback
- Importance of discounting
- The power of life cycle cost analysis
- The flexibility of internal rate of return calculations

Economic Efficiency

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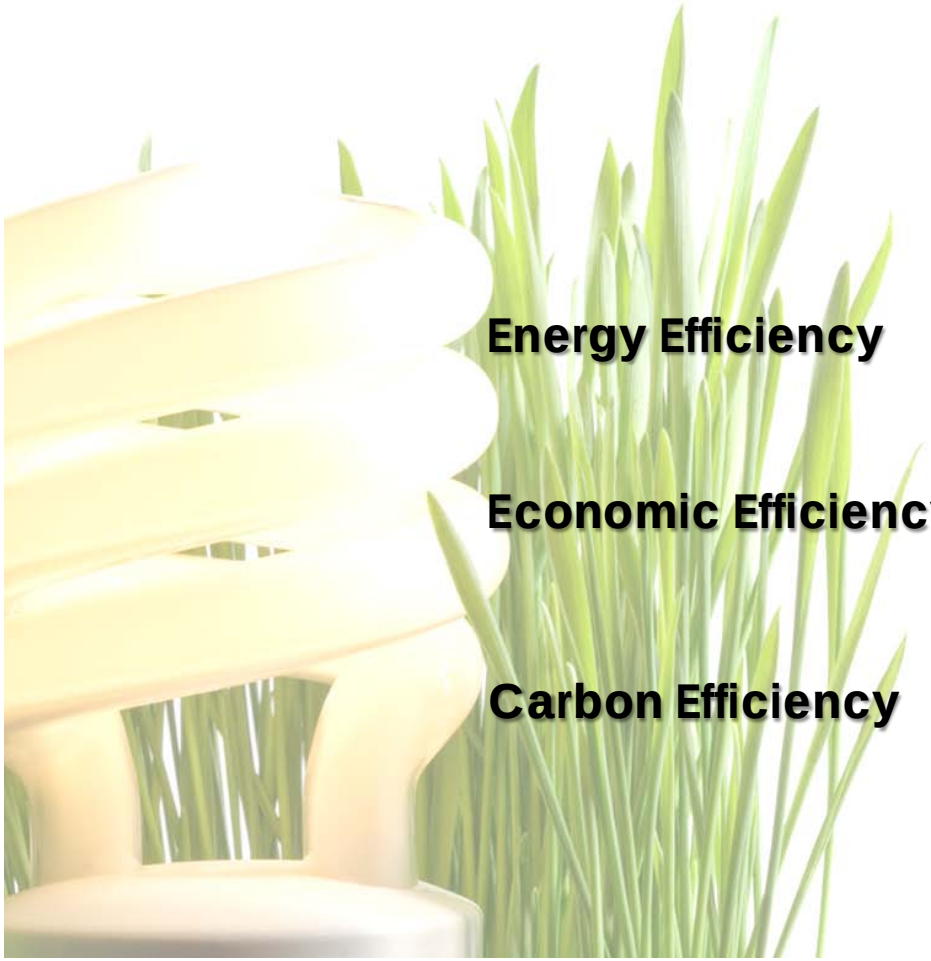

$$\text{Energy Efficiency} = \frac{\text{Energy Output}}{\text{Energy Input}}$$

$$\text{Economic Efficiency} = \frac{\$ \text{ Value of Energy Cost}}{\text{Value of Energy Benefit}}$$

$$\text{Carbon Efficiency} = \frac{\text{Amount of } CO_2 \text{ Generated}}{\text{Task}}$$

A

Simple Payback (SPB)

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$$SPB = \frac{COST}{SAVINGS/YR}$$

$$SPB = \frac{\$\ 100}{\$\ 20} = 5.0 \text{ yrs}$$

SPB = The number of years until the cumulative savings equals the cost without regard for the time-value of money.

Simple Payback (SPB)

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Advantages

- Fast
- Simple
- Shows time period to recovery of funds
- Does not require discounting for time-value of money

Use for quick screening tool for similar items

Disadvantages

- Too Simple
- Does not define relative efficiency or scale
- Does not account for additional savings over measure lifetime
- Does not account for time-value of money
- Not meaningful for dissimilar options

More Powerful Analytical Tools

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Life Cycle Cost

- Determines total cost of ownership for a project over its life expectancy
- Detailed comparison tool for similar items
- Comprehensive
- Well defined risk profile

Internal Rate of Return

- Determines the percent return to the organization for a given investment
- Detailed analysis tool
- Often used as an initial “Hurdle Rate” for investment by the organization

Discounting

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"A nickel isn't worth a dime today."

Yogi Berra

"Inflation is when you pay fifteen dollars for the ten-dollar haircut you used to get for five dollars when you had hair."

Sam Ewing

Discounting

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Discount Rate (DR)=	10%

Cost = $	100.00

Year -->	1	2	3	4	5	6	7	8
Nominal Savings	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00
Cuml Discount Rate Calc	(1- DR)^1	(1-DR)^2	(1-DR)^3	(1-DR)^4	(1-DR)^5	(1-DR)^6	(1-DR)^7	(1-DR)^8
Cuml Discount	0.9	0.81	0.729	0.656	0.590	0.531	0.478	0.430
Annual Discounted Savings	$ 18.00	$ 16.20	$ 14.58	$ 13.12	$ 11.81	$ 10.63	$ 9.57	$ 8.61

Total Savings=Present Value								
Present Value Year 1 =	$ 18.00							
Present Value Year 2 =		$ 34.20						
Present Value Year 3 =			$ 48.78					
Present Value Year 4 =				$ 61.90				
Present Value Year 5 =					$ 73.71			
Present Value Year 6 =						$ 84.34		
Present Value Year 7 =							$ 93.91	
Present Value Year 8 =								$ 102.52

Life-Cycle Cost (LCC)

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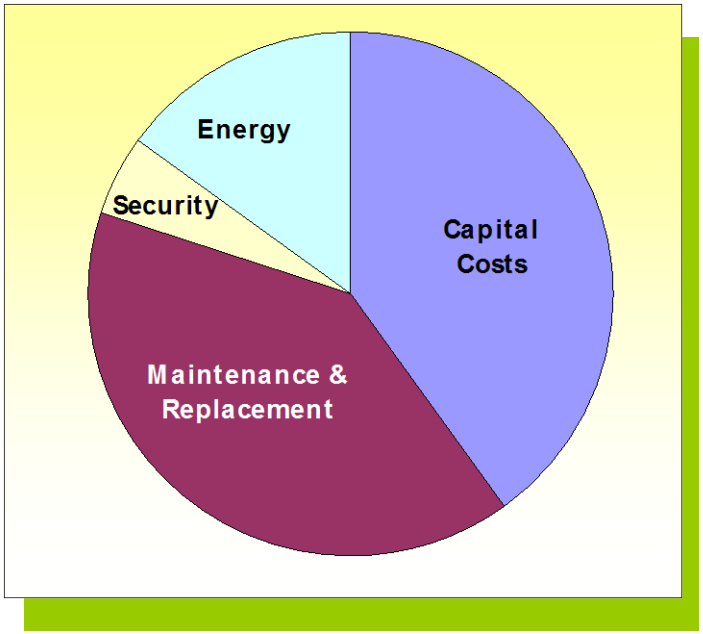

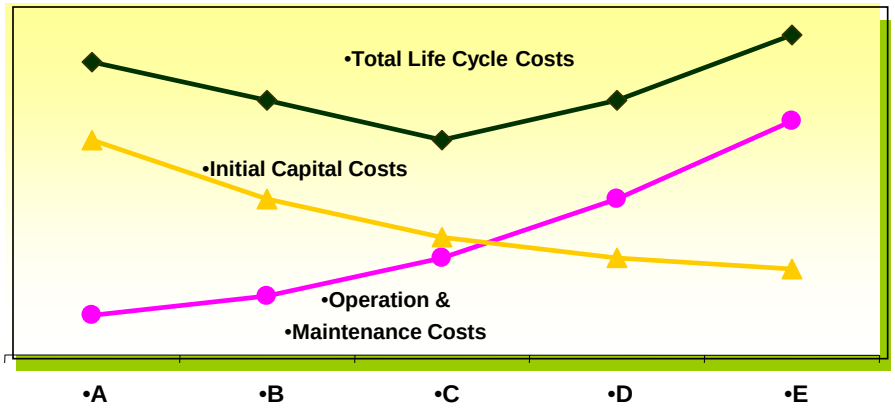

"Double bottom line"

- Considers operating costs in addition to first costs
- Typically applied to specific building components

"Triple bottom line"

- approach includes personnel costs/savings

Life-Cycle Cost (LCC)

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$$LCC = C - S + M + R + E$$

Where:

C = Purchase cost installed

S = Salvage value

M = Maintenance and Repair Costs

R = Replacement cost

E = Energy Costs

[All costs and revenues are in discounted dollars]

Sample LCC Spreadsheet

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EXAMPLE 2 - Multi-Year - Discount Rate = **5.0%**

Alternative A - Heat Pump 1	Nominal Values	Year
Term (life expectancy)	10	
Cost installed	$ 1,500	0
Salvage at end of life	$ -	0
Maintenance	$ 50	0
Replacement parts	$ 400	5
Energy use per year*	$ 425	0

Alternative B - Heat Pump 2	Nominal Values	Year
Term (life expectancy)	10	
Cost installed	$ 2,100	0
Salvage at end of life	$ -	0
Maintenance	$ 50	0
Replacement parts	$ 450	8
Energy use per year*	$ 300	0

*** Fuel escalation of** **3.0%**

	Year	0	1	2	3	4	5	6	7	8	9	10	**Totals**
5%	C	$ 1,500											$ 1,500
	S	0											$ -
	M		50	50	50	50	50	50	50	50	50	50	$ 500
	R	0						400					$ 400
	E*		464	477	492	506	522	537	553	570	587	605	$ 5,314
Nom Total	**$ 7,714**	$ 1,500	$ 514	$ 527	$ 542	$ 556	$ 572	$ 987	$ 603	$ 620	$ 637	$ 655	$ 7,714
Disc Total	**$ 6,176**	$ 1,500	$ 488	$ 476	$ 464	$ 453	$ 442	$ 726	$ 421	$ 411	$ 402	$ 392	$ 6,176

	Year	0	1	2	3	4	5	6	7	8	9	10	**Totals**
5%	C	$ 2,100											$ 2,100
	S	0											$ -
	M		50	50	50	50	50	50	50	50	50	50	$ 500
	R	0								450			$ 450
	E*		309	318	328	338	348	358	369	380	391	403	$ 3,542
Nom Total	**$ 6,592**	$ 2,100	$ 359	$ 368	$ 378	$ 388	$ 398	$ 408	$ 419	$ 880	$ 441	$ 453	$ 6,592
Disc Total	**$ 5,447**	$ 2,100	$ 341	$ 332	$ 324	$ 316	$ 308	$ 300	$ 293	$ 584	$ 278	$ 271	$ 5,447

Life Cycle Cost Analysis

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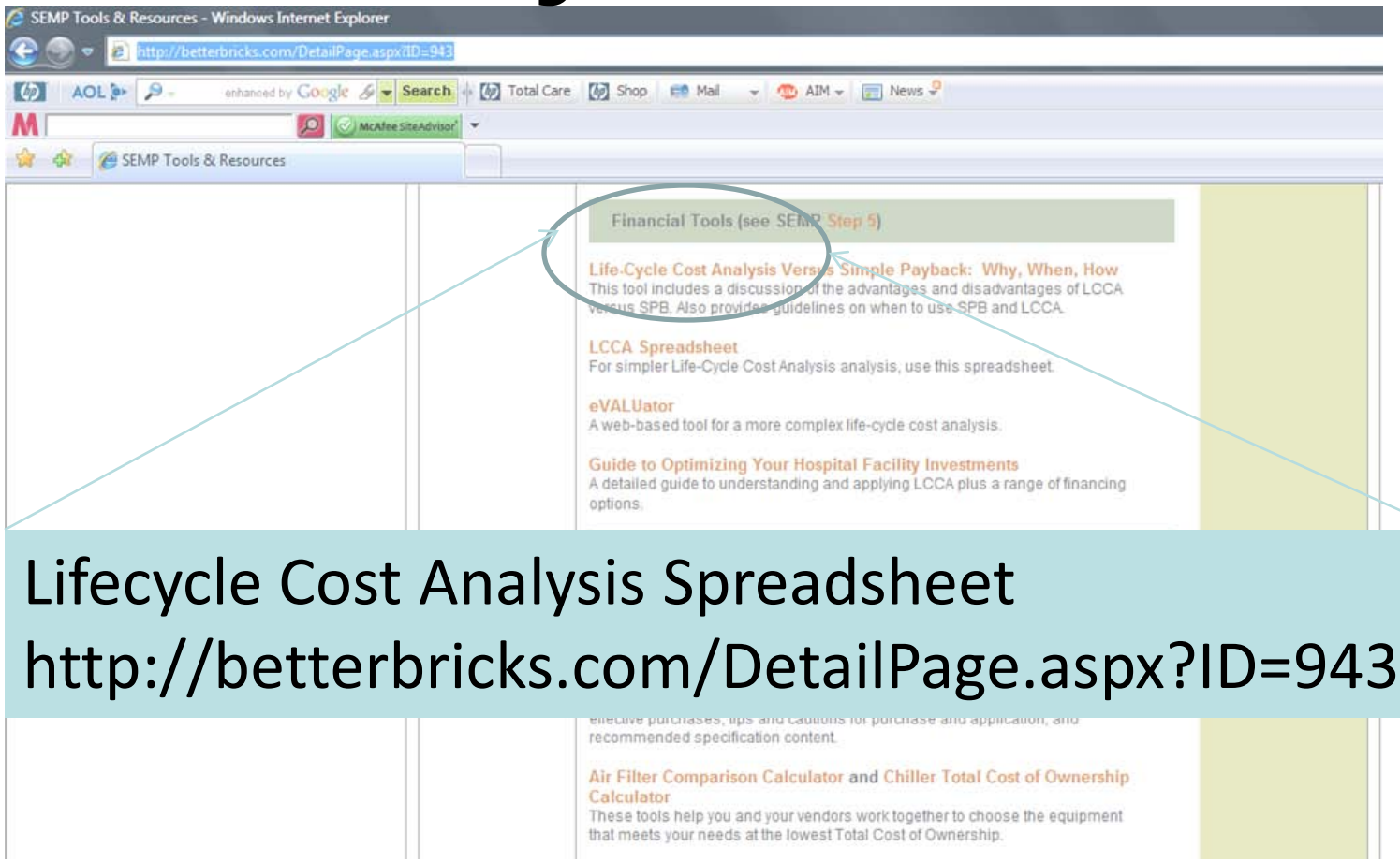

Lifecycle Cost Analysis Spreadsheet
http://betterbricks.com/DetailPage.aspx?ID=943

Life-Cycle Cost (LCC)

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Advantages:

- Does account for total savings over measure lifetime
- Comprehensive
- Useful for comparing like solutions
- Does account for time-value of money

Disadvantages:

- Does not indicate the return on investment
- Does not define scale or relative efficiency
- Not meaningful for dissimilar options

Use - Detailed comparison tool for similar items

Internal Rate of Return (IRR)

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The Internal Rate of Return

- is the equivalent of the interest rate earned on an investment.
- allows the comparison of dissimilar projects or alternatives in terms of their profitability.
- is often used as an initial project “hurdle rate”.

Internal Rate of Return (IRR)

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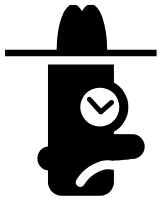
BAD NEWS!



The equation for this function is quite complex and requires significant expertise to work from scratch.

GOOD NEWS!

Most spreadsheet programs and financial analysis programs have a simple “plug-in” model that allows easy calculation.

Internal Rate of Return (IRR)

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$$IRR = \Delta C - \Delta S + \Delta M + \Delta R + \Delta E$$

Where:

C = Purchase cost difference (installed)

S = Salvage value difference

M = Maintenance and Repair cost difference

R = Replacement cost difference

E = Energy Costs difference

[All costs and revenues are in discounted dollars]

Sample IRR Spreadsheet

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	Nominal		Nominal		Nominal
Alternative A	Values	**Alternative B**	Values	**Alternative C**	Values
T=Term (life expectancy)	10	Term (life expectancy)	10	Term (life expectancy)	10
C=Cost installed	$ 15,000	Cost installed	$ 10,000	Cost installed	$ 1,100
S=Salvage at end of life	0	Salvage at end of life	0	Salvage at end of life	0
M=Maintenance Increase	100	Maintenance	200	Maintenance	250
R=Replacement parts - 1X	600	Replacement parts - 5X	200	Replacement parts - 10X	40
E=Energy savings*	$ 2,300	Energy savings	$ 1,500	Energy savings	$ 400
		* Fuel escalation of	3.0%		

Alternative A

Year	0	1	2	3	4	5	6	7	8	9	10	**Totals**
C	$ (15,000)											$(15,000)
S	0											
M		-100	-100	-100	-100	-100	-100	-100	-100	-100	-100	$ (1,000)
R							-600					$ (600)
E*		2369	2440	2513	2589	2666	2746	2829	2914	3001	3091	$ 27,158
Nom Total	$ (15,000)	$ 2,269	$ 2,340	$ 2,413	$ 2,489	$ 2,566	$ 2,046	$ 2,729	$ 2,814	$ 2,901	$ 2,991	$ 10,558

$ 10,558

IRR = 10.5%

Alternative B

Year	0	1	2	3	4	5	6	7	8	9	10	**Totals**
C	$ (10,000)											$(10,000)
S	0											
M		-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	$ (2,000)
R			-200		-200		-200		-200		-200	$ (1,000)
E*		1,545	1,591	1,639	1,688	1,739	1,791	1,845	1,900	1,957	2,016	$ 17,712
Nom Total	$ (10,000)	$ 1,345	$ 1,191	$ 1,439	$ 1,288	$ 1,539	$ 1,391	$ 1,645	$ 1,500	$ 1,757	$ 1,616	$ 4,712

$ 4,712

IRR = 7.3%

Alternative C

Year	0	1	2	3	4	5	6	7	8	9	10	**Totals**
C	$ (1,100)											$ (1,100)
S	0											
M		-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	$ (2,500)
R		-40	-40	-40	-40	-40	-40	-40	-40	-40	-40	$ (400)
E*		412	424	437	450	464	478	492	507	522	538	$ 4,723
Nom Total	$ (1,100)	$ 122	$ 134	$ 147	$ 160	$ 174	$ 188	$ 202	$ 217	$ 232	$ 248	$ 723

$ 723

IRR = 9.1%

Internal Rate of Return (IRR)

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Advantages:

- Shows relative economic efficiency
- Does account for time-value of money
- Can compare dissimilar alternatives competing for investment dollars

Disadvantages:

- Does not define relative scale
- Does not provide information on the optimum size of investment

Uses:

- Detailed analysis tool
- Set "Hurdle Rate"

Providence Newberg

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"The internal rate of return on the investment is estimated at 54 percent when incentives are factored into the equation and even higher with energy tax credits."

Richard Beam

Which Tool for Which Job?

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To screen projects or options:	SPB
To rank similar, mutually exclusive projects:	LCC
To size the economic optimum:	LCC
To rank dissimilar, not mutually exclusive projects:	IRR
To find a project rate of return:	IRR

Strategic Issues

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- **What financial standards are used by your organization for decision-making purposes?**
- **What are the "hurdle rates" and calculation procedures for each?**
- **What economic efficiency policies could be implemented in energy related areas?**

Alignment with Organizational Goals

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Organizational Goals Frequently Linked to Energy Efficiency:

- Cost reductions/Higher net margins
- Higher productivity and comfort
- Healthier environment, inside and out
- Staff retention
- Quality of customer care
- Community leadership
- Reduced CO2 impacts on climate

Productivity - Lighting

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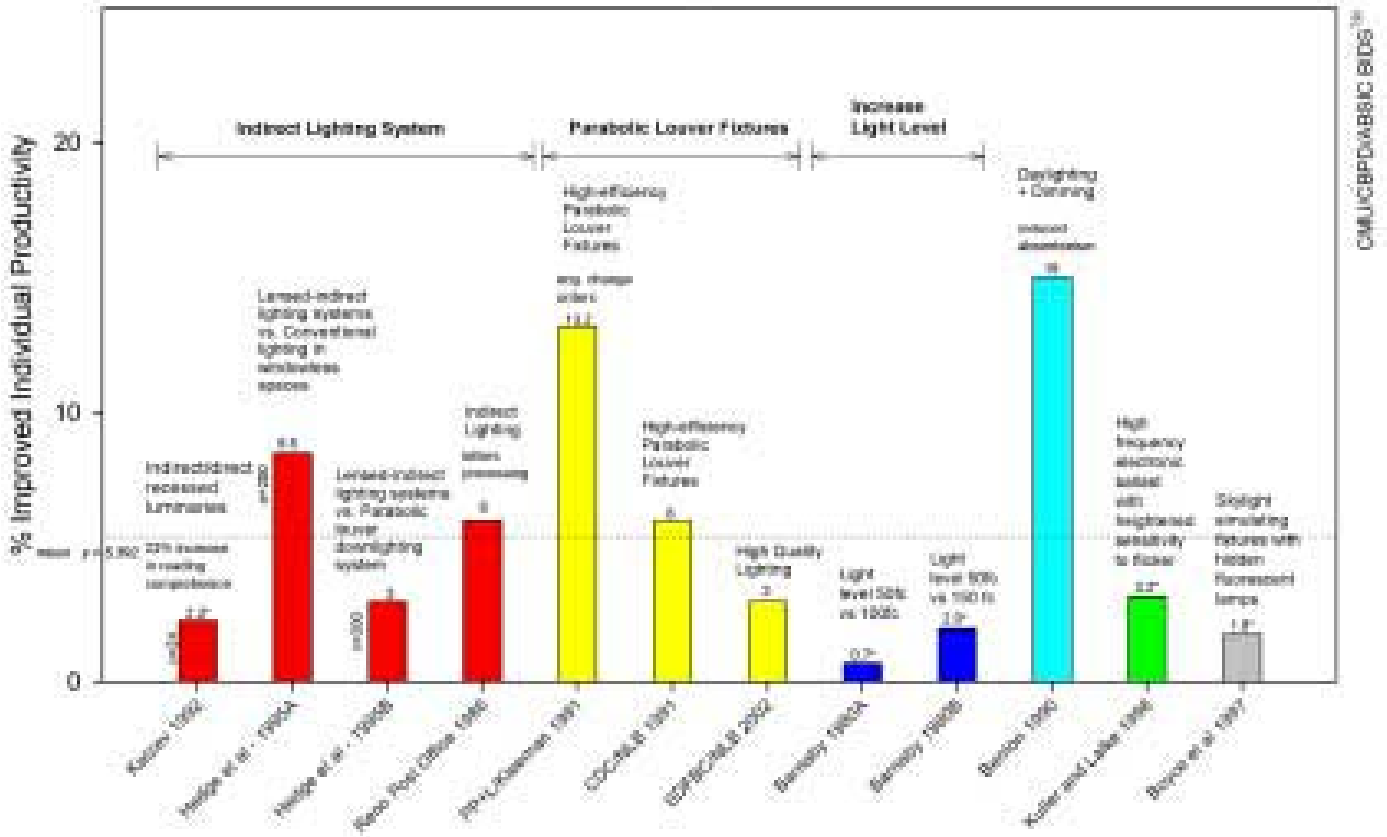

Productivity – Thermal Control

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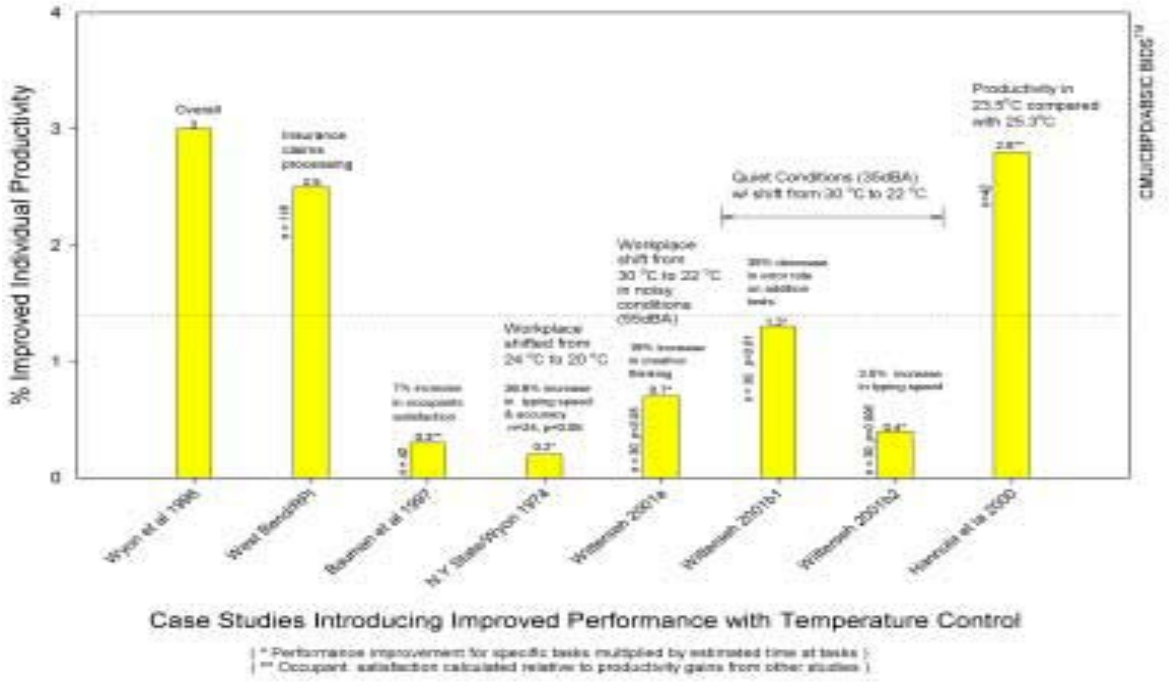

Case Studies Introducing Improved Performance with Temperature Control

(* Performance improvement for specific tasks multiplied by estimated time at tasks)
(** Occupant satisfaction calculated relative to productivity gains from other studies)

Summary

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Making the Business Case for Energy Upgrades

1. Create a financial frame for the project in "CFO-speak".

2. Use the right tool for the job.

3. Align your solution with organizational goals.

Getting Started

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What's your next step?

1) Go to the BetterBricks web site for their LCC spreadsheet and related documents
2) Go to the Whole Building design Guide: http://www.wbdg.org/resources/lcca.php for a comprehensive treatment of LCC.
3) Sit down with your financial team and determine what they need and how they can help you get it.

Other Resources

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ENERGY STAR® Buildings
www.energystar.gov

BetterBricks
www.betterbricks.com

Electric & Gas Utilities
Database of Incentives for Energy Efficiency
http://www.dsireusa.org/

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Roadmap for Success

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Know your starting point

- Accounting & benchmarking

Know your destination

- Establish an energy performance goal

Figure out your route

- Apply financial analysis tools to energy project decisions

Look at your map frequently

- Measure and report progress

Continuous improvement is better than delayed perfection. *Mark Twain*

Thank you !!

QUESTIONS?