UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

2009 BUSINESS LEADERSHIP CONFERENCE

Saving Green By Going Green

March 17, 2009: 9 AM and 1:15 PM

Business Leadership at Illinois: Collaborating for a Brilliant Future

Workshop Presenters

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Please …

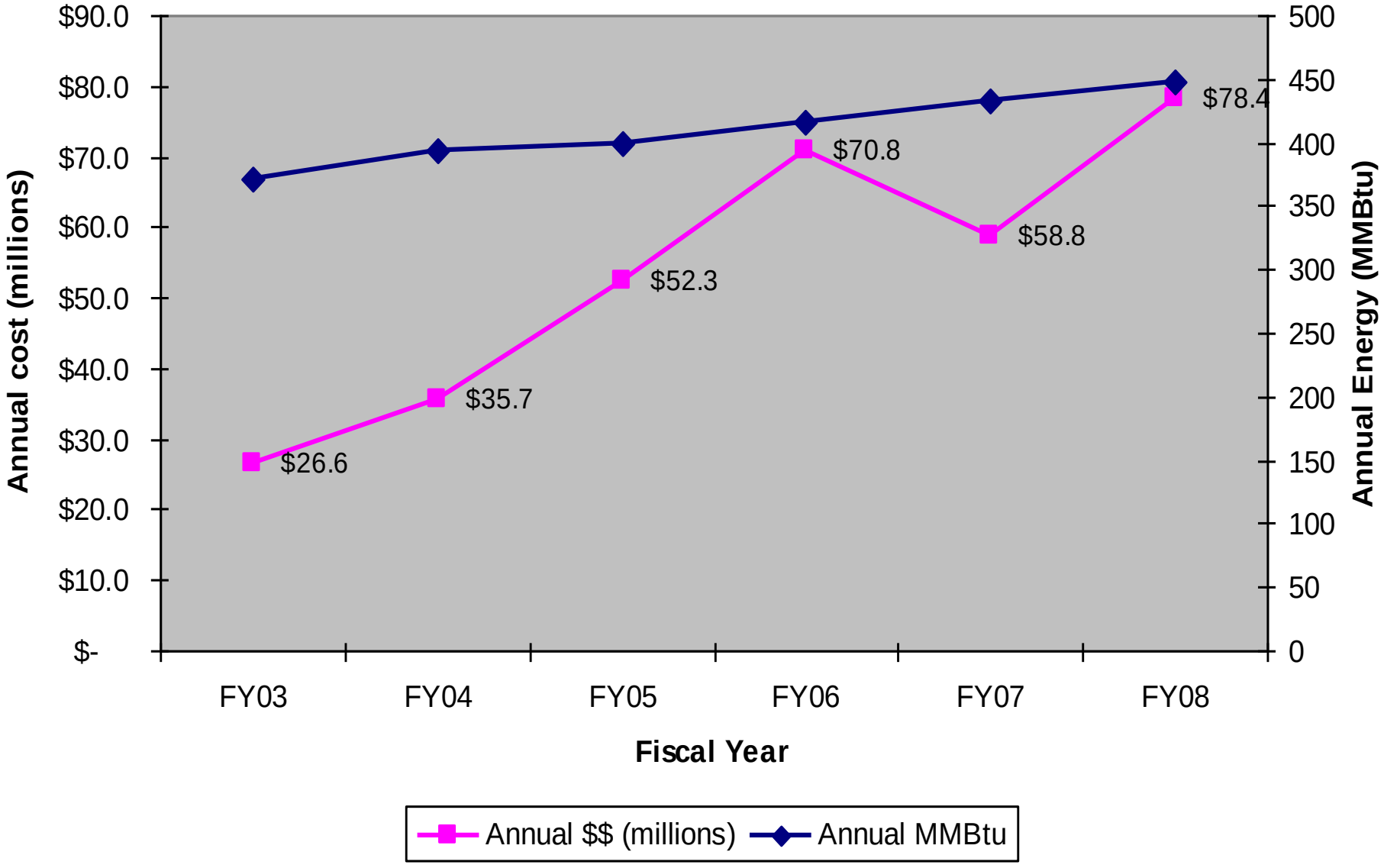
- Turn off cell phones.
- Avoid side conversations.
- Feel free to ask questions as they arise – discussion is encouraged
- Sign the attendance roster.
- Complete the evaluation at the end of the workshop.

Workshop Objectives

- Understand the current energy situation and benefits of energy conservation
- Learn basic strategies to reduce campus energy consumption
- Explore methods to fund these efforts

What's been the campus energy usage and energy cost picture over the past few years?

Annual Energy, Urbana Campus



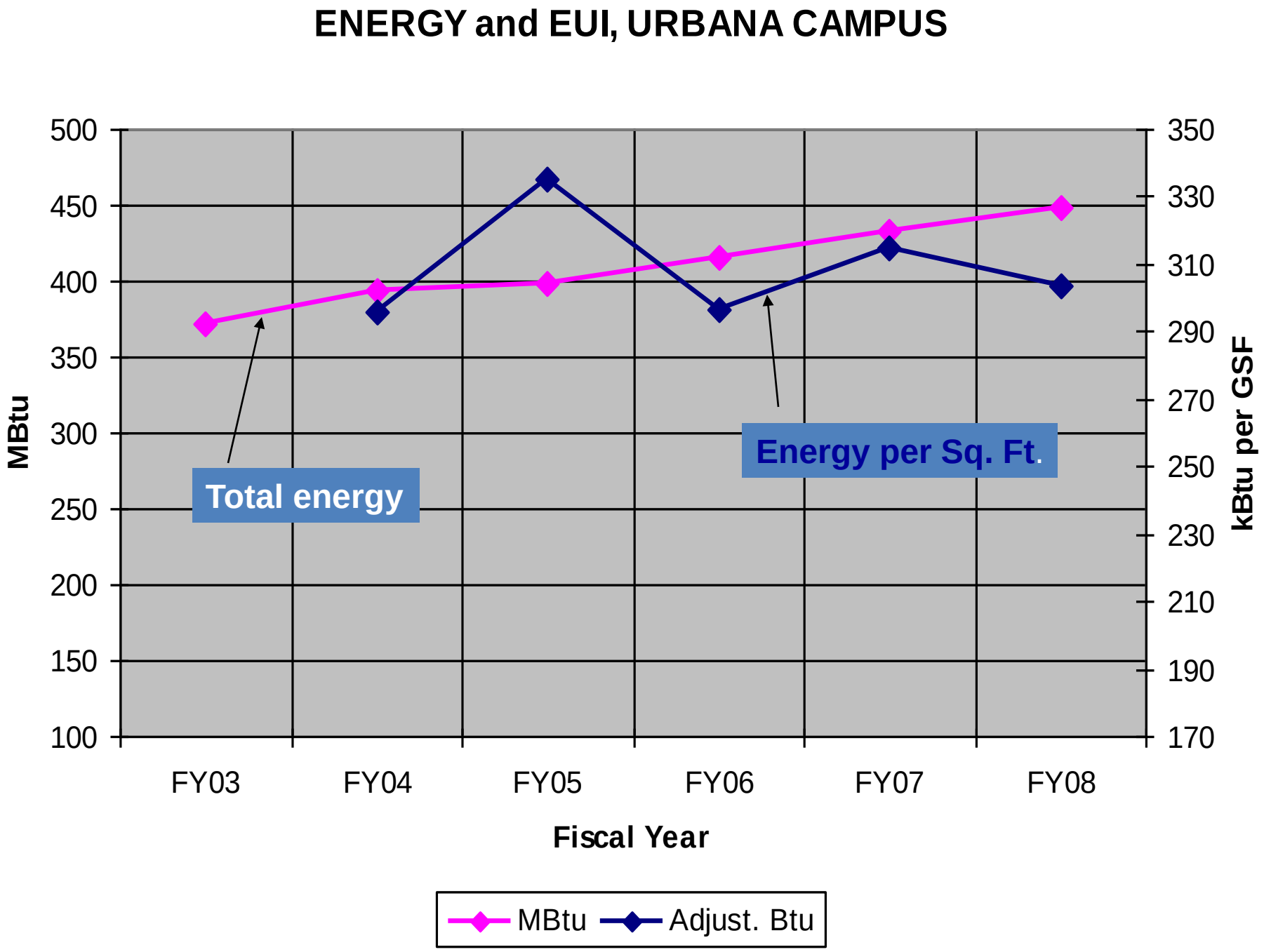
FY 2003 through FY2008:

Growth in enrollment: + 6.4 %

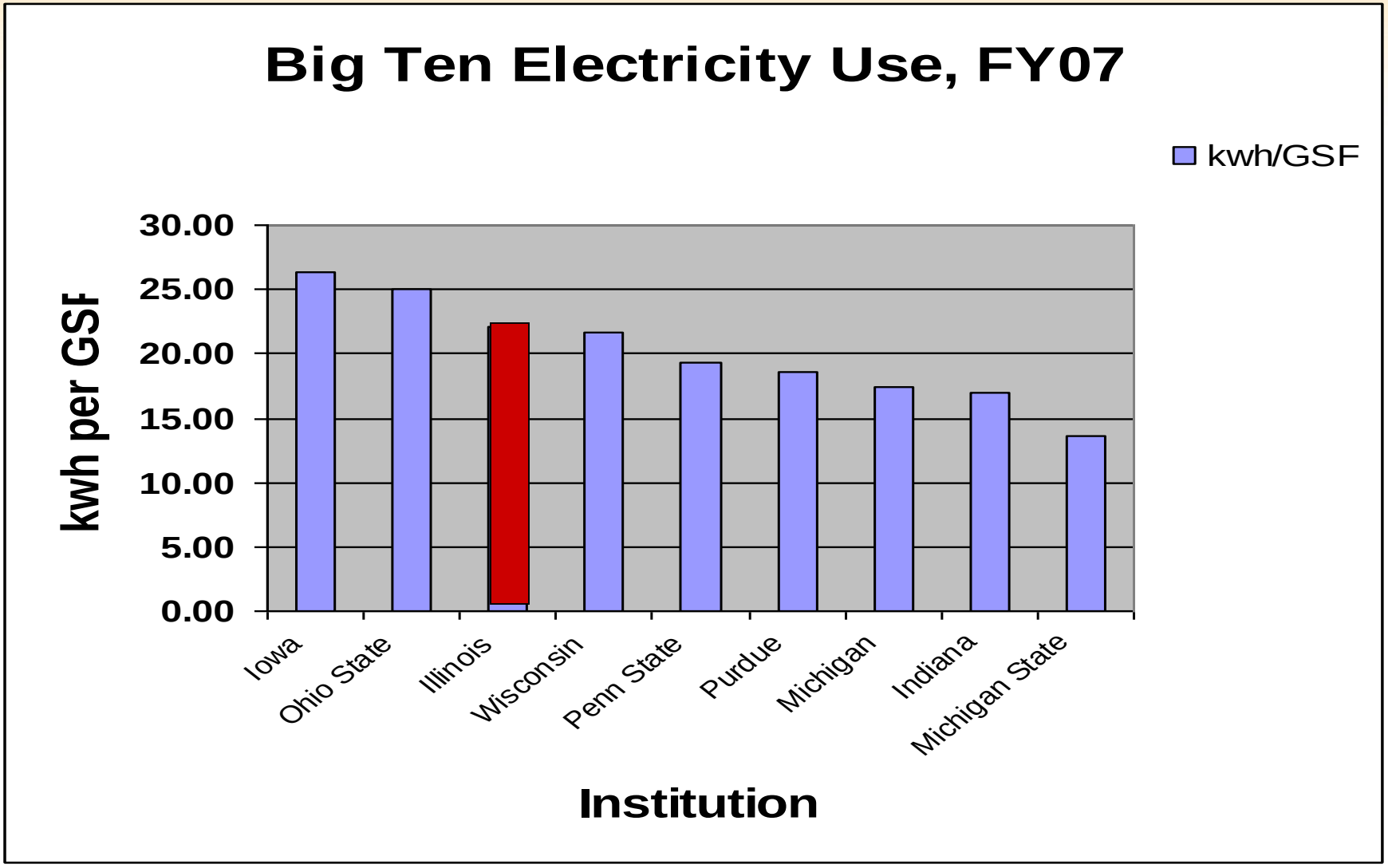
Growth in campus space: + 10.5 %

Growth in energy usage: + 20.5 %

Growth in energy expenditures: + 194.7%


ENERGY and EUI, URBANA CAMPUS
MBtu
500
450
400
350
300
250
200
150
100
350
330
310
290
270
250
230
210
190
170
kBtu per GSF
Total energy
Energy per Sq. Ft.
FY03
FY04
FY05
FY06
FY07
FY08
Fiscal Year
MBtu
Adjust. Btu

How Do We Compare?



Ten Year Energy Goals

- Reduce energy consumption from FY07 levels by 10% over the next 3 years

- Reduce energy consumption from FY11 levels by 15% over the following 2 to 6 yrs

Progress?

Energy Utilization Index (Btu/GSF/year)

FY07: 314,550

FY08: 303,650 (-3.5%)

Target FY09: 291,500 (-4.0%)

Actual FY09 thru January: 283,000 (-6.8%)

What Are We Doing?

- Retro-Commissioning

  Completed 1,200,000 sf; average reduction 28%

- Lighting Upgrade

  ~ 40 buildings, $2.8 million (incl. $1.2 million ICECF grant)

- Shadow Billing
  - since Fall 2007
  - actual billing begins July 2009

Success Story: Krannert Center Retro-Commissioning

- Analyze operation and functionality of all major building systems
- Assure building equipment and mechanical systems operate as intended
- Upgrade controls
- Address maintenance issues
- RCx Team visited from Oct. to Dec. 2007
- RCx follow up complete March 2008

Air Silencer at Festival Theatre return air ductwork caked with dust

Results:
Krannert Center Retro-Commissioning

- $418,000 saved per year in energy costs
- 32% energy cost reduction
- 31% reduction in energy consumption
- RCx cost of $188,000
- Simple payback – less than 6 months

Krannert Center Retro-Commissioning

i = 6% ; period = 10 years

IRR – 222%

NPV – $3,000,000

Monthly savings - $35,000

Monthly loan payment - $2,000

Monthly net cash flow - $33,000

Who wouldn't invest their own money in this?

Krannert Center Retro-Commissioning

- Projects like this available all over campus
- Hundreds lack funding; a lesser number lack identification
- Past budget structure did not reward those who implement/fund energy savings projects

"Reward desired behavior ! "

What Are We Doing? (contin.)

- Working with colleges and department energy liaisons
  - Energy "Toolkit"
- Improving campus-wide awareness
- Finalizing a system-wide utility/energy study
- Finalizing a Vision Statement for campus-wide sustainability

Changing the Culture:

- **Alert the campus to its usage**

  Shadow Billing

- **Increase awareness of conservation efforts**

  celebrate successes

- **Engage students, faculty and staff**
- **Communicate solutions**
  - Department/College Tool Kit
  - Comprehensive Communication and Action Plan

Opportunities for Improvement

Primary areas for reduction:

- Air Conditioning and Ventilation Usage and Operating Schedules
- Fume Hood Usage
- Space Usage
- Computer Policies and Practices
- Equipment Procurement Practices
- Laboratory Equipment Usage

Opportunities for Improvement

Examples of Short-term Goals:

- Establish policy for turning off computer work stations; turn off at night and change power settings to Standby or Hibernate
- Enact monitor power settings; screen savers are not energy conservation – can increase energy consumption!
- All faculty, students and staff turn off lighting and equipment not in use. Unplug/switch off power strips to defeat energy vampires.

Opportunities for Improvement

Examples of Short-term Goals:

- Create awareness across your department/college
- Require purchases of Energy Star rated equipment (computers/thin clients, monitors, lab equipment, audio/visual, refrigerators, etc)
- Close fume hoods when not in use; turn hoods off if equipped with start/stop switch
- Replace incandescents in personal lamps with CFLs

Purchasing and Procurement

Example 1:

CARLI Servers today	CARLI Replacement Servers
20 servers – 33.9 kw	21 servers - 6.2 kwh
Annual elect cost: $36,700	Annual elect. Cost: $6,400

Example 2:

	Price	Electricity Use
Reconditioned argon-ion Laser -	$25,000	99,000 kwh/yr
Diode-pumped solid-state Laser -	$75,000	840 kwh/yr

Payback on the $50,000 price premium …

5.8 yrs

Goals

Examples of Long-term Goals:

- Identify areas of high energy usage and develop a plan for reduction
- Consolidation of fume hoods and equipment
- Facilitate systems retrofitting with F&S Retro-commissioning Team
- Develop a plan for more efficient space and classroom usage
- Investigate the consolidation of climate-sensitive projects/equipment
- Develop a plan and timetable for reaching the 17 percent reduction in five years

Conservation Efforts

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Conservation Efforts

- **Implemented comprehensive steam trap maintenance program**
- **Adopted LEED Silver standards for all major construction**
- **Developed ESCO Request for Qualifications**
- **USEPA “Energy Star” partner**
- **Signed the Presidents’ Climate Commitment**

Conservation Efforts

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Energy Conservation As An Investment

- Many projects have incredible rates of return
- Combined with financing, energy conservation can make a tremendous financial investment
- Can even achieve higher yields than our endowment
- Especially in current economic climate, it makes financial sense to invest in our own infrastructure
- When departmental energy billing takes effect, individual units can take advantage of these investments

Economic Terms

- Installation Cost – First cost investment
- University Contribution – Installation cost minus any grants or rebates
- Annual Cost Savings – Estimated annual energy (and/or maintenance) cost reduction
- Simple Payback – Amount of time for the initial contribution to be paid back in future savings (oversimplified indicator)

Economic Terms

- Internal Rate of Return (IRR) – interest rate that equates the present value of expected future cash flows to the initial project cost.
  - If IRR > discount rate – project is viable.
- Net Present Value – sum of cash flows that a project generates in its lifecycle, including investment costs and annual savings, discounting cash flows that occur in the future (time value of money).
  - If NPV > 0 – project is viable
  - Comparing project NPVs better than IRRs

Economic Terms

- Monthly Savings – Estimated monthly energy and/or maintenance savings
- Monthly Loan Payment – Monthly payment for loan on the projects investment cost. Based on interest rate and loan period
- Monthly Net Cash Flow – Monthly savings minus the monthly loan payment. Positive cash flow indicates a strong project that instantly pays for itself.

Economic Analysis on Various Active and Potential Projects

Name	Installation Cost	University Contribution	Annual Cost Savings	Simple Payback (years)	IRR	NPV	Monthly Savings	Monthly Loan Payment	Monthly Net Cash Flow
Steam Pipe Insulation Inside 22 Buildings	$237,000	$118,500	$520,000	0.2	439%	$3,784,683	$43,333	$1,316	$42,018
Campus Lighting Retrofits for 34 Buildings	$3,223,482	$2,041,214	$838,497	2.4	40%	$4,252,646	$69,875	$22,662	$47,213
Install 1,000 Aerators in Restrooms	$12,000	$12,000	$55,000	0.2	458%	$400,837	$4,583	$133	$4,450
Levis Center Ventilation Control	$47,355	$23,678	$86,438	0.3	192%	$960,324	$7,203	$501	$6,702
Demand Control Ventilation for Four Large Animal Clinic Wards	$218,956	$218,956	$52,000	4.2	21%	$171,362	$4,333	$2,431	$1,902
Restroom Exhaust Control for 65 Buildings	$130,000	$130,000	$325,000	0.4	250%	$2,309,489	$27,083	$1,443	$25,640
Vending Miser Controls Across Campus (300 Cold Drink Machines, 150 Snack Machines)	$102,375	$76,875	$40,081	1.9	52%	$223,978	$3,340	$853	$2,487
Install LED lamps in KCPA Lobby	$304,850	$268,972	$68,582	3.9	23%	$245,813	$5,715	$2,986	$2,729
Total	$4,276,018	$2,890,195	$1,985,598	1.5	69%	$12,013,944	$165,467	$32,087	$133,379

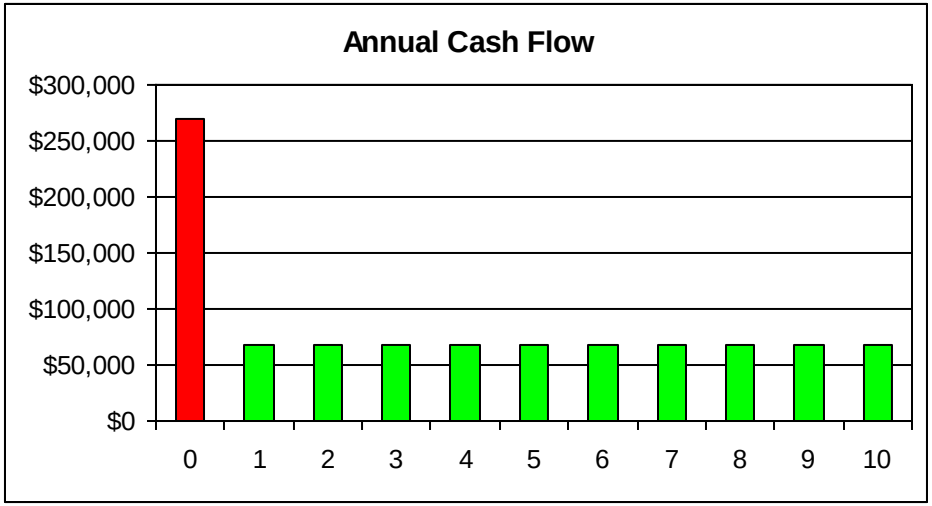
Assuming a discount and interest rate of 6% and study and loan periods of 10 years

Several economic calculators available

SEDAC's can be found here: http://www.ao.uiuc.edu/energy/Energy.cfm

Economics Example

- Install LED Lamps at KCPA Lobby
  - Installation Cost - $304,850
  - University Contribution - $268,972
  - Annual Cost Savings - $68,582
  - Simple Payback – 3.9



Economics Example

- Install LED Lamps at KCPA Lobby

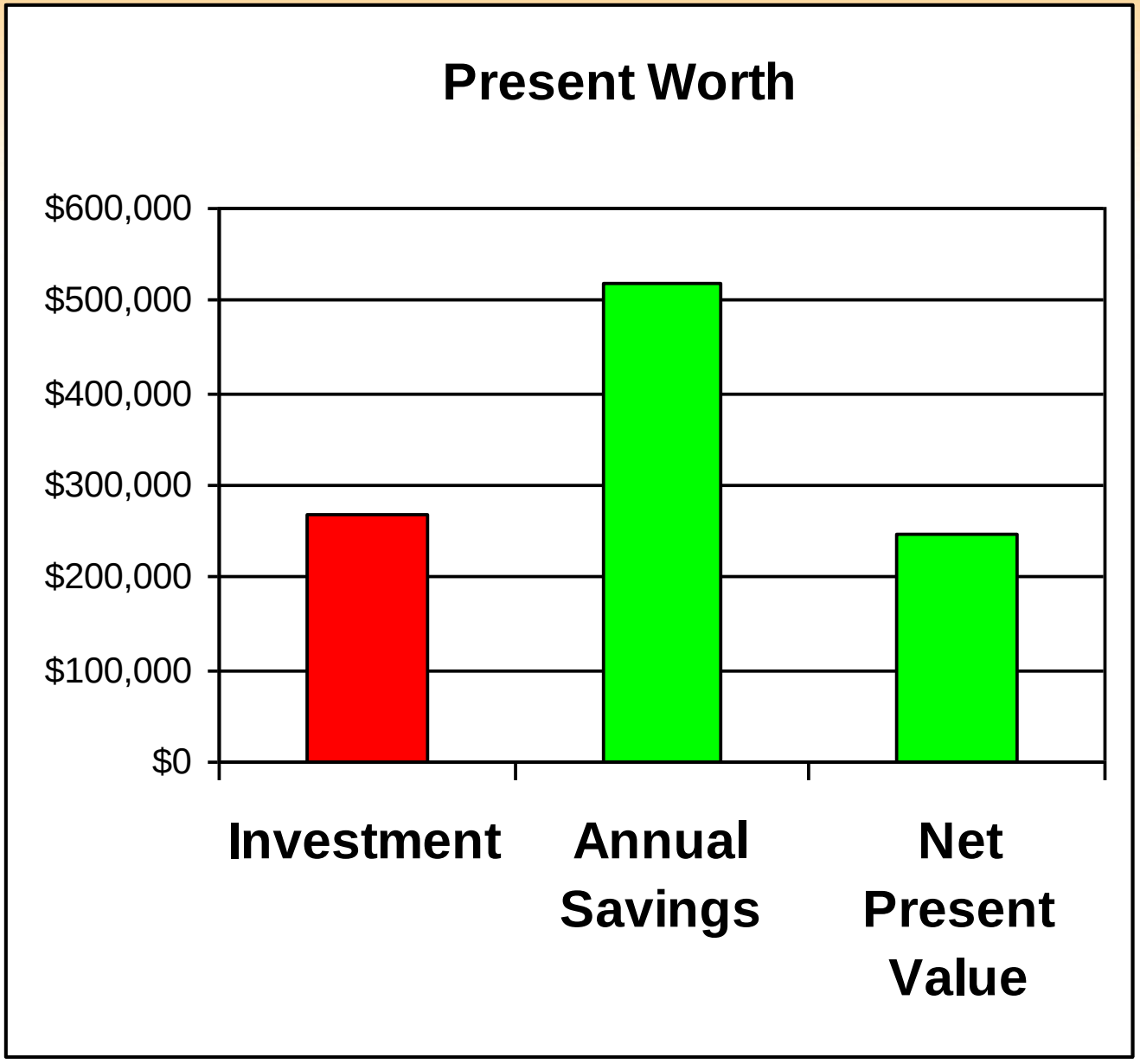
  IRR – 23%

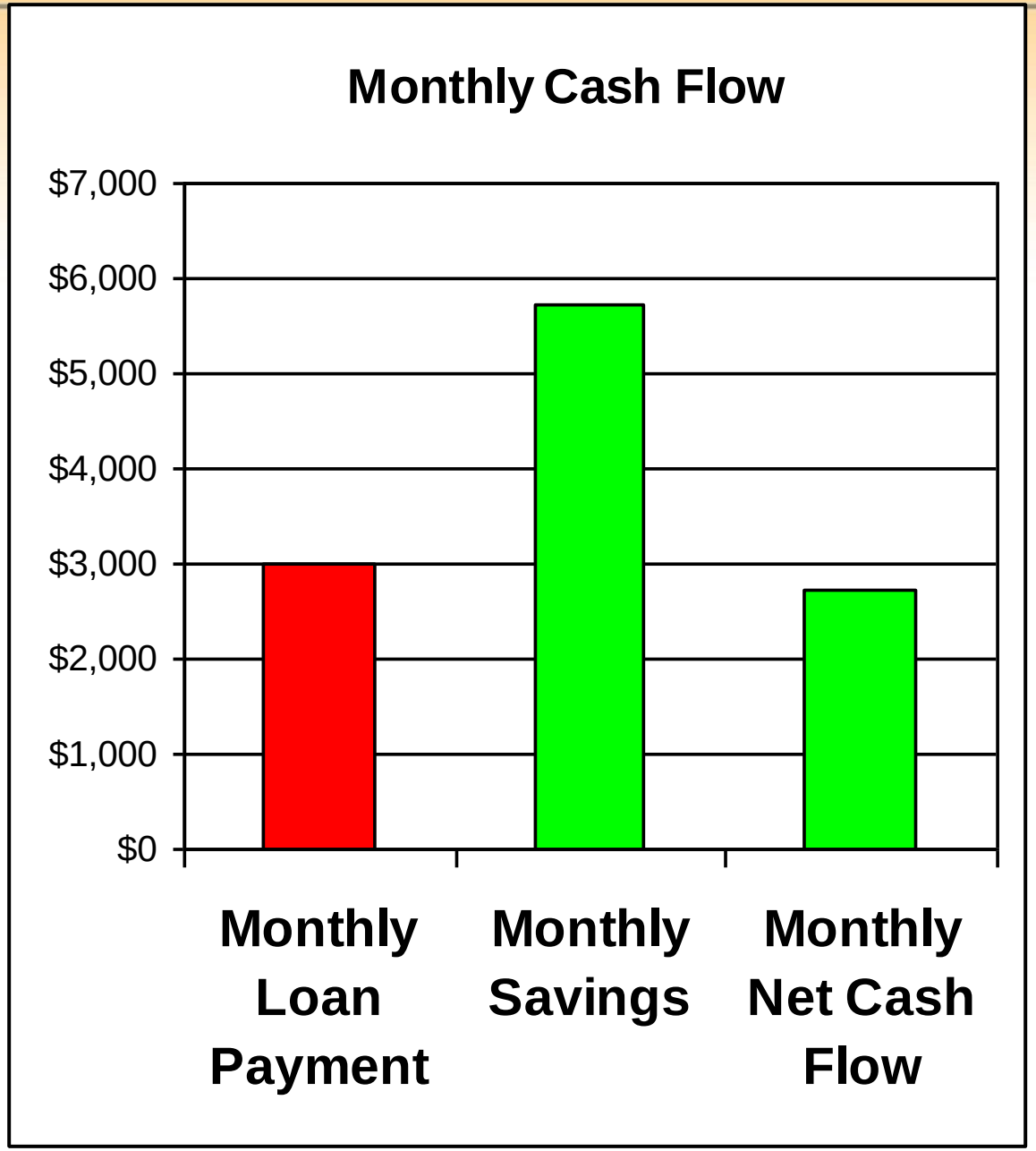
  NPV – $248,813

  Monthly savings - $5,715

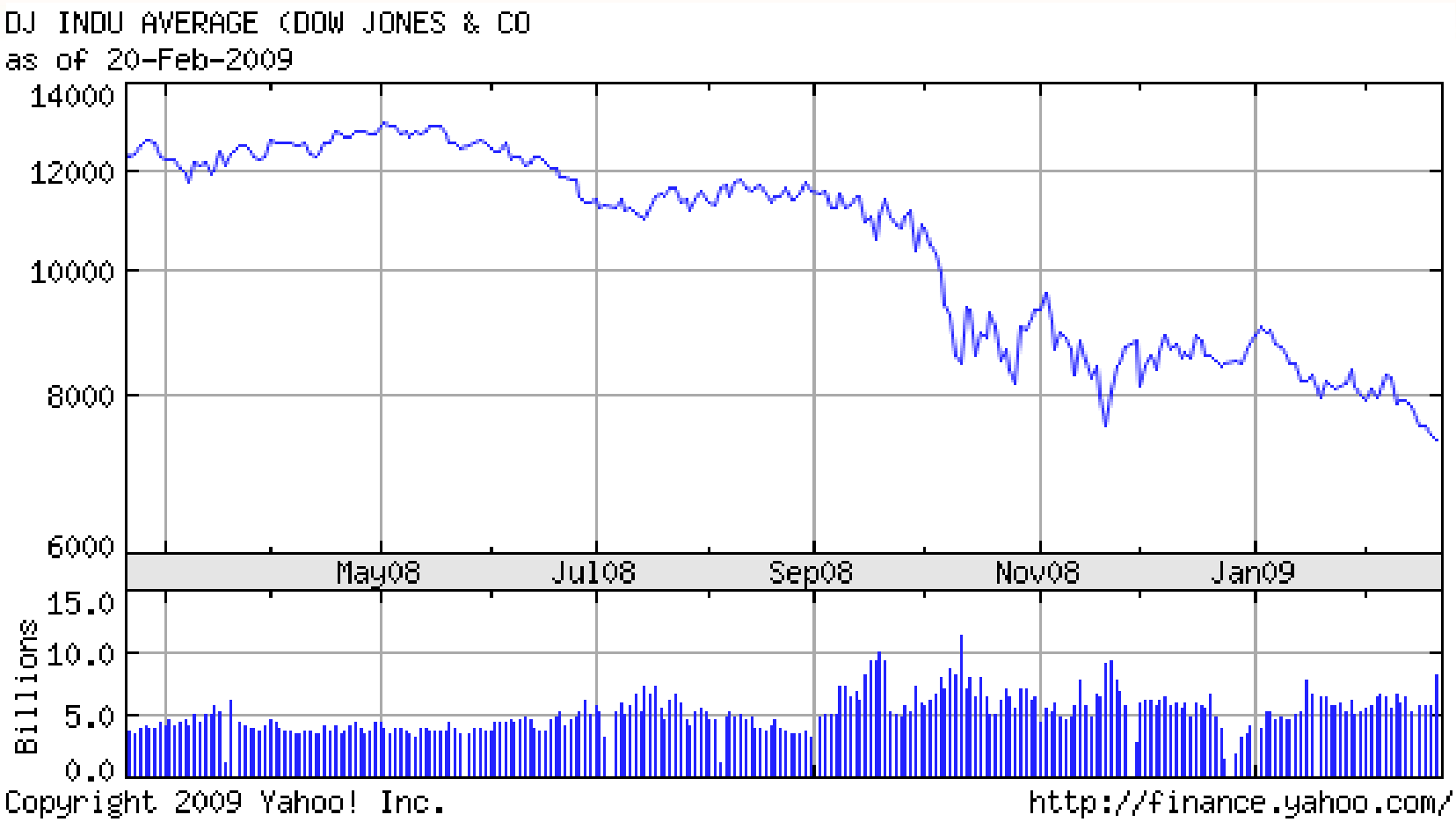
  Monthly loan payment - $2,986

  Monthly net cash flow - $2,729

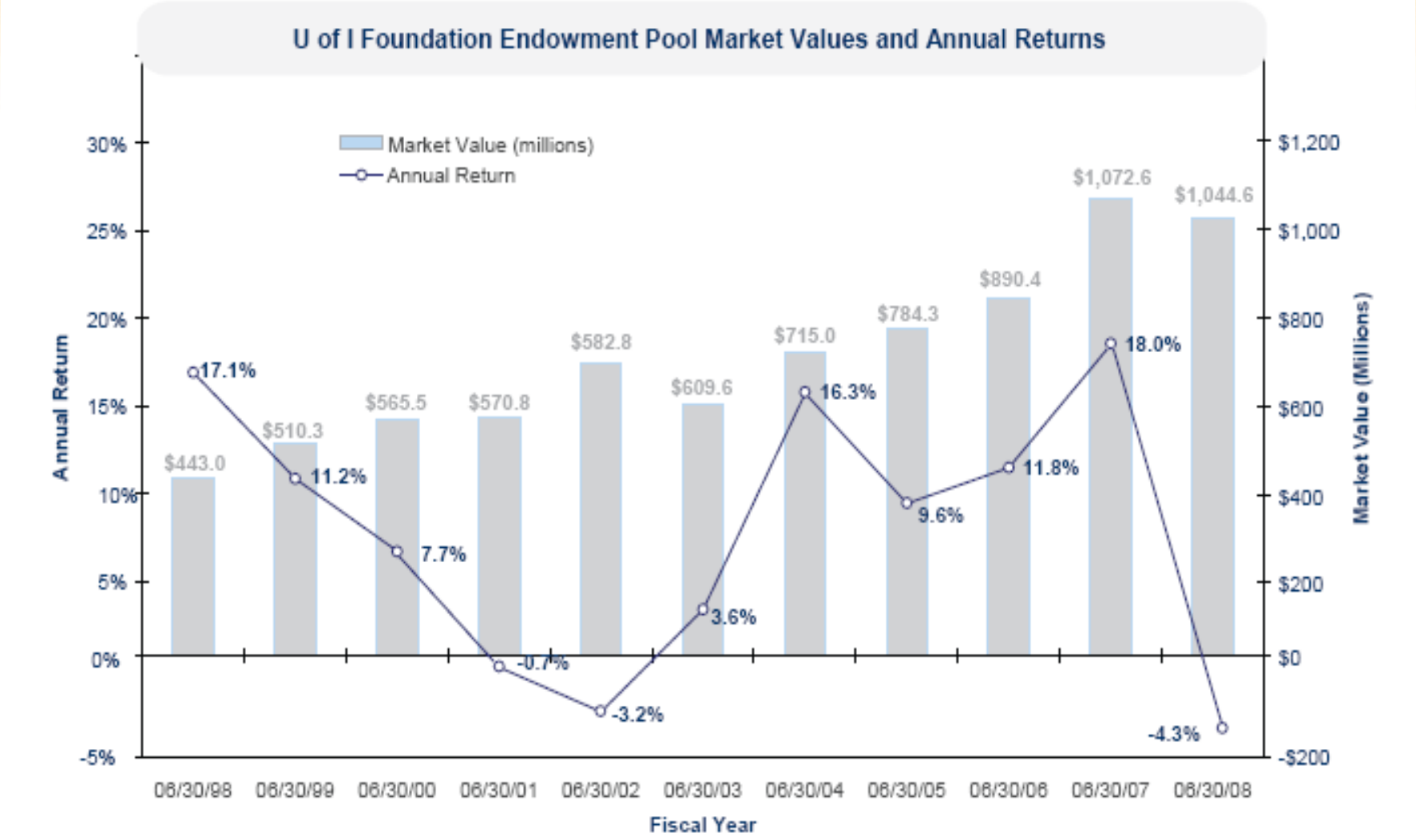

Present Worth
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$0
Investment
Annual Savings
Net Present Value


Monthly Cash Flow
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
Monthly Loan Payment
Monthly Savings
Monthly Net Cash Flow

Investment Alternatives



Investment Alternatives



Energy Conservation As An Investment

- Projects like these are all over campus
- Investing in conservation just makes sense
- Energy prices on the rise, increasing returns
- More stable than investment alternatives
- Loans can provide positive cash flow

Funding Sources

- Student Sustainability Committee
- AFMFA for Deferred Maintenance Projects
- Illinois Department of Commerce and Economic Opportunity - Public Sector Electric Efficiency Programs
- Illinois Clean Energy Community Foundation
- Departmental
- Central Campus/University
- Possibly in the future: revolving loan fund, donors

Student Sustainability Committee

- Two fees passed by students unto themselves
- $2/sem. Cleaner Energy Technologies
  - Renewable energy and energy efficiency
- $5/sem. Sustainable Campus Environment
  - Broader: includes above categories plus additional initiatives, including education, sustainable resource purchasing, green buildings, sustainable campus development

Student Sustainability Committee

- Students allocate funds via application process – once per semester
- Previously funded projects
  - PV Array and Green Roof on BIF , Occupancy Sensors, Wind turbine, Illini Union audit and retrofits, Biodiesel Initiative, WMRC Lighting Retrofit, Student Farm, Vet Med Prairie, Thin Client Computing, etc
- www.uiucsustainability.com

AFMFA

- Student fee that funds identified deferred maintenance projects
- Energy conservation projects prioritized
- Previously funded projects
  - Campuswide lighting retrofits, retro-commissioning, controls upgrades, RAL energy recovery units, etc
- http://www.fs.uiuc.edu/capitalmaintenance/

DCEO Energy Efficiency Program

- Provides energy efficiency grants for projects that reduce electricity (and chilled water)
- Fund cycle starts on June 1st
- Projects must be complete during the funding year
- Rebate – upfront capital and matching costs required
- Anticipated projects
  - Controls upgrades, exit lights
- www.illinoisenergy.org

Illinois Clean Energy Community Foundation

- Funds larger projects that reduce electricity consumption
- Programs include lighting (final year), green building, renewable energy, competitive cycles
- Previously funded projects
  - Campuswide lighting retrofits, BIF Solar Panels, BIF Efficient HVAC System, wind turbine, miscanthus boiler
- http://www.illinoiscleanenergy.org/

Future Funding Sources

- When departments pay their own energy bills, they will have an incentive to invest in energy conservation
- Will need access to capital for projects
- Revolving loan fund would address this issue
- Revolving loan fund would pay for project costs and would be reimbursed through energy savings
- Allows us to reinvest in energy conservation
- Like an internal ESCO

Other Sustainability Efforts

- Reduce bottled water consumption
  - Costs 1,000 times more than tap water!
- Separate recyclables
- Use recycled paper – 100% post-consumer
- Double-sided defaults
- Departmental bike share – Kinesiology and DURP already have programs
- Encourage bicycling, MTD, car share, walking, etc
- Encourage rail, bus, carpooling for trips

Workshop Summary

- Energy costs are rising and putting pressure on University budgets
- Although efforts are being made across campus, there needs to be a stronger commitment to energy conservation
- Energy conservation projects make economic sense
- New departmental billing system will allow units to take advantage of these investments
- We need champions among the business leaders to push for these projects and mechanisms to adequately fund them

Questions / Concerns?

Shadow Bills

Date of Bill: 12/23/2008

Period Covered: **09-01-2008** to **09-30-2008**

College: **KP - College of Engineering**

Applicable Utility Rates

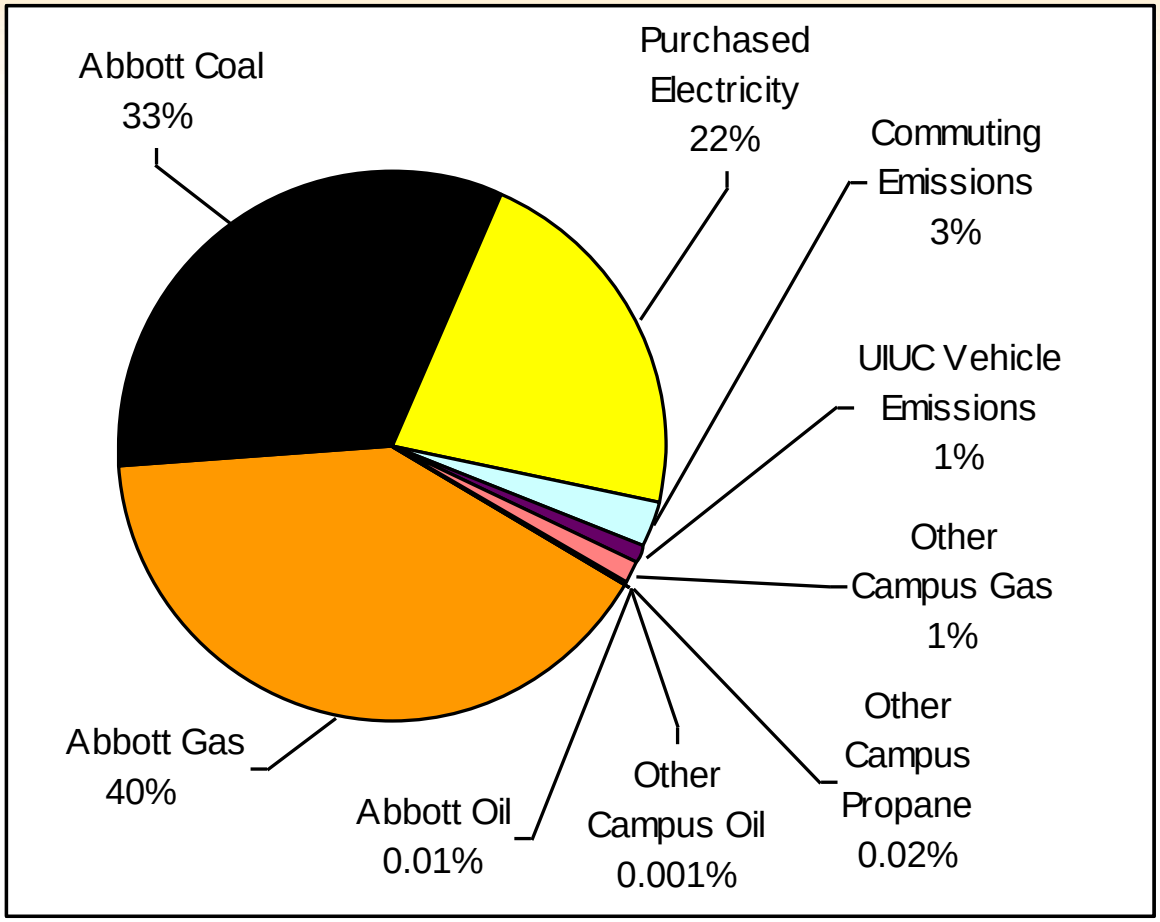
Electricity	0.074	$/kwh
Steam	18.98	$/klbs
Gas	9.50	$/MCF
Chilled Water	10.74	$/MMBTU
Potable Water	1.87	$/kgals
Sewer	1.71	$/kgals

Location Number	Location/Building Name	Percent of Building Usage Billed	Utility Usage for the Period					
			Electricity (kwh)	Steam (klbs)	Gas (MCF)	Chilled Water (MMBTU)	Potable Water (kgals)	Sewer (kgals)
0013	Talbot Laboratory	96.32 %	249,053.72	287.57	10.59	0.00	1,967.98	1,967.98
0015	Engineering Hall	92.58 %	92,224.48	673.96	0.00	830.42	36.11	36.11
0024	Newmark Civil Engineering Build	99.89 %	281,536.26	809.46	89.85	1,400.65	621.95	621.95
0029	Mechanical Engineering Laborato	99.75 %	241,591.02	608.65	0.00	3,148.18	376.71	315.91
0034	Materials Science and Eng Bldg	90.09 %	127,780.26	35.95	0.00	528.79	197.00	197.00
0037	Everitt Elec & Comp Engr Lab	89.04 %	240,610.92	1,063.48	0.00	2,019.85	49.35	49.35
0066	Seitz Materials Research Lab	99.79 %	319,203.16	1,749.35	0.00	2,505.39	2,193.09	2,193.09
0067	Loomis Laboratory of Physics	84.25 %	250,324.29	1,201.39	1.68	1,815.02	107.36	107.36
0095	Superconductivity Center	99.55 %	67,992.37	31.96	0.00	407.01	374.17	374.17
0112	Mechanical Engineering Building	87.40 %	218,676.85	595.26	0.00	780.76	1,773.75	1,773.75
0148	Coordinated Science Laboratory	100.00 %	390,839.00	958.00	0.00	2,096.00	46.00	46.00
0174	Engineering Sciences Building	99.10 %	190,168.20	1,074.74	0.00	1,776.71	1,834.06	1,834.06
0210	Digital Computer Laboratory	50.25 %	254,309.07	895.31	0.00	1,229.13	85.11	85.11
0237	Micro and Nanotechnology Labor	99.26 %	644,268.80	2,112.00	0.00	4,027.95	1,935.60	1,935.60
0563	Siebel Center for Computer Scier	88.29 %	483,914.42	1,967.97	0.00	3,693.15	152.74	152.74
	Usage Totals		4,052,492.82	14,065.05	102.12	26,259.01	11,750.98	11,690.18
	Utility Charges this Period		$299,884.49	$266,954.64	$970.15	$282,021.76	$21,974.33	$19,990.22

Total Utility Charges: $ 891,795.59

Distribute to Organization Executive Officer: Ilesanmi Adesida (iadesida@illinois.edu)

Urbana Campus Carbon Footprint, FY08



Total carbon equivalent emissions: 505,272 metric tons
Vast majority in Abbott and Purchased Electricity

12 Highest Energy Consumers, FY08

• Roger Adams Lab	126,441 MMBtu
• Advanced Computation	126,321
• Beckman Institute	109,224
• Vet Med/Basic Science	107,520
• Veterinary Tch'g Hosp.	107,360
• Micro/Nano-electronics	105,541
• Institute for Genomic Biology	98,803
• Siebel Ctr for Comp.Sci.	91,974
• Chem/Life Sciences	84,128
• Madigan Laboratory	83,228
• Digital Computer Lab	70,370
• Illini Union	68,684

30% of campus consumption