ACHIEVING 25% ENERGY REDUCTION

– URBANA CAMPUS -

DISCUSSION

May 21, 2008

Today:

1. **Conservation progress to date**
2. **Initiatives for FY09 and beyond**
   - 10% reduction in 3 yrs
   - 20%+ reduction in 6 to 10 yrs
3. **Special Need Areas**

Reduced energy use nets huge benefits…

Each 1% reduction is worth $500,000+ and 5,200 tons of annual carbon emissions

8.2% energy reduction returns CO2 emissions to 2000 levels

19.7% energy reduction returns emissions to 1990 levels

PROGRESS TO DATE …

- ✓ Developed a campus Energy Use Policy
- ✓ Installed new steam and/or chilled water meters in 80+ buildings (80/90%)
- ✓ Developed detailed energy statements for colleges and admin units showing their utility usage in the “Big Eighty”
- ✓ Implemented a retro-commissioning program
- ✓ Begun a major lighting retrofit/upgrade program
- ✓ Implemented comprehensive steam trap maintenance program

MORE …

- ✓ Prepared documentation for mechanical/electrical systems in the “Big Eighty”
- ✓ Adopted LEED standards for all major construction
- ✓ Approved wind generator for the South Farms
- ✓ Developed RFP for Performance Contracting
- ✓ USEPA “Energy Star” partner
- ✓ Joined the Presidents’ Climate Commitment

The ten year plan, in simplest form …

- Improve systems
- Control growth
- Create incentives
- Remove barriers
- Facilitate behavioral change
- Stimulate investment

Energy Program must address three key areas:

I Building/System Modifications & Upgrades

II Campus Culture shift

- Information and Awareness
- Incentives
- Policy changes

III Improved Communication/Coordination

e.g. Generation vs Consumption

GOAL # 1: Reduce energy consumption from FY07 levels by 10% over the next 3 years

- **Retro-commissioning (3%)**
- **Operational Measures (1 to 3%)**
  - night shutdown/turndown
  - modified temperature settings (summer vs winter)
  - reduced outside air during unoccupied hours
- **Lighting Retrofits/Upgrades (2%)**
- **ESCO projects (2 to 6%)**
- **Campus behavior (1%)**

GOAL #2: Reduce energy consumption from FY11 levels by 15% over 2 to 6 yrs

- Continued retro-commissioning (2 to 4%)
- Increased use of ESCOs (3 to 7%)
- Aggressive HVAC system replacements (1 to 3%) (via Def. Maintenance reduction)
- Increased savings from culture shift and resultant behavioral benefits (2 to 4%)

Qualifiers:

1. Savings are exclusive of campus growth during the ten year period
2. Savings based on energy saved; i.e. irrespective of future fuel price increases
3. Reductions in building consumption can be negated, or compounded, by actions at Abbott
4. Incentives, both financial and political, are necessary to get the campus fully on board

Areas in need of attention and/or incentives …

Campus IT community

- Broad resistance to shutting down PCs

"Energy conservation is YOUR job. Mine is to assure PCs and systems function 24/7/365."

- campus IT administrator

- Server rooms:

  - have proliferated … now a major impediment to night shutdown
  - can be combined and/or concentrated

Attention … Incentives …

- Server Rooms (contin.)
  - Newest servers can use as little as 1/10 the energy of the machines they replace
  - absent incentives, many IT administrators will buy the lowest cost replacement, regardless of energy use (*old habits die hard*)

EXAMPLE:

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**

Attention … Incentives …

Equipment Purchases

- **Millions of $$ of replacement equipment is purchased annually with first cost the only consideration**

Example:	*Cost*	*Electricity*
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

Attention … Incentives …

Equipment Purchases (contin.)

- **Number of purchasers and equipment types too large to legislate the buy decisions or provide effective oversight.**

Incentives likely the only solution

DISCUSSION

Next Steps - A Prescriptive Diet for UIUC Sustainability

Strategy #1

Adopt management protocols that foster the renovation/updating of existing space and inhibit the addition of new.

Strategy #2

Adopt a total-cost-of-ownership approach to campus planning/development. View first costs in full context of lifetime and recurring costs.

Next Steps …

Strategy #3

Fully engage all campus citizens in reducing energy consumption. Develop a sustained information campaign regarding campus energy use, cost, and conservation progress.

Strategy #4

Implement an incentive-based budgeting structure to spur college and department commitment and investment in improved energy efficiency

Strategy #5

Transform the campus culture to one that views wasting energy as politically incorrect

A Prescriptive Diet … .

Strategy #6

Through advanced coal technologies and carbon reduction strategies, exploit the advantages of Illinois coal at Abbott Power Plant

Strategy #7

Integrate building/system reinvestment to accommodate multiple drivers … capital renewal, energy reduction, and programmatic upgrade

Strategy #8

Assure that supply and demand sides of campus energy system(s) are *operationally* linked, despite organizational separation

Is it feasible to achieve 1990 carbon emissions at UIUC?

APPROACH A (no conservation)

Reduce CO_2 emissions to 1990 levels by reducing coal burn and increasing natural gas.

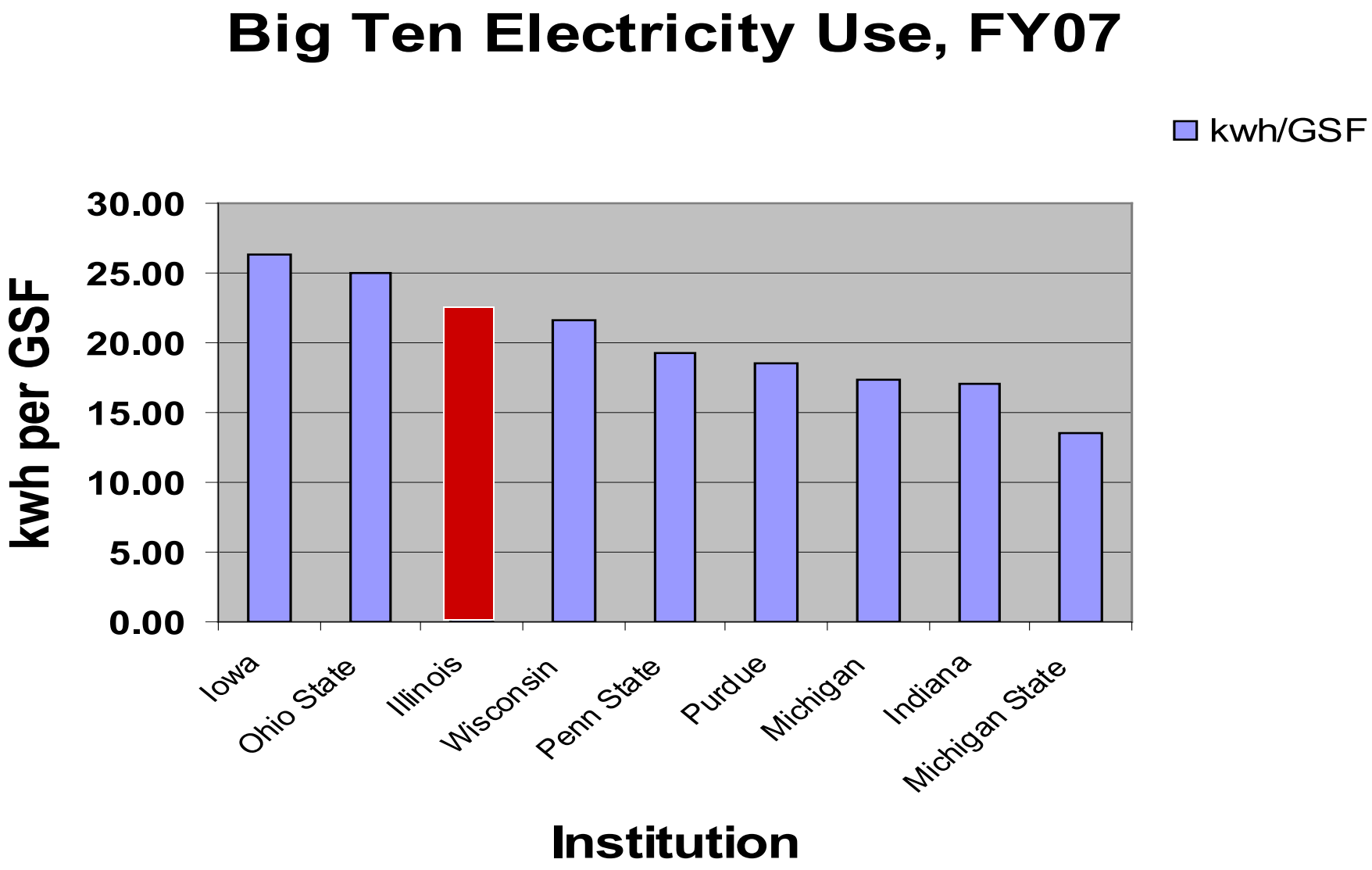
NET COST = + $16,000,000 /yr

APPROACH B (w/Conservation):

First reduce energy use 10%, then shift to nat.gas as required to match 1990 CO_2 emissions:

Conservation savings	- $7,000,000 /yr
Increased nat. gas burn	+$7,700,000/yr
NET COST	+$ 700,000 /yr

HOW OBESE?


Big Ten Electricity Use, FY07
kwh/GSF
kwh per GSF
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Iowa
Ohio State
Illinois
Wisconsin
Penn State
Purdue
Michigan
Indiana
Michigan State
Institution

BIG TEN ELECTRICITY USE, FY2005

(kilowatt-hours per gross square foot)

	kwh/GSF
Iowa	26.3
Ohio state	25.0
Illinois	22.1
Wisconsin	21.6
Penn State	19.3
Purdue	18.6
Michigan	17.4
Indiana	17.0
Mich. State	13.6

Mean, excluding UIUC = 19.9

Urbana Campus Carbon Footprint, FY07

Abbott PP, nat. gas	*198,341 tons*	***37.5 %***
Abbott PP, coal	*204,126 tons*	***38.6 %***
Abbott PP, oil	*118 tons*	***0.0 %***
Other campus burn	*10,472 tons*	***2.0 %***
Purchased Electricity	*96,635 tons*	***18.3 %***
	Stationary sources	***96.4 %***
All UIUC vehicle emissions	*5,319 tons*	***1.0%***
Employee Commuting	*14,015 tons*	***2.6%***
Annual Air Travel	*na*	*?*
TOTAL	***529,027 tons***	