



Energy Efficiency and Conservation on Campus: Opportunities and Barriers

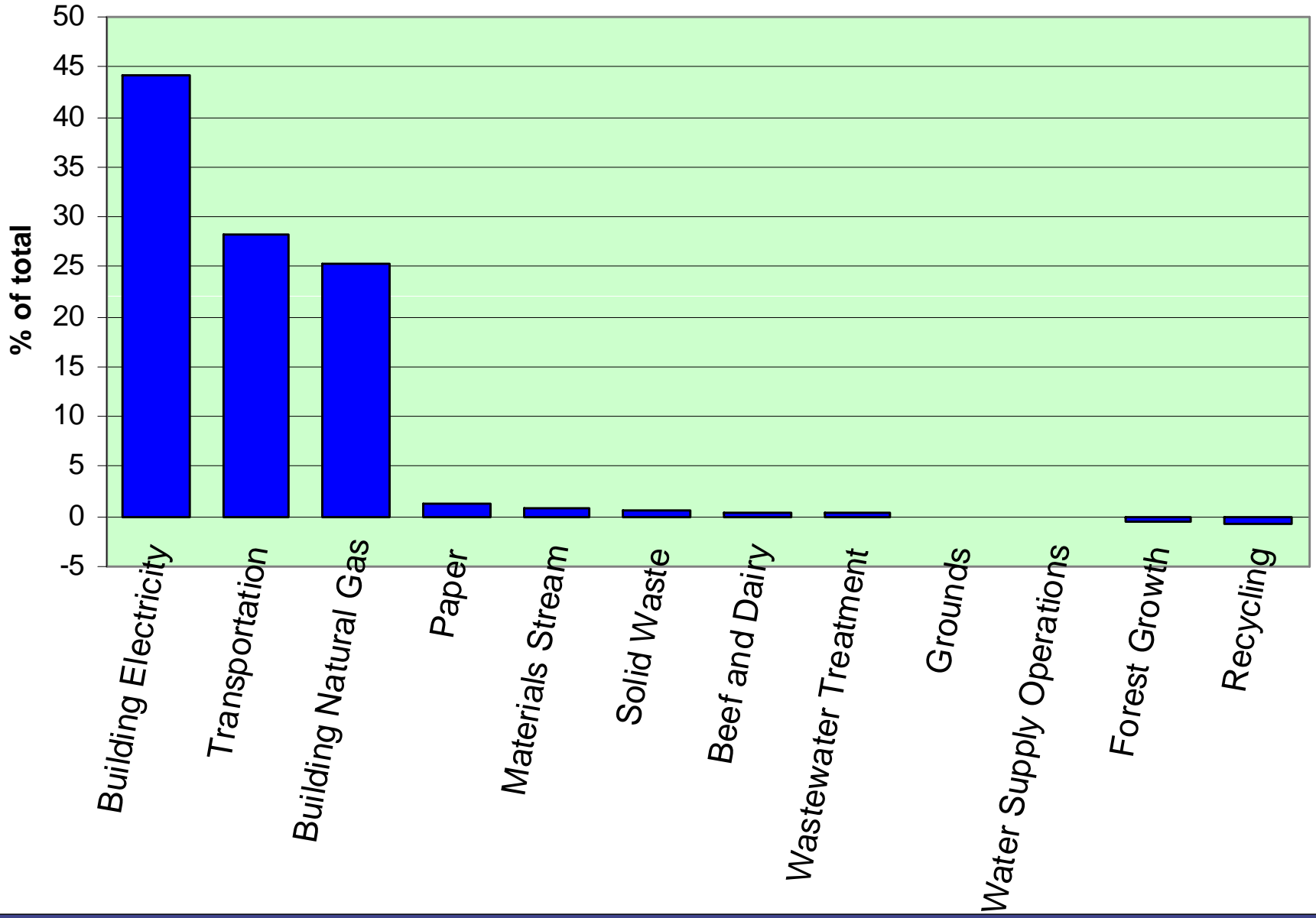
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UNC Asheville

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Climate footprint

- Electricity
 - Natural gas
 - Transportation
 - Materials
 - Food
 - Water
 - Land use
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UNCA: Distribution of GHG emissions by sector



Grapes or Watermelons?



Why are some so far along?

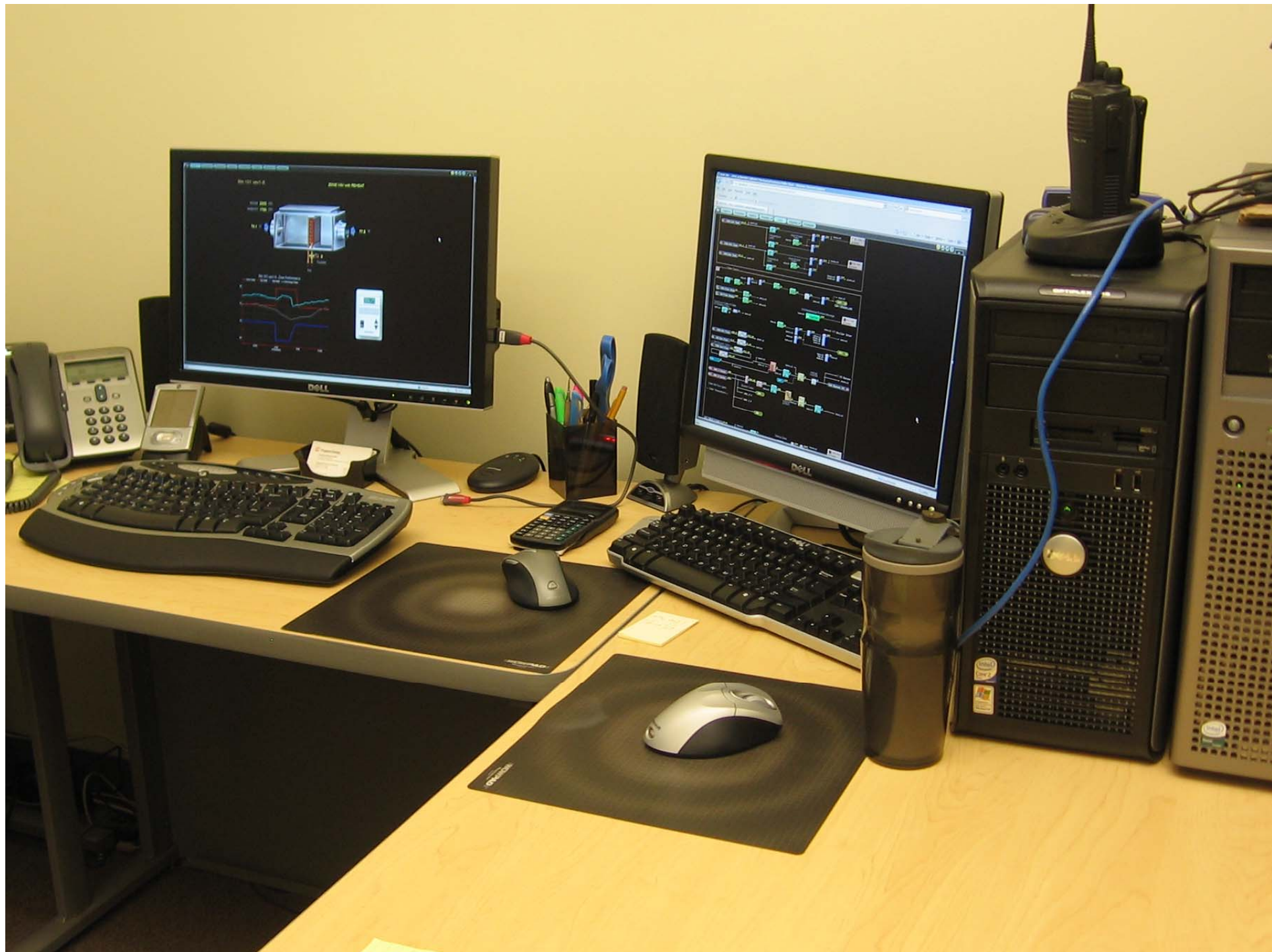
- Facilities Management – national trend
 - Students – national trend
 - Faculty – national trend
 - Administration - varies
 - “Science advances one funeral at a time”
-

Why are some so far along?


- Individuals
 - Flexibility
-

Opportunities

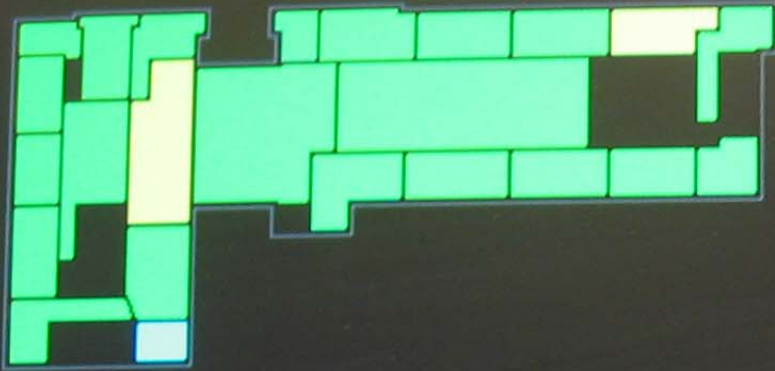
- Energy management systems
 - Minimize number of energy program systems
 - “You have to RUN IT.”
 - Energy manager must see bills – not just Btu/therms/kWh
 - More homegrown...?
-



New Hall

 57.2 °F
61.5 %rh

To: U.N.C.A
Diagrams
Geothermal Plant



Level Three Floor Plan



Level One Floor Plan



Level Two Floor Plan

To: Mechanical Room
Communications Riser

58.1F
62. %

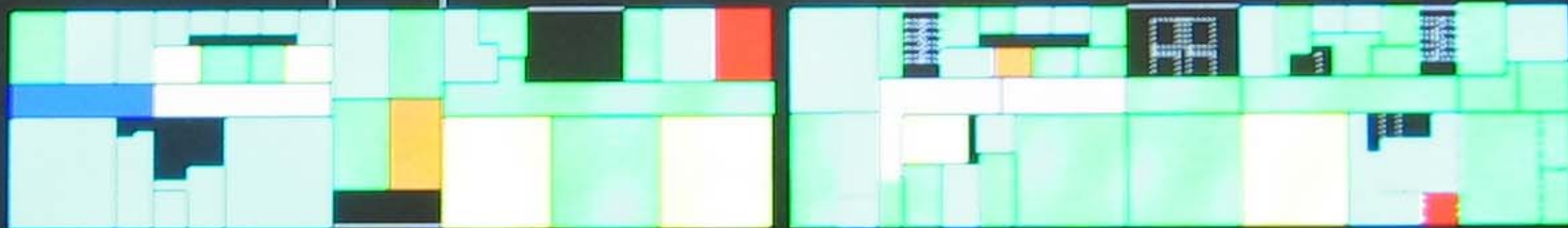
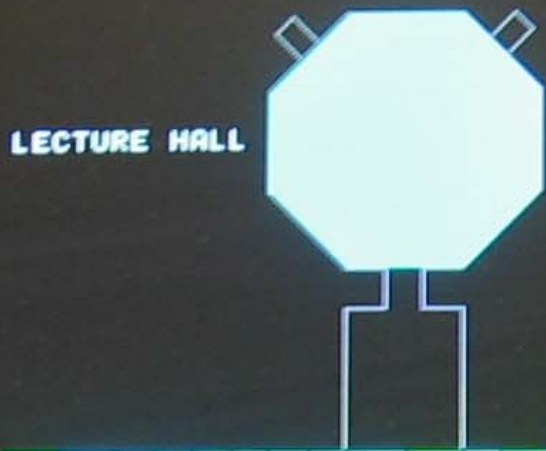
OUTSIDE AIR AHU

Number of Heating Requests: 14
Number of Cooling Requests: 4

System is in Chiller Mode? NO
Chilled Water Available? NO

System is in Boiler Mode? YES
Hot Water Available? YES

System is in Transition Mode? NO
(FCU/UV fans locked out) for: 0 :00 mm:ss

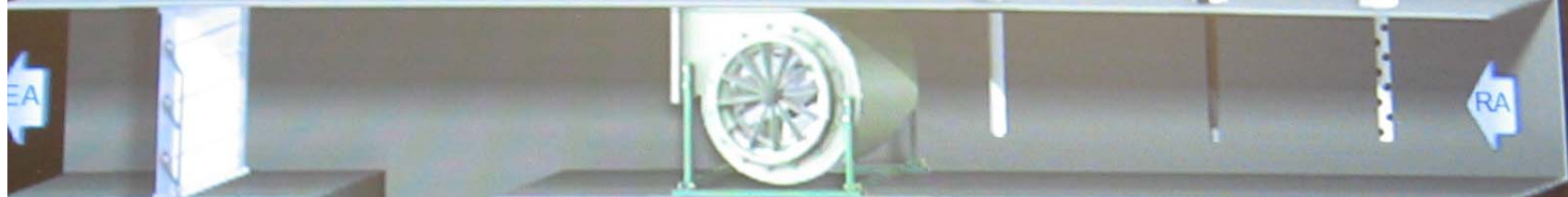


First Floor

Second Floor



CO2 470 ppm 72.4 °F 45 %rh

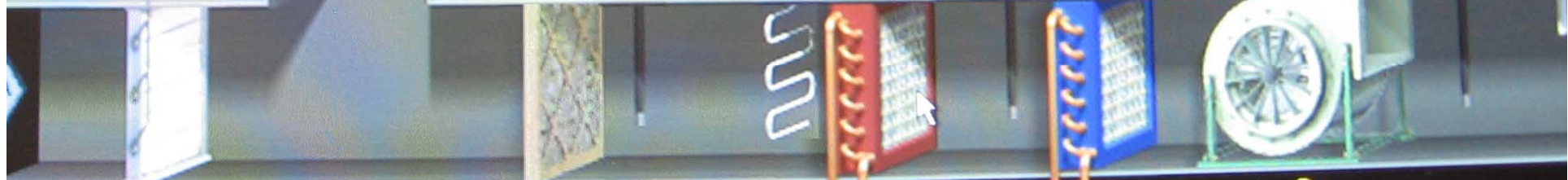


0 %open
100 %open
0 %open

s/s On
status Off
vfd 42 Hz

72.5 °F freezeostat Normal 73.0 °F

SA 73.9 °F Sm
setpt 55.0 °F No



Dirty

0 %open hw
0 %open chw
s/s On
status On
vfd 60 Hz

Hidden savings

- Fewer mechanics
 - Trouble shooting
 - Time to solution
-



Performance Contracting

- Types of projects
 - Ease
 - Payback
 - Missed opportunities (as targets?)
-

Target - “Once in a lifetime projects”

Projects that should happen but PC wont address etc.

- Longer payback
 - Possibly more complex
 - Possibly larger projects
 - e.g., chiller loop, solar thermal pool heating, PV
-



Even if I were certain
that the world would
end tomorrow, I
would plant a tree
this very day.

Martin Luther King, Jr.



Deferred Maintenance and PC

- ... is not politically compelling
 - May be a barrier to further EE&C
 - Allocate % of each project for this?
 - Create reward for more investment in EE?
-

Lack of Incentive for EE&C

- Ability to retain some % of cost savings
 - Legislative barriers to small schools
 - Not institutional priority
 - Money “does not flow”
-

Perception of State Energy Office

- Should exist
- Great technical capacity and content
- Administratively, major barrier
 - Funds do not flow through well - red tape - significant missed opportunities
 - Client focus/coordination problems in this area only

“Receipt Funded” Buildings

Dorms, dining halls, student unions

- Not eligible for PC
 - Much low hanging fruit
 - Will not benefit state budget
-

Other Barriers

- “Value engineering”
 - Institutional culture
 - Loss of flexibility
(e.g., VCF now approve – more red tape)
 - Institutional inertia
 - Fear of criticism – lack of tolerance for “worse before better” (poss can’t learn)
-

Opportunities

- Target projects that increase institutional capacity – mgt systems, energy mngr
 - Target projects that change inst culture
 - Increase tolerance for “worse before better”
 - Somehow consider externalities
-

Opportunities, cont.

- Reward success – system president, chancellor, fac mgt etc.
 - Reduce fear of punishment
 - Reduce internal and external red tape
-

Opportunities, cont.

- Transportation
 - Energy audit
 - Embed “continuous improvement” goal - inst and culture
-

Opportunities, cont.

- Vendor contracts
 - Purchasing
 - Dorms – fridge etc., vampire load, green games
 - Freshman orientation – student culture
-



THOSE WHO HAVE BEEN
REQUIRED TO MEMORIZE
THE WORLD AS IT IS
WILL NEVER CREATE
THE WORLD
AS IT MIGHT BE.

Curricular Innovation


- Engineering
 - Business Management
 - Economics
 - Religious studies
 - Gen Ed core
-

Cultivating an attitudes of social responsibility and engagement are cornerstones of our education... and...



...must be combined with knowledge and skills for alumni to effectively engage to solve the environmental problems of this century





The finest candle makers could neither
have conceived of nor developed
electric lights.

- Alan Savory



Projects

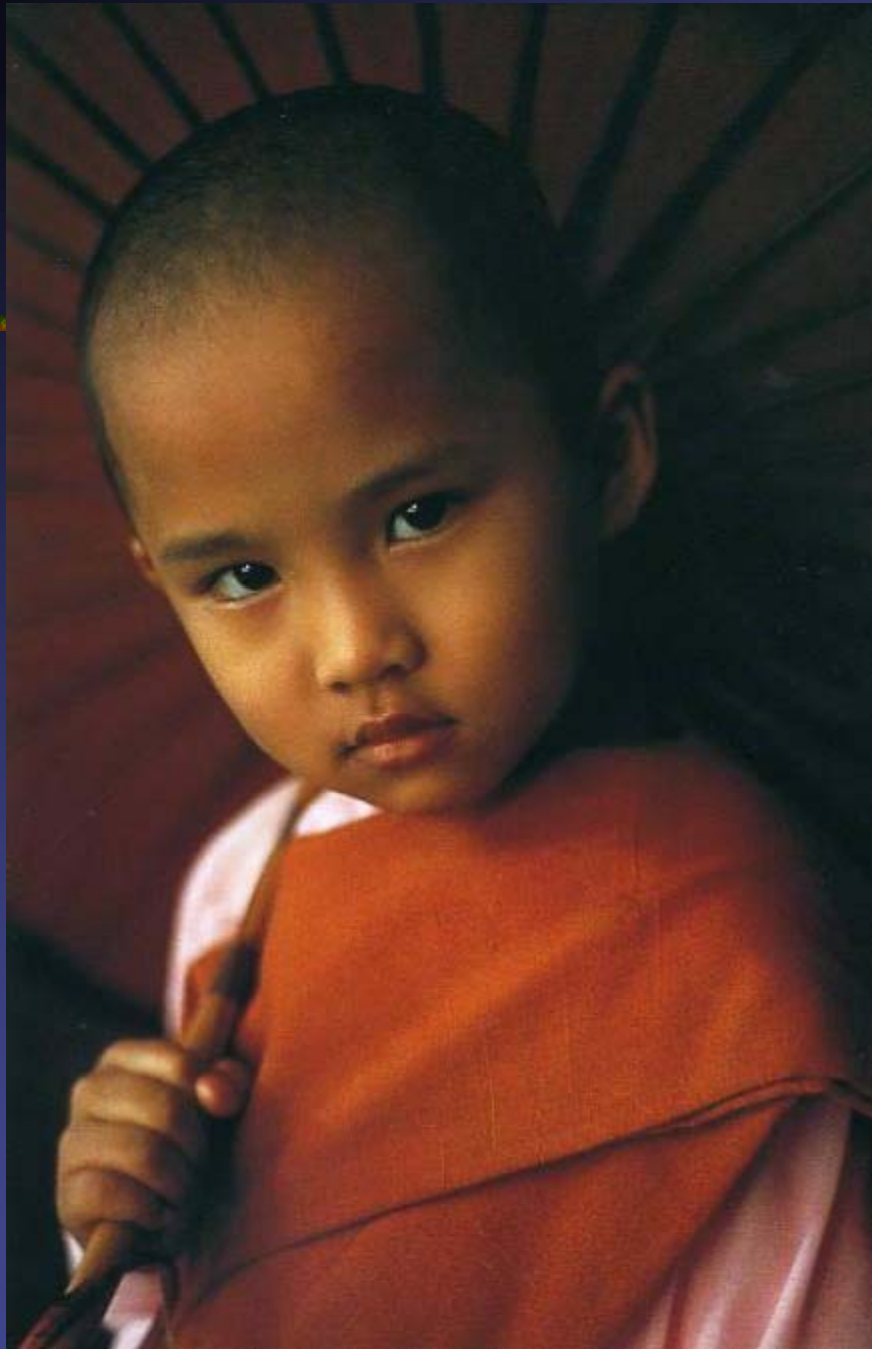
- Lighting
 - Occupancy sensors
 - Chillers
 - Boilers
 - Window film
 - Insulation
 - ***Individual metering on all buildings
-

Campus of the future

- Comprehensive Master Planning to optimize sustainability
 - Robust energy procurement, monitoring and data collection programs
 - Sustainable design/LEED buildings
-

Campus of the future, cont.

- Reduction in energy use through retro-commissioning and operational optimization
 - Enhanced energy and environmental awareness for students, staff and faculty
 - Environmental literacy and sustainability as core requirements
-



Unless somebody leads,
nobody will. Why not us?

*-Ray Anderson,
Interface Carpet*