

SC3-Your Green School: Ideas for Getting Started



Presentation

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Green Schools Checklist

STEP 1: Make a Commitment to Sustainability

- ✓ Be inclusive, involve your School Board, Head or Principal, Business & Facilities Officers, Faculty, Parents and Others
- ✓ Urge your school to sign The Green Schools Climate Commitment

STEP 2: Get Started—Using the Green Schools Toolkit

- ✓ Organize a school-wide sustainability task force or committee
- ✓ Benchmark your School with EPA Portfolio Manager & enter your energy consumption data for 1 yr (www.energystar.gov/istar/pmpam)
- ✓ Conduct a Green Audit

STEP 3: Take Action

- ✓ Short term: Initiate two or more green projects
- ✓ Long term: Create a Comprehensive Greens Schools Action Plan

STEP 4: Share Information

Why do Green Schools Matter?



~2 million Acres Developed Each Year



Water Use: >80% Potable Water

@ argus



Energy Use & Atmospheric Emissions

Buildings use:

- 70% U.S. electricity
- ~50% U.S. energy
- 41% operations
- 2-3% industrial buildings
- 7-8% embodied energy
- ~ 40% GHGs
- 2x Cars & light trucks



40-50% of all materials and wood use



35-40% of Municipal Solid Waste



People Spend Up to 90% of Their Time Indoors





But wait, there's more!

Buildings Generate:

- More than 39% of total CO2 emissions
- 46% of sulfur dioxide emissions
- 19% of nitrogen oxide emissions
- 10% of fine particulates

Note: Sulfur Dioxide and Nitrogen Oxide are pollutants from incomplete combustion of fossil fuels

ENERGY: Conservation & Efficiency

Pick the Low-Hanging Fruit First!

- Your first, and best, effort should always be to reduce what you're already using.
- Work your way from the simplest items to the most complex:
 - Do simple things before you tackle the complex, like solar photovoltaics or biomass energy plants!
 - Conservation returns the most energy savings for the lowest dollar invested.

The Path to Sustainable Energy



Misc. / Other
Geothermal

Conservation/Efficiency

Solar
Wind
Biomass

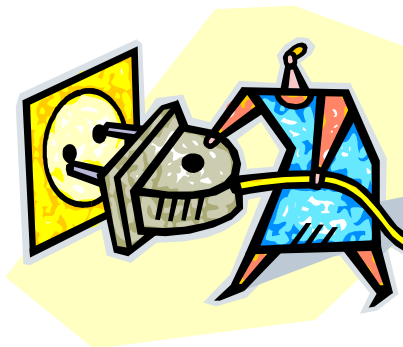


Total Sustainable Energy Opportunity

“Site” Energy vs. “Source” or “Primary” Energy



1 kWh = 3,412 Btu
At Light bulb (Site)



Transmission
losses = 5 – 7%

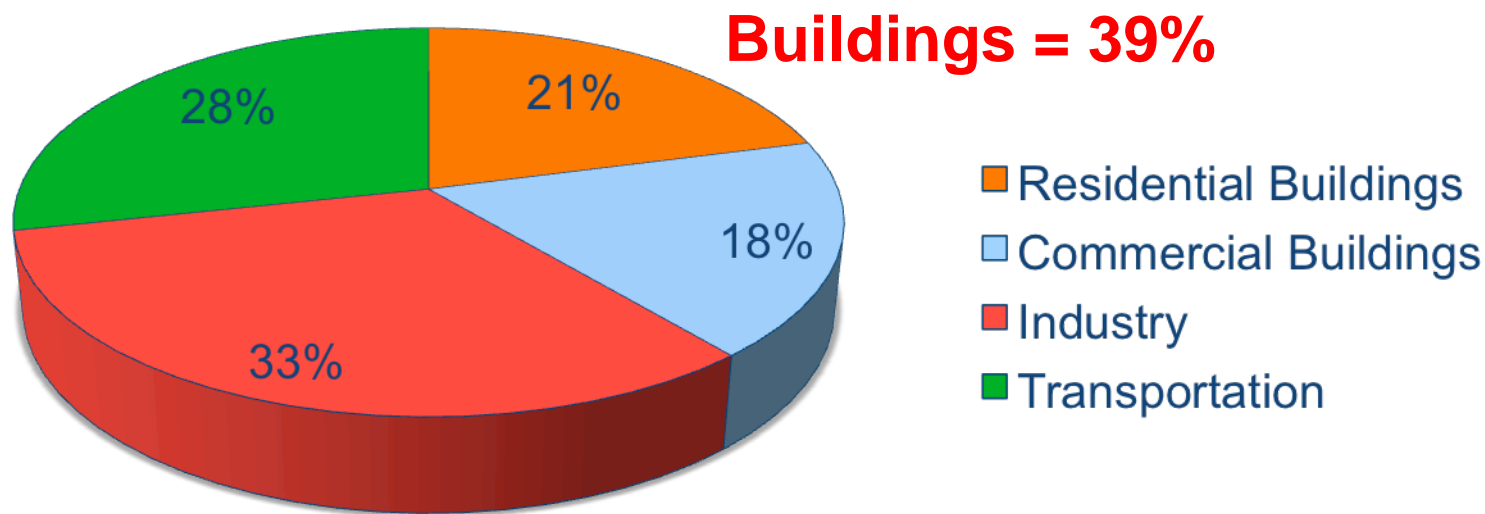


Power Plant losses = 60-66%

1 kWh = 9,919 Btu
At Power Plant (Source)

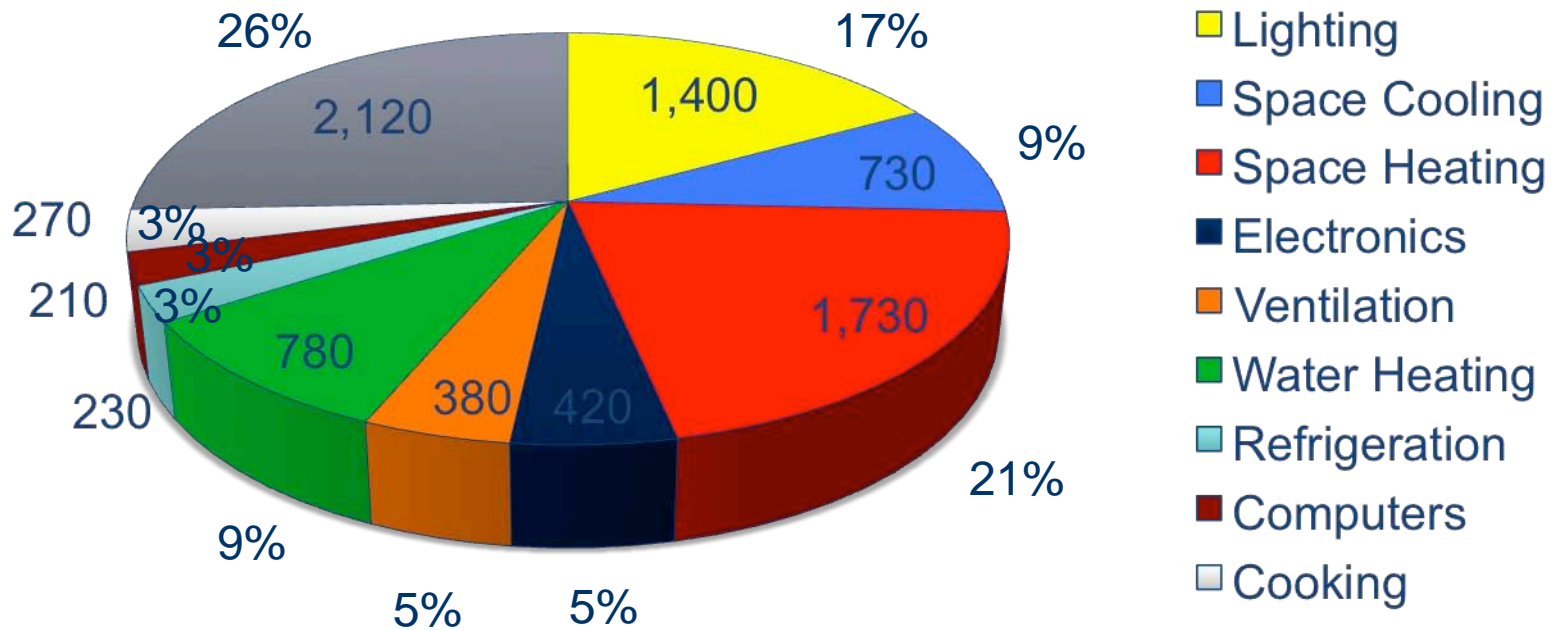
Overall U.S. Energy Use

2006 Primary Energy Use



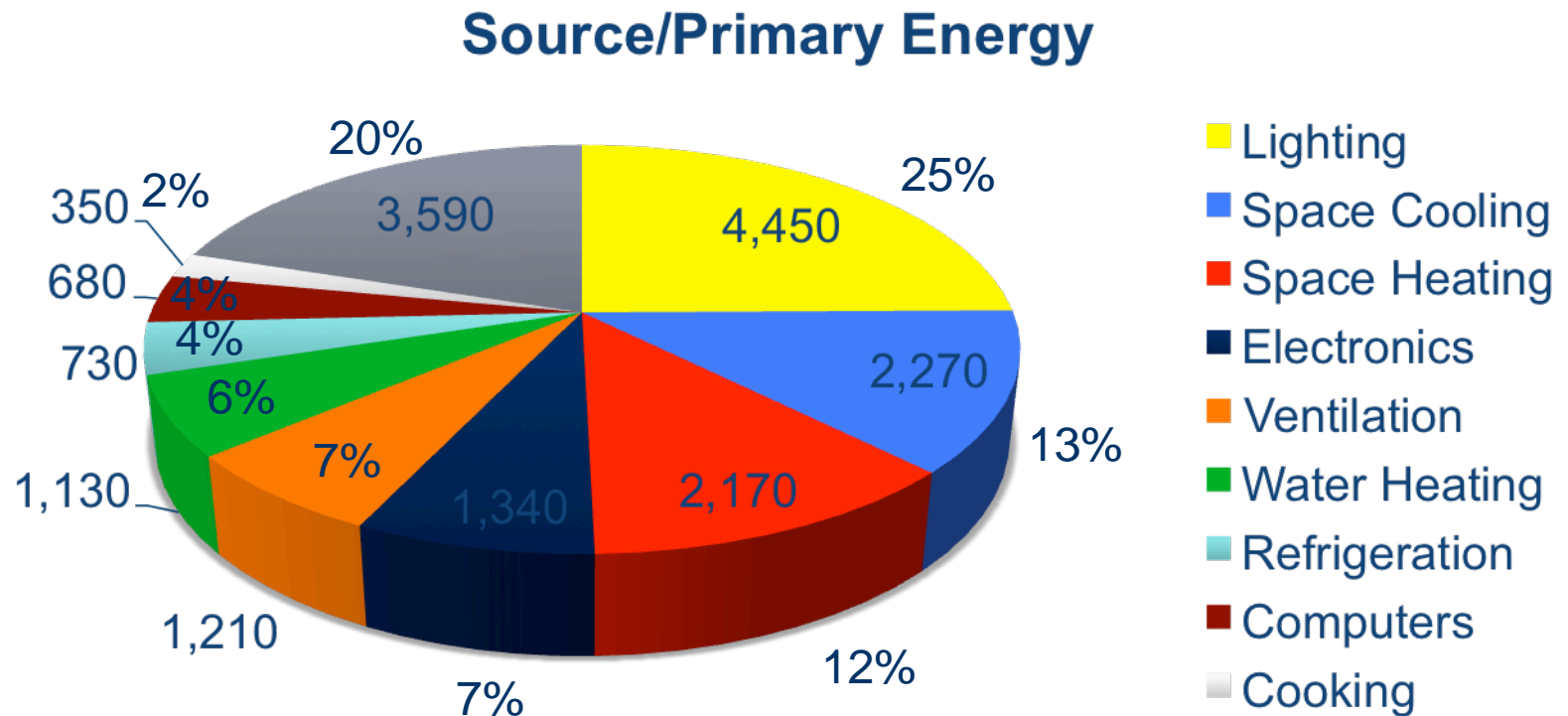
The “Little” Building Energy Picture

Site Energy (Trillion Btu)



2006 Site Energy Use U.S. Commercial Buildings
 U.S. DOE Building Energy Databook, March 2009

The “Big” Building Energy Picture



2006 “Source” or “Primary” Energy Use U.S. Commercial Buildings
 U.S. DOE Building Energy Databook March 2009

LIGHTS-What if we just turned them off?

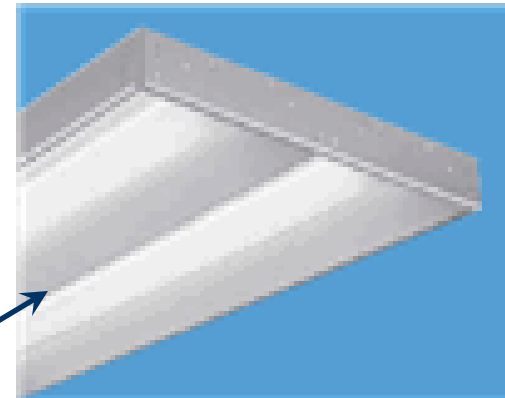
- The cleanest kilowatt-hour is the one not consumed.
- Look around your campus
 - Are there big windows that extend from floor to ceiling or almost that big?
 - Do you think you could turn the lights all the way off and still have plenty of light to perform the task at hand?
 - Have you ever tried it?



Common Fluorescent Lighting



Types of Compact Fluorescent (CFL)



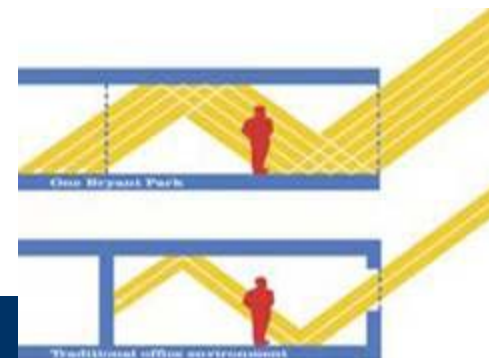
T5 Lamp



Larger Fluorescent Fixtures



Lighting Inventory



- ✓ What type?
 - ✓ Are the fixtures and bulbs old, inefficient and providing poor light?
 - ✓ Are the bulbs T5 or T8 or Compact fluorescent?
 - ✓ If fluorescent is the ballast high efficiency electronic ballast?
 - ✓ Are they LED?
- ✓ How are they controlled?
 - ✓ Are they all on toggle-switches by the entrance door?
 - ✓ Could they be on occupancy sensors?
 - ✓ Could they be on daylight AND occupancy sensors?
 - ✓ Could they be on daylight AND occupancy sensors AND timers?
 - ✓ Is there a placard around the switch emphasizing energy conservation and asking if you would please turn this light off when leaving the space?



Other things to do?



Putting It All Together



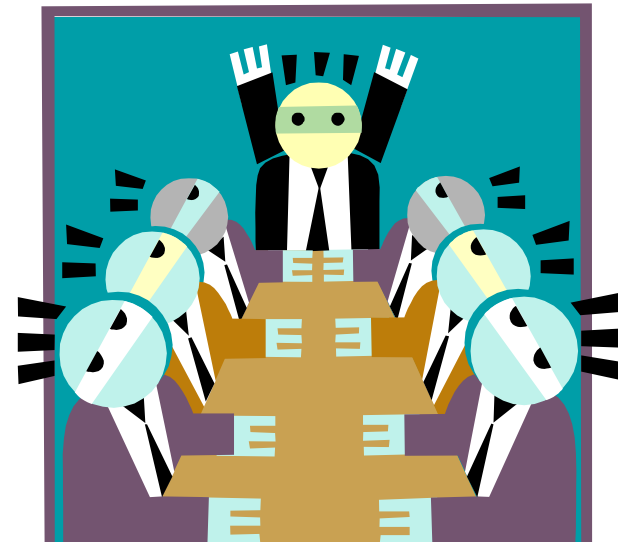
STEP 1: The Power of ONE

“Does what I do really matter?”



Make the Commitment

- How Committed is your School or District?
 - Has your school signed the Green Schools Climate Commitment?
 - Is there an Energy Director and Energy Team at your school?
 - Is there a Sustainability Committee or Task Force?
 - Is there a Sustainability Mission Statement?
 - Is your Physical Plant Dept. engaged and excited about Sustainability?
 - Is there a green purchasing policy at your school?
- How Committed are YOU?
 - <http://www.energystar.gov/index.cfm?fuseaction=globalwarming.showPledgeHome>
- LEED Certification



STEP 2: Get Started



BUILD A TEAM: Organize a school-wide sustainability task force or committee

- Be Inclusive, involve your School Board, Head or Principal, Business & Facilities Officers, Faculty, Parents and Others
- Get some friends involved, it's more fun to do things in groups.



BENCHMARK Your School: Know your energy & carbon footprint

- Work with your school's administration (Finance and/or Facilities Director) to obtain the data; The more data you have, the better:
 - How many years of energy bills can you obtain?
- Why is this historical energy consumption use important? What do we do with it?
 - Develop Metrics for Quick Data Analysis
 - Use Benchmarking for Comparison
 - Build a Business Case

EPA-Portfolio Manager for Benchmarking
<https://www.energystar.gov/istar/pmpam/>



GREEN AUDITS



- Start with an Analysis that includes the following:
 - ✓ Study the building and learn how it operates.
 - ✓ Identify and prioritize potential changes that will reduce the use and cost of energy and other natural resources.
 - ✓ Perform an engineering and economic analysis of potential changes.

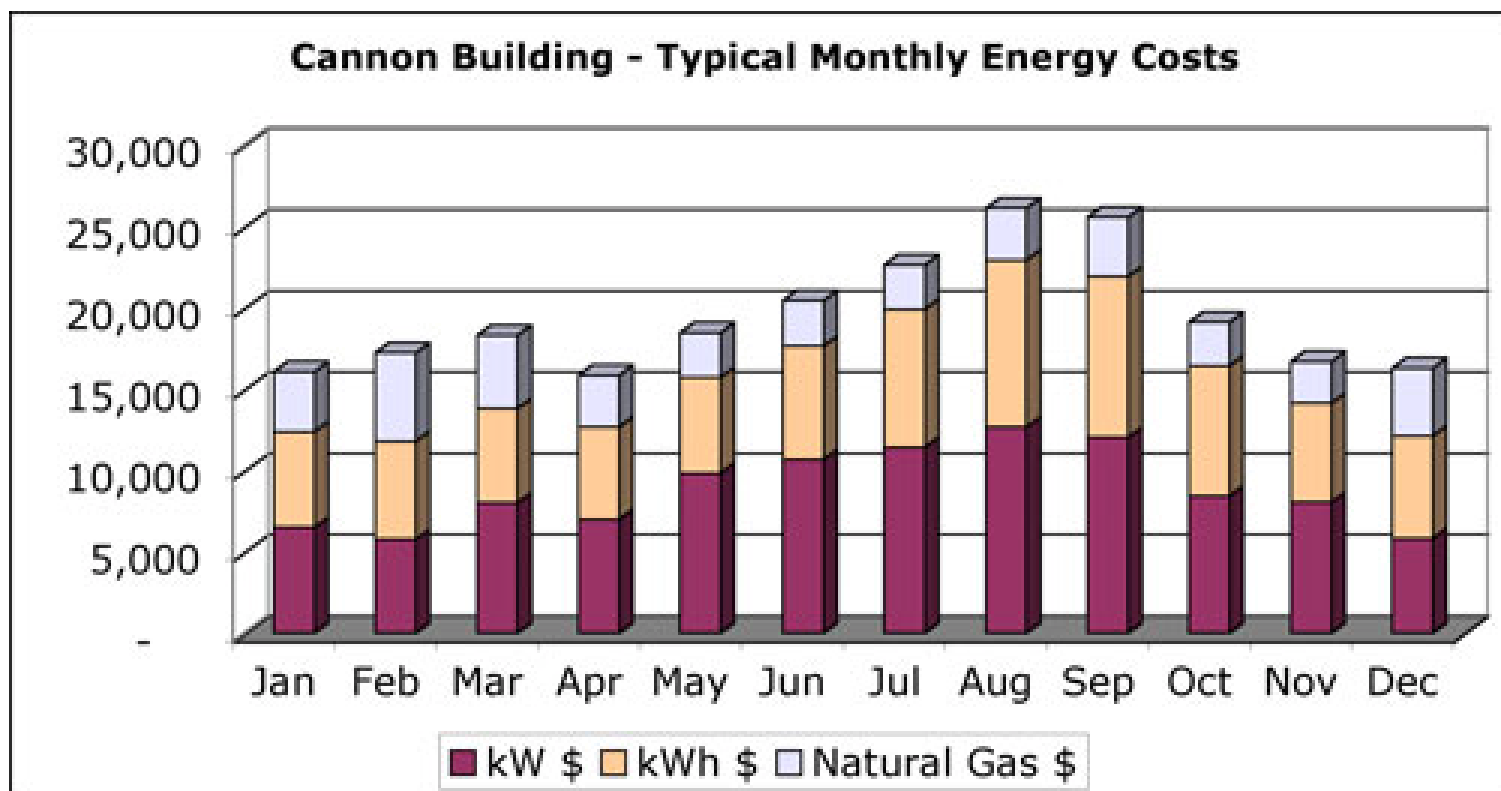
Energy First

Collect and analyze historical energy use—we can't manage what we don't measure.

- Data Tracking
- Energy Policy
- Building Automation System (BAS)
- Lighting efficiency
 - Daylight harvesting
 - Occupancy & daylight sensors, timers
 - Lamp efficiency (LED, fluorescent)
- High Efficiency Equipment (Energy Star®)

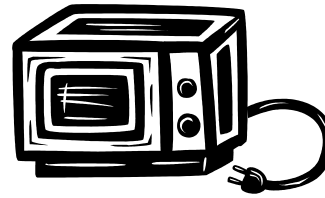


Your Building has a Lot to Say . . .





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How much power does that consume?

- Purchase a few consumption meters, such as a “KILL A WATT” plug-in meter and see how much power a computer, cell phone charger, vending machine or appliance uses. What if it was shut off for just a few hours a day, how much energy would be saved?



Building Improvements: Short-Medium-Long Term

Start with easy to measure, big savings . . .

- ✓ Lighting – just turn them off
- ✓ Operations – occupancy sensors, seal and repair leaks

Big, medium-cost savings next . . .

- ✓ Building Automation Systems – Control Equipment
- ✓ Replace heating/cooling systems, windows
- ✓ Solar hot water heating – renewable grid electricity

Save the expensive items for last . . .

- ✓ Photovoltaic solar
- ✓ Wind machines

Water Conservation

- Low or Waterless Fixtures & Equipment
 - Waterless urinals
 - IR sensor or Micro-flush Devices
 - Faucets and showers
- Rainwater Reuse
 - Cooling Towers
 - Irrigation
 - Flushing toilets
- Gray Water
 - Cooling Towers
 - Flushing toilets



Grounds, Roadways and Landscaping

- Fertilizer
 - Use & impact
 - organic vs. fossil fuel based
- Microclimate
 - Use of local vegetation and trees for energy savings
- Xeriscaping
- Hardscape vs. Landscape
- Stormwater management
- Green Roofs



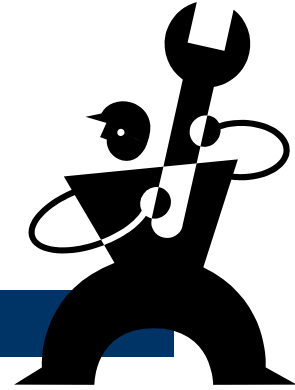
Starting at the TOP: With a Green Roof



- NOT a solar absorber
- Provides insulation
- Provides evaporative cooling
- Vegetation absorbs CO₂ and puts Oxygen back into the atmosphere

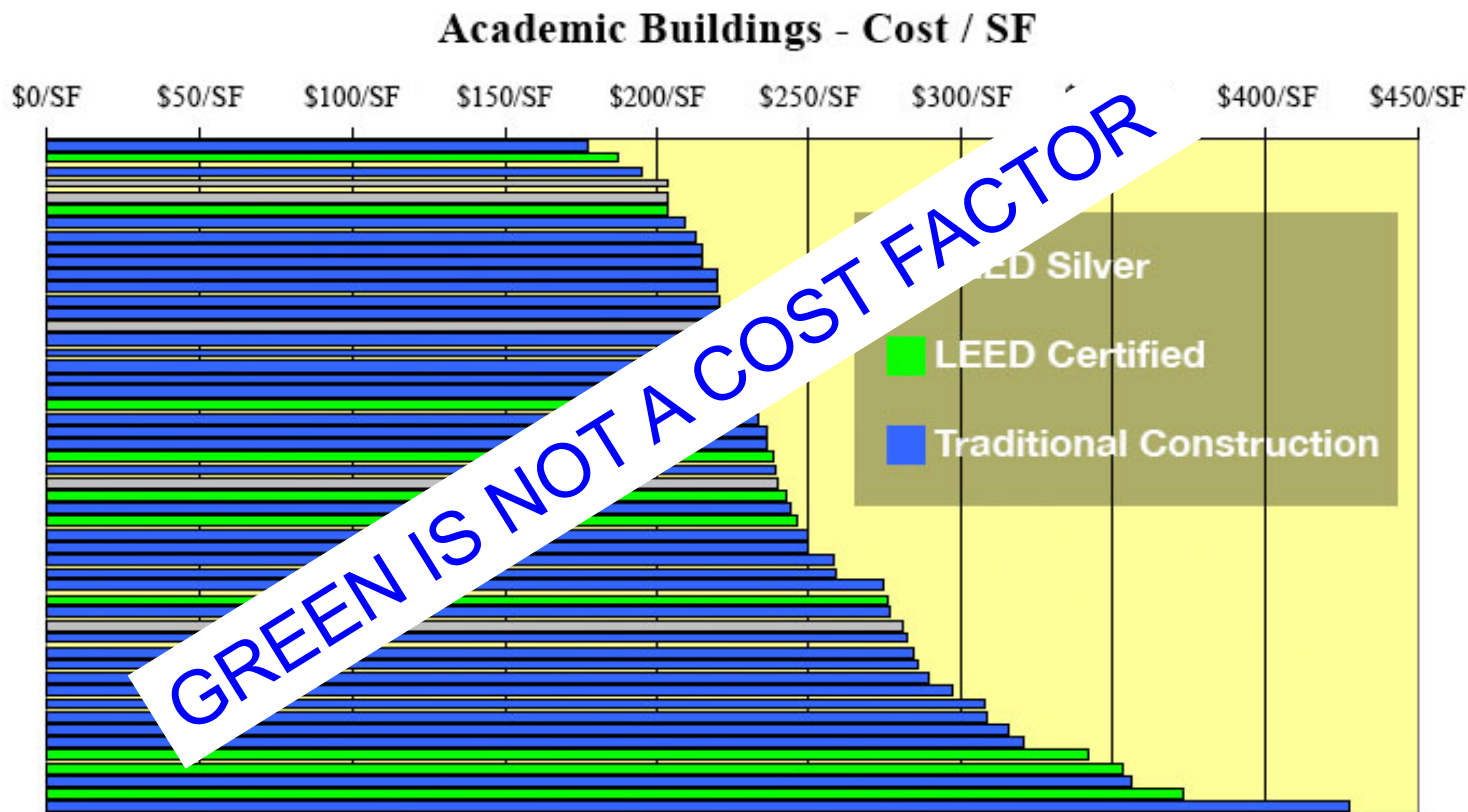


What about Construction & Maintenance?



- LEED Certification
- Windows & Doors
 - Low Infiltration and Low-E Glass
 - Thermally Broken
 - Insulated-double pane, maybe triple panes
- Air Lock Entry or Revolving Door
- Insulation
- Low VOC Construction Materials
 - Paint, adhesives
 - Carpet, furniture, finishes
 - Recycled content
- Wood Containing Products
 - Forest Stewardship Council
- Green Cleaning products & practices

The Cost of Green Buildings



Other things to Consider

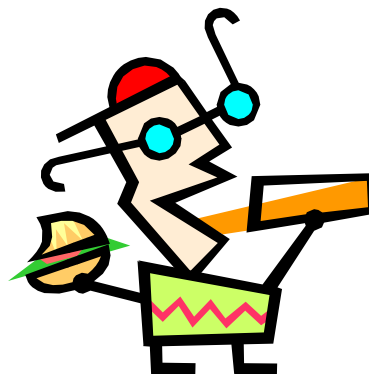


Transportation

- How many people commute by auto?
- How many buses and what type of fuel?
- Bicycle racks?



Food and Dining



- Is your food locally grown and trucked a short distance, or is it packaged far-away and shipped?
- Is it all individually packaged or bulk purchased?
- Is there composting anywhere on your campus and what is the compost used for?
- Are your dishwasher, oven or other cooking devices energy efficient?
- Do you still use trays?

Recycling, Reusing and Reducing

- Do you reduce-reuse-recycle every possible thing that you can?
- Is there an active recycling program at your school and in your dining facility?



STEP 3: TAKE ACTION



SHORT TERM: Begin Two or More Green Projects

- Adopt a once a month cafeteria cold lunch program and don't use paper plates.
- Implement a signage program to create campus awareness about recycling and energy & water conservation. "Lights off, Please"
- Start a no-idling policy for waiting buses and autos.
- Encourage car-pooling, walking, bike-riding and the use of public transportation.
- Urge your school to make the Green Schools Climate Commitment
- What other ideas do YOU have?

LONG TERM: Create a Comprehensive Greens Schools Action Plan

- Install a full Building Automation System
- Build a Greenhouse and grow some of your own veggies
- Install a new Green Roof
- Install a Solar Powered Hot Water Heating System
- Install Photovoltaic Energy Panels
- Put up a Wind Machine
- What Other ideas do YOU have?

STEP 4: Sharing Information



EDUCATE OTHERS: “Spread the word, not CO2 emissions”

- Take the Climate & Conservation Message back to your school; Use the “SC3 Climate Action Toolkit” to help your school launch:
 - Curriculum - Integrate lessons & activities
 - Clubs - If you don’t have one, organize one
 - Community Corps - Join students nationwide in service to green your school and community

MAKE THE CASE: Generating Dollars from Good Sense



LCCA-Life Cycle Cost Analysis

Example of Life Cycle Cost Analysis (LCCA) for Comparative Hot Water Systems Gas Fired and Solar Hot Water For a 21 Year Life Cycle

Type of Expense	Natural Gas Hot Water Heating System \$\$		Active Solar Hot Water Heating System \$\$	
Materials (Initial or First Cost)	\$ 5,000	The cost for the hot water Heater and required piping & controls.	\$ 17,000	The cost for solar panels, piping, pumps, back-up system & controls.
Installation Labor (part of First Cost)	\$ 1,000	What you pay the mechanic to install the hot water heater.	\$ 5,000	What you pay the company to install the full system.
Annual Operating Costs	\$ 8,000	Cost for natural gas to make All the hot-water when it's required.	\$ 2,000	Cost for operating pumps and the occasions when the back-up system must run.
Annual Maintenance Costs	\$ 200	Regular and common costs associated with owning and maintaining this piece of equip.	\$ 500	Regular and common costs associated with owning and maintaining this piece of equip.
Replacement Cost	\$ 6,000	Over the course of 21 yrs it is likely that this system will be replaced 3 times PLUS Initial	\$ 17,000	Over the course of 21 years this system will require replacement at the end of the cycle.
Total Cost of Ownership over the 21 years	\$ 202,200	This is my total cost to own the gas-fired hot water heating system over 21 yrs.	\$ 91,500	This is my total cost to own the solar hot-water heating system over 21 yrs.

Analyzing the LCCA Financials

LCCA Analysis Over the 21 Year Life Cycle

	Gas Fired Hot Water Heater	Solar Hot Water Heater	Difference	Notes:
Initial Installation or First Cost	\$6,000	\$22,000	\$16,000	Installing the Solar System will cost \$16,000 more on day 1
Cost to Own & Operate	\$202,200	\$91,500	\$110,700	Installing the Gas Fired System will cost \$110,700 more over 21 Years.



What about Simple Payback?

- Solar Hot Water Heating System
 - \$22,000 Installed
- Annual Fuel Charges for Natural Gas
 - \$8,000 Per Year
- Annual Fuel and Electricity Charges for Solar
 - \$2,000 Per Year

$$\$22,000 \div (\$8,000 - \$2,000) = 3.67 \text{ Years}$$

In Three Years and Eight Months The Solar Hot Water Heating System becomes a Return vs. an Expense

Questions?



The New Green Economy



Your Future in Sustainability

- Skills & Competencies
- Green Careers



Skills



- Determination and Grit
- Follow through
- The ability to influence others and spread awareness
- Learning to gain consensus, always think “win-win”
- Keen analytical and observation skills
- Math skills
- Having and developing an open mind, a willingness to learn new things and listen to others viewpoint
- A combination of data and facts with a splash of passion
- Ability to Walk the talk

Green Careers



- Agriculture
- Architecture & Construction
 - Solar Architect
 - Landscape Teacher or Professor
- Engineering
 - Mechanical, Electrical, Civil, Chemical, Structural, Environmental, Facilities, Architectural
- Environmental Law
- Financial Analyst or Accountant
- Fundraising
- Government Service
- Scientific Research
- Social Activism & Justice, Community Organizing
- Teacher or Professor

**And so much more...
the list can go on-
and-on!!**

Agriculture



- Sustainable Bio-Fuels
 - Cellulosic Fuels (not JUST corn)
- Environmental Stewardship
 - Producing crops without causing severe or irreversible damage to ecosystem health
- Organic farming
 - Reduction or elimination of carbon based fertilizer
 - Reduction in use of chemicals for feeding of livestock
 - Stopping erosion of soils

Architect or Engineer



- Design Sustainable Solutions
- Solar Design, either active or passive
- Microclimatic Design
- New fuels, Chemical Compounds
- Increasing the efficacy of our electrical distribution system
- Wind farm designer
- Design bio-mass digesters
- Transportation designer—development of light-rail system

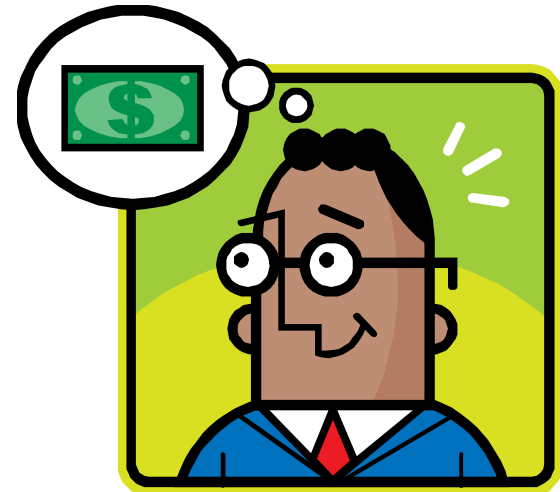


Environmental Law & Politics

- Working for a Senator or Congressperson
- Running for Congress or President
- Working as a Lawyer for a Green Company or Environmental Organization
- Representing companies that are trying to uphold Environmental Laws
- Prosecuting companies that are breaking Environmental Laws

Financial Analyst or Accountant

- Conducting Life Cycle Cost Analysis
- Looking at Return on Investments for ECMs
- Tracking Costs with Green Projects
- Working for Green Companies as an accountant or investment manager





Fundraising

- Working as Director of Development
 - Private Non-profit organizations representing environmental issues
- Develop Plans & Programs for raising funds
- Write Grant Proposals for Green Projects and Initiatives



Government Service

- U.S. Dept of Energy
- U.S. Dept of Interior
- U.S. Environmental Protection Agency
- U. S. Fish and Wildlife Service
- National Park Service
- Minerals Management Service
- U.S. Geological Survey
- Bureau of Reclamation
- Bureau of Land Management



Scientific Research

- Development of Bio-fuels
- Designing more efficient Photovoltaic Cells
- Study the Effects of CO₂ on the Environment
- Discover Alternate Fuels
- Make Hydrogen Fuels affordable
- Designing more Fuel Efficient Motors



Social Activism & Justice, Community Organizer



- Representing disadvantaged groups of people
- Organizing people into a cohesive group
- Bringing issues from others to the forefront
- Influencing others
 - Negotiating disagreements between disparate groups



Aristotle

Teacher

- Develop curriculum around sustainability
 - Fun and exciting examples and exercises for students
 - Challenging the status quo, always questioning
- Lead by Example
 - Teachers have a profound impact on their students
- Working collectively and collaboratively
 - Working with fellow teachers, spread the enthusiasm!
- Creating opportunities for a Private-Public Collaboration
 - Bring private sector knowledge into the classroom

“Those who educate children well are more to be honored than they who produce them; for these only gave them life, those the art of living well.” Aristotle

The future depends on everyONE to Make A Commitment to Change

