Campus Sustainability
at Tufts

Tina Woolston
Office of Sustainability
HISTORY
Institutional responses

- 1990 – Talloires Declaration
  - *Practice institutional ecology*
- 1990 – Environmental Policy
  - *Responsible stewards of physical environment*
- 1990-1994 – Tufts CLEAN!
- 1993 – Environmental Improvement Committee
- In 1999 – Climate Change Commitments
  - Kyoto: 7% below 1990 by 2012
- 1999 – Tufts Climate Initiative formed
  - *Tasked with reducing Tufts’ emissions*
Institutional responses cont.

  - 10% below 1990 by 2020
  - 75% below 1990 by 2050
- 2001 – Energy Affairs Council begins
- 2002 – Recycling Coordinator hired
- 2004 – 2006 – Chicago Climate Exchange
- 2006 – Office of Sustainability (OOS) formed
- 2008 – OOS reports to EVP
- 2009 – Sustainability becomes part of Administrative Excellence Plan
WHERE ARE WE NOW?
2008 Tufts Emissions by source (% of total)

- 71% Heating
- 24% Transportation
- 5% Agriculture
- 0.39% Electricity
Tufts University Carbon Inventory

Emissions Target

Year

Emission Releases (MTCE)

0
5,000
10,000
15,000
20,000
25,000
30,000


Projected

Agriculture
Transportation
Heat
Electricity

Tufts gets green
WHAT HAS ALREADY BEEN DONE?
Surveys

- 1999 Tufts’ student concern about climate change:
  - 19% - not concerned,
  - 52% - slightly concerned,
  - 9% - moderately concerned,
  - 3% - very concerned
Student Projects

- Biofuels: Development of a Demonstration Project for the Tufts Climate Change Challenge
- Solar Power in Massachusetts: A Study of Large Animal - Greater Boston Analysis
- Tufts University School of Veterinary Medicine: Windfarm Design Report
- Tufts University: Learning How to Harness Available Renewable Energy: A Case Study on Solar Hot Water Application
- Bowling Green and Campus Safety: Creating Environmentally Sound Renovations
- Managing and Monitoring Campus Emissions
- Biodiesel for Tufts University: A Cost Benefit Analysis
- The Case for Hardiplank vs. Vinyl Siding
- Sustainable Carpeting Opportunities for the Lincoln Filene Center at Tufts University
- Occupancy Sensors and Daylight Savings Devices: A cost/Benefit Analysis
- Computer Usage at Tufts University
- Recycling at Anderson Hall
- Dowling Hall and 419 Boston Avenue: A Cost Benefit Analysis of Waste Management and Removal
- Desktops and Laptops: A Cost Benefit Comparison for the Lincoln Filene Center at Tufts University
- Applicability of Fuel Cells as Cogeneration Energy Plants in Tufts University Medford Campus
- A Preliminary Analysis of Energy Efficiency of the Lincoln Filene Center: Features for Renovation
- Tufts University's Solar Residence Hall
- Cost Benefit Analysis of Replacing the Urinals in Halligan Hall with Waterless Urinals
- Investigation of Climate Control Systems for the Telecommunications Department at Tufts University
- Boston Area Cogeneration Consortium
- Energy Efficiency in Dining Halls
- Solar Hot Water at the Hospital for Large Animals - Grafton Campus
- The Heat is On! (Along with the lights, the hot water, etc.)
- A Cost Benefit Analysis of Using Biodiesel Fuel at Tufts University
- Fletcher Energy Consumption: Creating Environmentally Sound Renovations
- Tufts University GHG Inventory: Commuter Emissions
- Pooling for Green Power in Massachusetts: Make Way for the Aggre-Gator: Helping Pool Consumer Demand for Green Power
- Solar Power at Tufts University
- Solar Energy Alternatives: Tufts University Wildlife Clinic
- Signaling Change: Studying the Effect of Price Signals on Disposal Hot Beverage Cup Consumption
- Residential Building Solar Thermal Analysis: A Case Study on Sophia Gordon Hall
- Boilers and Water Heaters in Wood Frame Houses: A Cost Benefit Analysis
- Tufts University Biodiesel Processor Feasibility Study
- Energy Star Compliance
- Recycling at Dowling Hall and 419 Boston Avenue
- Cost Benefit Analysis of Installing Occupancy Sensors in Anderson Hall
- Rainwater Harvesting Projects
- A Demand Assessment for Fair Trade Coffee at Tufts University: An Evaluation of the Impact of a Fair Trade Option for the Tufts Department at Tufts University
Student initiatives

- Recycling (1990!)
- Student gardens
- Wind power
- Think Outside the Bottle
- Climate Fest
- Focus the Nation
- Energy conference
- Earthfest
- Do It In The Dark
Efficiency in Existing Buildings:

- Schmalz House weatherization and solar panels
- Lighting sensors and controls
- Heating: Sizing and Controls
Infrastructure

Steam Traps

Construction Standards
<table>
<thead>
<tr>
<th>FY</th>
<th>MMBTU</th>
<th>Heating Degree Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY02</td>
<td>15,755</td>
<td>5,900</td>
</tr>
<tr>
<td>FY03</td>
<td>16,696</td>
<td>6,500</td>
</tr>
<tr>
<td>FY04</td>
<td>14,539</td>
<td>6,100</td>
</tr>
<tr>
<td>FY05</td>
<td>12,481</td>
<td>6,200</td>
</tr>
<tr>
<td>FY06</td>
<td>12,633</td>
<td>6,200</td>
</tr>
<tr>
<td>FY07</td>
<td>9,782</td>
<td>5,000</td>
</tr>
<tr>
<td>FY08</td>
<td>9,404</td>
<td>5,500</td>
</tr>
<tr>
<td>FY09</td>
<td>8,995</td>
<td>5,000</td>
</tr>
<tr>
<td>FY10</td>
<td>8,071</td>
<td>5,000</td>
</tr>
</tbody>
</table>

**Science and Technology Center**

4 Colby Street

- **Lighting / controls retrofit** completed September 2002
- **Retro commissioning** completed February 2004
- **Hot water temperature lowered in preparation for new boilers** completed November 2005
- **Condensing boilers installed** completed November 2006
- **HVAC Chiller retrofit complete** completed April 2008

*Tufts gets green*
Envelopes

Windows
Air-sealing
Insulation
No thermal bridging
Lighting

Motion sensors
CFLs
Higher efficiency tube lights
LEDs
<table>
<thead>
<tr>
<th>Campus</th>
<th>Building</th>
<th>kWh Savings</th>
<th>$ Saving</th>
<th>Payback in years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medford</td>
<td>Anderson</td>
<td>98,107</td>
<td>$9,811</td>
<td>1.1</td>
</tr>
<tr>
<td>Boston</td>
<td>Dental</td>
<td>216,398</td>
<td>$25,968</td>
<td>1.6</td>
</tr>
<tr>
<td>Medford</td>
<td>Cabot</td>
<td>13,660</td>
<td>$1,366</td>
<td>1.7</td>
</tr>
<tr>
<td>Medford</td>
<td>Mugar</td>
<td>16,454</td>
<td>$1,645</td>
<td>4.1</td>
</tr>
<tr>
<td>Medford</td>
<td>Cabot Hall of Flags</td>
<td>29,784</td>
<td>$2,978</td>
<td>0.9</td>
</tr>
<tr>
<td>Medford</td>
<td>Facilities (520 Boston Ave)</td>
<td>10,850</td>
<td>$1,085</td>
<td>2.6</td>
</tr>
<tr>
<td>Medford</td>
<td>Halligan</td>
<td>90,102</td>
<td>$9,010</td>
<td>2.9</td>
</tr>
<tr>
<td>Medford</td>
<td>Olin</td>
<td>109,314</td>
<td>$10,931</td>
<td>3.5</td>
</tr>
<tr>
<td>Medford</td>
<td>Bray</td>
<td>14,806</td>
<td>$1,481</td>
<td>3.6</td>
</tr>
<tr>
<td>Medford</td>
<td>Eliot Pearson</td>
<td>24,927</td>
<td>$2,493</td>
<td>3.3</td>
</tr>
<tr>
<td>Medford</td>
<td>Bromfield Pearson</td>
<td>36,069</td>
<td>$3,607</td>
<td>3.6</td>
</tr>
<tr>
<td>Medford</td>
<td>Dowling</td>
<td>67,752</td>
<td>$6,775</td>
<td>3.3</td>
</tr>
<tr>
<td>Medford</td>
<td>Eaton</td>
<td>51,984</td>
<td>$5,198</td>
<td>3.5</td>
</tr>
<tr>
<td>Medford</td>
<td>Pearson/Michael</td>
<td>95,817</td>
<td>$9,582</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>876,024</strong></td>
<td><strong>$91,930</strong></td>
<td><strong>2.5</strong></td>
</tr>
</tbody>
</table>
Fuel Switching
Energy Reserve Fund

- $1 million
- Invests first cost or incremental first cost
- Paid back out of savings
- 5-year payback
New Construction
Sophia Gordon Hall Energy Usage

Real Time Energy Data

Today's Domestic Hot Water
Tuesday, 11/6/2007

To display numeric value, hover over a bar in the graph.
Solar thermal rooftop arrays provide hot water (funded by a grant from the Massachusetts Technology Collaborative with matching funds from Tufts). The vertical axis of the graph shows the BTU's that were consumed in heat the domestic hot water heaters, dishwashers,
Vertical Expansion – Dental School

Rapidly renewable bamboo

Lights automatically react to brightness levels in the room

Natural linoleum – Linseed oil and wood flour or cork dust

Modular carpeting – no glue!

U.S. Green Building Council LEED Silver USGBC

Tufts gets green
Water
Purchasing
Recycling:
Composting

240 tons

= 40 Jumbos!
Dining

- Fair Trade coffee and bananas
- Cage-free, local eggs
- Local produce
- Organic options
- Farmer’s market
- Trayless dining
- Re-usable cup discounts
- Free mugs and water bottles
- Waste oil ➔ biodiesel
- Compostable disposables
- Sustainable seafood
- Awareness events
Catering

- Offer local, organic food
- Offer china or compostable dishes
- Reuse serving dishes and utensils
- Donate food
- Compost
- Provide bulk condiments, utensils, drinks, (incl water)
Landscaping
Transportation
Occupant Behavior

Sophia Gordon Hall
Daily Electric Consumption

The Guide to Living & Working Green
at Tufts
gets green
## Benefits of Behavior Change

<table>
<thead>
<tr>
<th>Action</th>
<th>Individual Annual Savings (estimated)</th>
<th>Campus Annual Savings (estimated) (Savings assume that nothing is happening now)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn off computer or enable power management</td>
<td>$38</td>
<td>$61,000 (quantity = 1600)</td>
</tr>
<tr>
<td>Turn off copiers at night/weekend – use power management</td>
<td>$160</td>
<td>$12,800 (quantity = 80)</td>
</tr>
<tr>
<td>Shut off lights every time</td>
<td>$100-$400</td>
<td>$10,000+</td>
</tr>
<tr>
<td>Shut fume hood sash</td>
<td>$500 +</td>
<td>$170,000+ (quantity = 340)</td>
</tr>
</tbody>
</table>
Help Tufts Be Green!
Use the thermostat to regulate temperature rather than your windows!
Turn down the thermostat when you leave the suite for the day!

Help Tufts Be Green!
Turn lights and appliances off when you don’t need them!

Photo Voltaic Panels (PV)
23.8 kW photovoltaic panels (PV) on the roof generate electricity.

Bamboo Flooring
Rapidly Renewable Resource
Bamboo is a fast growing grass, as much as three feet a day.

At Sophia Gordon Hall, XX sf of bamboo flooring have been installed.
Ex-college
Eco-Reps
ECO Ambassadors

- Peer to peer education and action
- Faculty, staff
- 3 campuses
- 29 graduates from 25 departments
- Support from OOS
Freecycle Room
26 Winthrop Street
Other

- Office Audits
- Dining Hall audits
- Green roof
- Dorm shut-down
- Green printing
- IT
- Wind power – RECs, large scale
- Temperature policies
- Zero-waste, single-stream recycling pilots
- Competitions (Recycle-Mania; DIITD)
- Green Vet practice website
- Advising, thesis committees
- Compton fellowship
- Events – for alumni, current and incoming students, conferences and symposiums on sustainability
- Green guides in new staff orientation

- Recognition
- Climate offset research
- Sustainable food production
- Energy loan fund
- Filtered water dispensers
- AASHE member
- USBGC member
- Newsletter
- Twitter
Recognition

- Sierra Club Top 10 (2007 and 2008)
- EPA Climate Protection Award (2005)
- Clean Air Cool Planet Climate Award (2001)
- Kaplan Report Top 300
- Grist Magazine
- Kiwi Magazine
- Chicago Climate Exchange (2003)
- Clean Air-Cool Planet Climate Champion Award (2003)
Influence beyond Tufts

- Founding member of NE Sustainability Coordinator Network
- Sustainability Metrics Advisory Committee
- Website -- 2000 hits/month
- Twitter
- Books, articles, conferences
- STARS technical advisory committee
- Programs replicated nationwide
  - Eco Reps
  - Vending Misers
  - Energy loan funds
  - GHG inventory
THINGS TO THINK ABOUT
Making Good Choices

1. Solar PV Panels on Sophia Gordon Hall
2. LED lights in the Dowling Hall Parking Garage

<table>
<thead>
<tr>
<th></th>
<th>23 KW PV</th>
<th>192 LEDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net First Cost</td>
<td>$51,000</td>
<td>$98,000</td>
</tr>
<tr>
<td>Savings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KWH/year</td>
<td>25,000</td>
<td>165,400</td>
</tr>
<tr>
<td>Dollars/year</td>
<td>$3,500</td>
<td>$23,156</td>
</tr>
<tr>
<td>Tons CO2/yr (grid)</td>
<td>13.75</td>
<td>90.97</td>
</tr>
<tr>
<td>Tons CO2/yr (Tufts)</td>
<td>6.88</td>
<td>45.48</td>
</tr>
</tbody>
</table>
http://sustainability.tufts.edu