

Computer Calculations:

Tufts owned computers (staff, faculty, labs): 4300

Student owned computers: 3000

Boston Population: 1,600,000

Boston Households: 1,200,000

Numbers of Computers in households: 600,000¹

Work days per year: 250

Days per year: 365

Electricity usage: 0.12 kW per computer, 0.045kW per CPU, 0.075kW per monitor: measured with line logger, compared to numbers from the Berkley National Laboratory)

CO2 emissions: 1.45 lbs per kW (/2000 for tons) (*Instruction for Forms EIA-1605, Voluntary Reporting of greenhouse Gases*, Energy Information Administration, US Department of Energy)

Costs: 11 cents per kWh / 12 cents per kWh for Metro Boston example.

C to CO2 conversion factor = 44/12:

The weight of 1 unit of C (elemental Carbon) is equivalent to the weight of 44/12 units of CO2 (because one CO2 molecule is heavier than just one Carbon atom).

I. If all students at Tufts University turned off their computer at night (at least 6 hours), we could prevent 572 tons of CO2 from heating the atmosphere each year and it would save over \$87,000 in electricity costs!²

$A = 365 \text{ days} \times 3000 \text{ computers} \times 0.12 \text{ kW} \times 6 \text{ hours} = 788,400 \text{ kWh}$

$A \times \$ 0.11 = \86.724 (rounded to \$87,000)

$A \times 1.45 \text{ lbs of CO}_2 \text{ per kW} / 2000 = 571.6 \text{ tons}$ (rounded to 572 tons)

One computer left on 24 hours a day will cost you \$115 in electricity bills a year and dump 1500 pounds of CO2 into the atmosphere.

$A = 365 \text{ days} \times 24 \text{ hours} \times 0.12 \text{ kW} = 1051.2 \text{ kWh/year}$

$A \times \$0.11 = \115

$A \times 1.45 = 1524$ (rounded to 1500 pounds of CO2)

If Tufts students and staff turned off their computer monitors 1-5 hours a day we could prevent 118 - 590 tons of CO2 from heating the atmosphere each year. This would save \$18,000 - \$90,000 in electricity costs!²

¹ From: *Wisdom of our Choices: Boston's indicators of Progress, Change and Sustainability*

² *Not all the savings would be Tufts savings because the school year is less than 365 days. For the calculations, 365 days was used, because it was assumed that students take their computer home over the summer. It was also assumed that they would use them the same way at home as at Tufts (i.e. usually not shut them off at night). A survey in 1999 showed that 85% of Tufts students almost never shut off their computers.

Staff: $A = 4300 \text{ computers} \times 250 \text{ work days} \times 0.075 \text{ kW} \times 1 \text{ hour} = 80,625 \text{ kWh}$
Students: $B = 3000 \times 365 \text{ days} \times 0.075 \times 1 \text{ hour} = 82,125 \text{ kWh}$

Low estimate:

$C = A + B = 162,750 \text{ kWh}$

CO₂: $C \times 1.45/2000 = 117.9 \text{ tons (rounded to 118)}$

Costs: $C \times \$ 0.11 = 17.902 \text{ (rounded to 18,000 dollars)}$

High estimate:

$D = A \times 5 \text{ hour} + B \times 5 \text{ hours} = 403,125 \text{ kWh (staff)} + 410,625 \text{ kWh (students)} = 813,750 \text{ kWh}$

CO₂: $D \times 1.45/2000 = 589.9 \text{ tons (rounded to 590 tons)}$

Costs: $D \times \$ 0.11 = \$89,512 \text{ (rounded to 90,000 dollars)}$

Computer Calculations:

Boston Population: 1,600,000

Boston Households: 1,200,000

Numbers of Computers in households: $600,000^3$

Work days: 250

Days per year: 365

Electricity usage: 0.12 kW per computer, 0.045kW per CPU, 0.075kW per monitor

Cost: 12 cents per kWh

If each household in the metro Boston area turned off their computers just one additional hour per day, we could save \$ 3.2 million in electricity bills and prevent 19,000 tons of CO₂ from heating the atmosphere. If businesses and universities were included, the savings could be much higher.

$600,000 \text{ computers} \times 365 \text{ days} \times 0.12 \text{ kW} \times \$ 0.12 = \$3,153,600 \text{ (rounded to \$3.2 million)}$

$600,000 \text{ computers} \times 365 \text{ days} \times 0.12 \text{ X kW} \times 1.45/2000 = 19,053 \text{ tons of CO}_2 \text{ per year (rounded to 19,000 tons)}$

³ From: *Wisdom of our Choices: Boston's indicators of Progress, Change and Sustainability*