Carbon Trust – Poster Calculations

A photocopier left on overnight uses enough energy to produce over 1500 copies

This fact is based on a mid-volume copier. In "sleep" mode this uses 51W and is on all day. Assume that the office is empty from 6pm to 8am = 14 hours.

Then (51W x 14 hours) / 1000 = 0.714kWh

In copy mode the machine uses 614W and produces 25 copies a minute (1/60=0.016667 hours).

This is (614 x 0.016667) / 1000 = 0.010233kWh for 25 copies

0.714kWh / 0.010233 = 69.77199

69.7719 x 25(copies) = 1,744 copies could be produced overnight.

Lighting an office overnight wastes enough energy to heat water for 1000 cups of tea

This fact is based on a typical office space with 18 x 6ft (1800mm) T8 tubes at 70W each. Ballast increases consumption by 25% so consumption is 87.5W each. Assuming lights are left on when the building is unoccupied for 14 hours (6pm-8am)

(14(hours) x 87.5(Watts)) / 1000 x 18(tubes) = 22.05kWh

Assume 1 cup of tea requires raising the temperature of 0.25 litres (i.e. 0.25kg) through 70°C (from 20°C to 90°C approx).

Specific heat capacity = 4200 J/kg/°C
Energy requirement = 4200 x 0.25 x 70 = 73,500 J
Conversion to kWh = 73,500 / 3,600,000 = .02 kWh

Based on these calculations, then these lights use enough energy to make 1103 cups of tea.

A typical window left open overnight in winter will waste enough energy to drive a small car over 35 miles

Assumes vehicle performance of 10 miles/litre (= 45mpg). Calorific value of petrol = 32 MJ/litre (Dukes 2002) = 8.9kWh i.e. 1.12 miles/kWh

Assume the effect of the open window is air movement at an average velocity equivalent to 0.1 m/s perpendicular to the facade across its cross sectional area.

For a window with an openable area of 1 sq.m this is equivalent to an air change rate of 0.1 cu.m/s, = 360 cu.m/hr.

density of air = 1kg/cu.m, heat capacity = 1200 J/kg/°C, so for outside air at 0°C displacing internal air at an average temperature of 16°C.

Heat loss per hour = 360 X 1 X 1200 X 16 = 6,912,000 J = 1.92 kWh.
Assume window remains open for 14 hours, 27kWh
Assuming a boiler efficiency of 80% gas fuel requirement is 27/.8 = 33.75 kWh

1.12 * 33.75 = 37.8 miles

A PC monitor switched off overnight saves enough energy to microwave six dinners
Assumes stand-by consumption of monitor is 20W Monitor in use for 8 hours and in stand-by overnight for 16 hours. Energy wasted by monitor is 20W x (16 hours x 60 sec x 60 mins) = 1,152,000 J

Assumes microwave meal is heated for 4 mins in an 800W microwave
800W x (4 mins x 60 sec) = 192,000 J

Number of meals = 1,152,000/192,000 = 6.

Switching off all non essential equipment in an office for one night will save enough energy to run a small car for 100 miles.
(Or uses enough energy to photocopy 224,000 copies or would make over 4500 cups of tea.)

Overnight is from 5pm to 9am - 16 hours

Assume no power save is enabled on the PC's or monitors and 18 6ft fluorescent lights at 70W with wire bound ballasts.
For lights – 18 (T8) lights x (70W + 25%) x 16 hours = 25kWh

Switching off 1 photocopier 51W standby consumption x 16 hours = 0.8kWh

Switching off 30 PC's (140W each) = 25 x 140W x 16 hours = 67.2kWh

Switching off 1 laser printer 45W standby consumption x 16 hours = 0.7kWh

Assumes vehicle performance at 10 miles/litre (=45mpg). Calorific value of petrol = 32MJ/litre (Dukes 2002) = 8.9kWh i.e. 1.12 miles/kWh
25+0.8+67.2+0.7=93.7kWh overnight x1.12 miles = 105 miles

A compressed air leak the size of a match head wastes enough energy in a working day to toast 444 slices of bread
It takes 2 mins and 15 secs to toast 2 slices of bread in a 950W toaster (empirical data).

Energy used to toast 2 slices of bread = (2.25 minutes) / 60 minutes * 950W = 36Wh

0r 36Wh / (2x1000) = 0.018kWh per slice of toast.

A 1.6mm (match head) hole in a compressed air system wastes 1kW of electricity (Source: Good Practice Guide 126).
The energy wasted for a 1.6mm leak during and 8 hour working day is 1kWx8 hours = 8kWh.

The number of slices of bread that could be toasted with this energy is

(8kWh) / 0.018kWh = 444 slices of toast.