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Power footprint of use of kettles in offices

a view commissioned by Air2Eau Ltd

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Summary

Air2Eau requested a view of the "power picture" of an office community using kettles to obtain hot water when the source is plumbed in water coolers:-

THEORETICAL

The amount of energy (Q) required to boil water is calculated thus:-

Q=m*c*dTheta
where m is the mass of water (in g)
c is the specific heat of water - 4.186 Joule/gram °C
dTheta is the difference in temperature between starting temperature and target temperature

Assuming that the water is at a temperature of 16 degrees Celsius and the kettle holds 1.5l of water (==1.5kg), Then we get Q=1500*4.186*(100-16) = 527,436 joules. If we assume the kettle is rated at 3000W, then the time is seconds to boil the kettle will be 527436/3000 = 175.81s which is 2m 55.81s. In terms of power consumption this equates to 527436/(1000*60*60) = **0.147kWh**

At 10 cycles /day, 270 days /year, the total power requirement per kettle, per year is (10*270*527436)/(1000*60*60) kW hours = **396.9 kWh .**

PRACTICAL

Obviously the above is all theoretical, and takes no account of the efficiency of the kettle. To get a real-world view, we tested a normal household kettle rated at 3000W over a number of cycles:

To boil 1.5 litres of water from 16 degrees C took an average of **3min 18s** and consumed an average of **0.165kWh**.

Used 10 times per day equates to 10 x 0.165 = **1.65 kWh**
Assuming 270 working days means 270 x 1.65 = **445.5 kWh per kettle per year**

It is difficult to accurately represent this as a financial value, as there is a huge variation in commercial electricity tariffs, however as an example E.On's easygreen business tariff for West Sussex for a 1 year, 100,000 unit contract equates to £0.101 per unit giving a cost of **~£50 per kettle per year**.

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