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## A1\_10 Energy-generating Hamsters

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### Abstract

This paper investigates how many hamsters running in a wheel for six hours every day for a year would generate enough energy to supply the UK for a year. The number of hamsters needed is found to be  $2.3 \times 10^{12}$ . Hamster-generated power is concluded to not be a viable energy source for the UK.

### Introduction

This paper investigates the potential contribution that hamsters running in wheels could make to generating energy for consumption in the UK. It is estimated that a hamster runs in its wheel for approximately six hours every day.



Figure 1: A Hamster Running in a Wheel [1].

### Investigation

A hamster of 0.05 kg, running up at a  $30^\circ$  angle at  $2 \text{ ms}^{-1}$ , can generate a power output of  $P_H = 0.5 \text{ W}$  [2]. The energy generated,  $E_H$ , by one hamster running in a wheel for six hours each day for a year (one quarter of the total year) would be:

$$E_H = P_H \times \frac{t_Y}{4}, \quad (1)$$

where  $t_Y$  is the seconds in a year ( $3.1536 \times 10^7 \text{ s}$ ) [3].

Thus, the energy generated by one hamster in one year is approximately  $E_H = 3.9 \times 10^6 \text{ J}$ . The energy output calculated from the hamster in a wheel neglects friction and other losses that would be incurred in the wheel and generator, therefore, the system is assumed to be 100% efficient.

The UK energy consumption in 2009 was  $2.56 \times 10^{12} \text{ kWh}$  ( $2.2 \times 10^8$  tonnes of oil equivalent) [4]. For one year, this energy consumption is, therefore,  $E_{UK} = 9.2 \times 10^{18} \text{ J}$ . The percentage of the UK's yearly energy consumption that could be generated by one hamster is:

$$\frac{E_H}{E_{UK}} \times 100\% = 4.3 \times 10^{-11}\%. \quad (2)$$

The number of hamsters needed to supply the UK with energy for one year would be approximately  $2.3 \times 10^{12}$ .

The estimated total number of hamsters in the entire world (including wild hamsters) is  $6.8 \times 10^9$  [5]. So, the number of hamsters needed to power the UK for one year is approximately 300 times greater than the number of those in existence.

### Conclusion

This paper has calculated how many hamsters running in a wheel for six hours every day for a year would generate enough power to supply the UK's energy for a year. The number of hamsters needed has been found to be  $2.3 \times 10^{12}$ , which is approximately 300 times greater than the number of hamsters in the whole world.

Therefore, hamster-generated energy could not make a significant contribution to the UK's supply.

### References

[1] <http://www.ecademy.com/node.php?id=156596> (28/02/2011)

[2]<http://www.newscientist.com/article/mg19325862.300-wheels-of-fortune.html>  
(15/03/2011)

[3]G. Woan, *The Cambridge Handbook of Physics Formulas* (Academic, Cambridge, 2003) p. 15.

[4]<http://www.decc.gov.uk/assets/decc/Statistics/publications/dukes/348-dukes-2010-printed.pdf> (28/02/2011)

[5]<http://www.hamsterliberationfront.com/dictor.htm> (28/02/2011)