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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 2.3x10^{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° angle at 2 ms^{-1}, can generate a power output of P_H = 0.5W [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:

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

where t_Y is the seconds in a year (3.1536x10^{7}s [3]).

Thus, the energy generated by one hamster in one year is approximately E_H = 3.9x10^6 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 2.56x10^{12}kWh (2.2x10^8 tonnes of oil equivalent) [4]. For one year, this energy consumption is, therefore, E_{UK} = 9.2x10^{18}J. The percentage of the UK's yearly energy consumption that could be generated by one hamster is:

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

The number of hamsters needed to supply the UK with energy for one year would be approximately 2.3x10^{12}.

The estimated total number of hamsters in the entire world (including wild hamsters) is 6.8x10^9 [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 2.3x10^{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

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