energyEGG White Paper

Cost Saving Analysis

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Introduction

This paper will outline the energy savings that can be achieved by an energyEGG system and the pay back of the system in one year. The energyEGG uses a patented occupancy sensor to detect when a room is empty, and then it wirelessly signals plug sockets and lights to 'switch off' the power. It also has 'one touch' manual control and a user set timer to delay when the 'switch off' command occurs.

There are two main ways in which appliances are used inefficiently:

1. **'Idle Time'**: The appliance remains switched on at full power while not in use e.g. games console ON with no-one in the room.
2. **'Standby mode'**: The appliance consumption is reduced but can still consume significant amounts of electricity.

Public and commercial awareness of 'Standby' Mode is high and has been researched by the Energy Saving Trust (EST) and Department of Energy and Climate Change (DECC). 'Idle Time' is not so well understood. It will be shown in this paper that 'Idle Time' can account for up to 28% of the running cost of an appliance and is potentially twice as costly as standby waste.

The EST produced a report in July 2012 called "Powering the Nation: Household electricity-using habits revealed". This is a seminal study in the UK, revealing for the first time UK household electricity consumption down to the appliance level. This level of detail is essential to understanding electricity wastage in the home. Some of the key findings are listed below:

- *"The UK really is a nation of television watchers. Instead of the previously assumed figure of almost five hours of typical daily TV viewing, our study shows this is more likely to top six hours a day."*
- *"The proportion of time that TVs were on 'stand-by' state depended, to a large extent, upon the technology type. CRT TVs had a standby rate of 11 per cent; LCD 8.7 per cent; and plasma screens a much smaller 0.4 per cent."*

- *"Given that the average power bill for the average home in the study was approximately £530, we can see that standby power demand could account for 9–16 per cent of a household's power bill."*
- *"The distribution of lighting throughout the home does not reveal many surprises. The biggest lighting demands arise from the kitchen and lounge.* Cost Saving

This white paper focuses on one particular group of appliances; the living room entertainment hub. The appliances found here are regularly left on and cost between £70-300 per year to run, depending on the specific types of appliances used.

Typical running costs for individual living room consumer electronics are shown in Table 1. We have separated the total running cost into an 'on cost' (the cost while the appliance is switched on) and a 'standby cost' (the cost of the appliance in standby mode') using data provided in the 'Powering the Nation' report. We have applied 12.5% standby figures; the average of the 9%-16% given in the 'Powering the Nation' report.

NOTE: The "Powering the Nation" report provides actual measured figures for TV standby consumption. We have used these as opposed to using the 12.5% derived figure.

Table 1

Consumer Electronics product	Annual usage(kWh)	Running cost rounded(£)	ON Cost (£)	Standby Cost (£)
Aerial	24.5	4	3.50	0.50
AV receiver	1025.8	149	130.38	18.63
CD player	34.7	5	4.38	0.63
DVD recorder	96.8	14	12.25	1.75
Wii	40	6	5.25	0.75
Games console	47.6	7	6.13	0.88
PS3	67.7	9	7.88	1.13
Xbox 360	56.6	8	7.00	1.00
Hi fi	107	15	13.13	1.88
Radio	35	5	4.38	0.63
Set top box	115.2	17	14.88	2.13
Complex set-top box	148	21	18.38	2.63
VCR	48.3	7	6.13	0.88
Home cinema (sound amplifier)	54.5	8	7.00	1.00
CRT – traditional	118	17	15.13	1.87
LCD – flat screen	199	29	26.48	2.52
Plasma – flat screen	658	95	94.62	0.38

The data in Table 1 provides the basis for calculating the cost saving potential of an energyEGG system. The theory is that if the daily 'on cost' of an appliance is known and the daily usage time (6 hours) is known then you can arrive at an average cost per hour of using the appliances e.g. if a plasma TV costs £94.62 per year when ON and it is used 6 hours per day then it costs £0.04 to run each hour. Once the running cost per hour is known the next step is to calculate the amount of 'Idle Time' and therefore the cost saving potential.

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Idle Time

TreeGreen has provided an energy saving calculator on their website for over 2 years. In this period it has gather almost 1000 entries from all over the UK. The calculator allows the user to input the estimated idle time of their appliances, it then outputs the yearly cost of wasted electricity. The data produced an average idle time of 2hr 15mins. TreeGreen found many entries of approximately 10 hours - suggesting that users are leaving appliances on overnight.

Strathclyde University conducted preliminary research (additional research, covering a large number of homes, is scheduled for February 2013). To do this room occupancy and appliance status (ON, OFF or standby) were monitored simultaneously. The occupancy data was plotted against the appliance status. These results were then examined for periods were appliances were left ON or in standby with no one in the room.

The study concludes that, on average, living room appliances are left idle for 1hr 7mins and in standby for approximately 7 hrs. It also confirms that appliances are being left on overnight.

For the purposes of cost saving calculations we will take the average of the figures taken from the Energy Saving Calculator and the Strathclyde University research. This results in an 'Idle Time' of 1hr 41mins. This is equivalent to 28% of the ON time of the appliance hence 28% of the ON cost.

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Overnight Idle Time

Table 2 shows the cost of leaving the most common living room setups on overnight once a month. Using the ON cost as a basis and an overnight ON time of 9 hours (based on data from focus group) we can calculate the overnight cost of leaving appliances ON. We have removed the overnight cost of leaving the TV on as it was found that the TV produced noise and light, meaning it was less likely to be left ON.

Table 2: Overnight Idle time

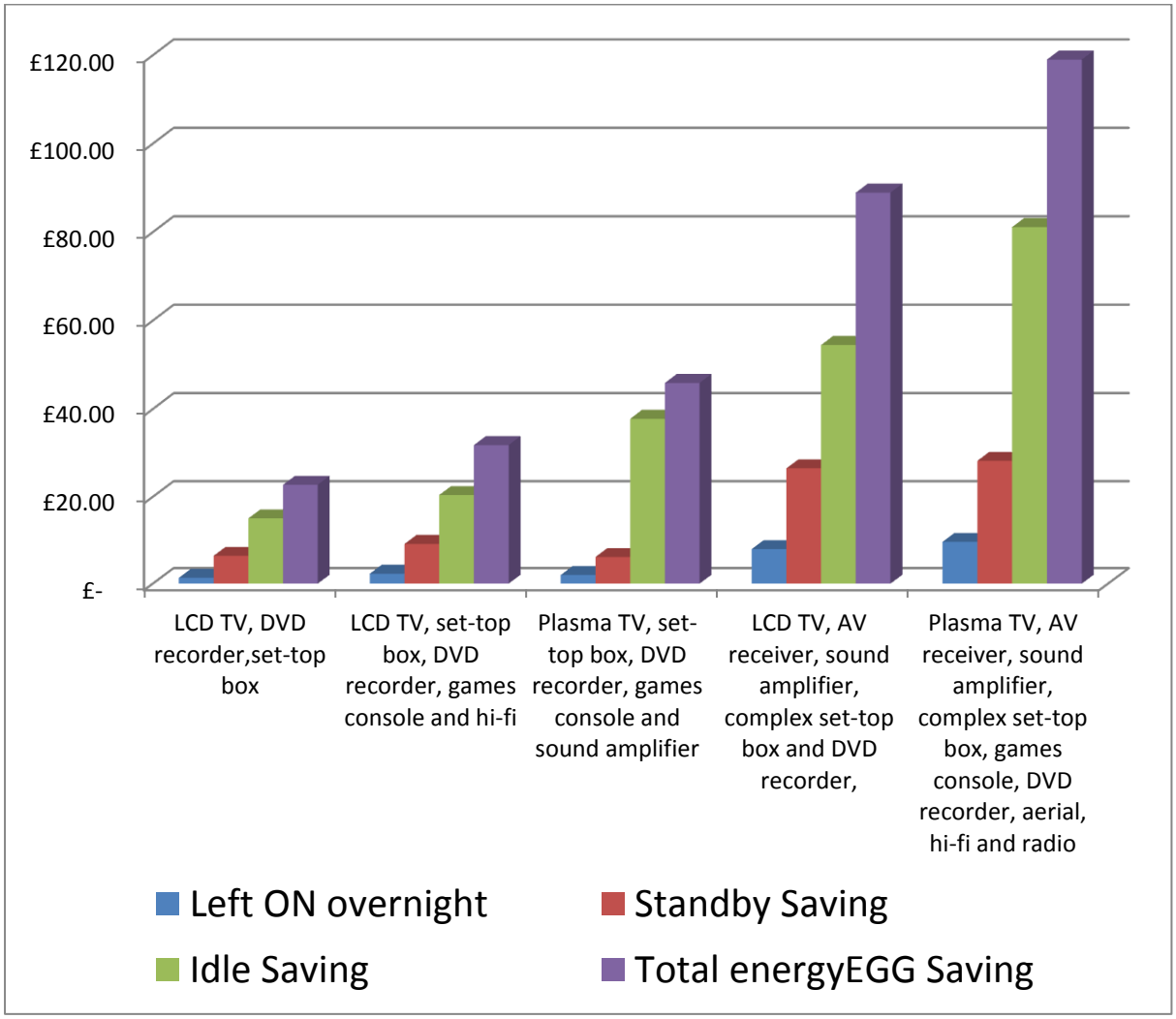
Appliances	Annual overnight cost – twelve nights per year (£)
DVD recorder and set-top box	1.34
Set-top box, DVD recorder, games console and hi-fi	2.29
Set-top box, DVD recorder, games console and sound amplifier	1.98
AV receiver, sound amplifier, complex set-top box and DVD recorder,	7.94
AV receiver, sound amplifier, complex set-top box, games console, DVD recorder, aerial, hi-fi and radio	9.62

energyEGG Cost Saving

Graph 1 (see below) outlines the potential cost savings achieved with an energyEGG used with a number of television peripherals, using the following assumptions:

- *All usage figures assume six hours per day of 'ON' time, as specified in the EST report. All savings data are therefore calculated as a proportion of the total annual running costs, from a baseline ON time of six hours per day.*
- *All annual running costs come from EST Powering the Nation report*
- *A standby cost, of 12.5% of the annual total, is included in the savings figures.*
- *TVs are not included in the 'Left on overnight' calculations*

Graph 1 energyEGG Savings



Graph 1 highlights that an energyEGG will pay for itself in all cases in under 24 months and, when used with the majority of entertainment hubs identified, will pay for itself in under 12 months. This is based on the energyEGG Solo pack, which retails at £39.95, and has a 3 year warranty. This has a power rating of 3kW and can have multiple appliances connected to it via an extension strip. The graph also shows that the cost saving potential from switching of idle appliance is more than twice that of switching of appliances in standby.

Lighting

The “Powering the Nation” report also states that 225W of electricity is the average power used for living room lighting. If we assume that lights are left on with the same frequency as appliances i.e. 1.41 hours per day, and use the kWh price used in the EST report (14.5p/kWh), then we arrive at a figure of £20.04 per annum for a living room.

Further rooms are shown in Table 3 below:

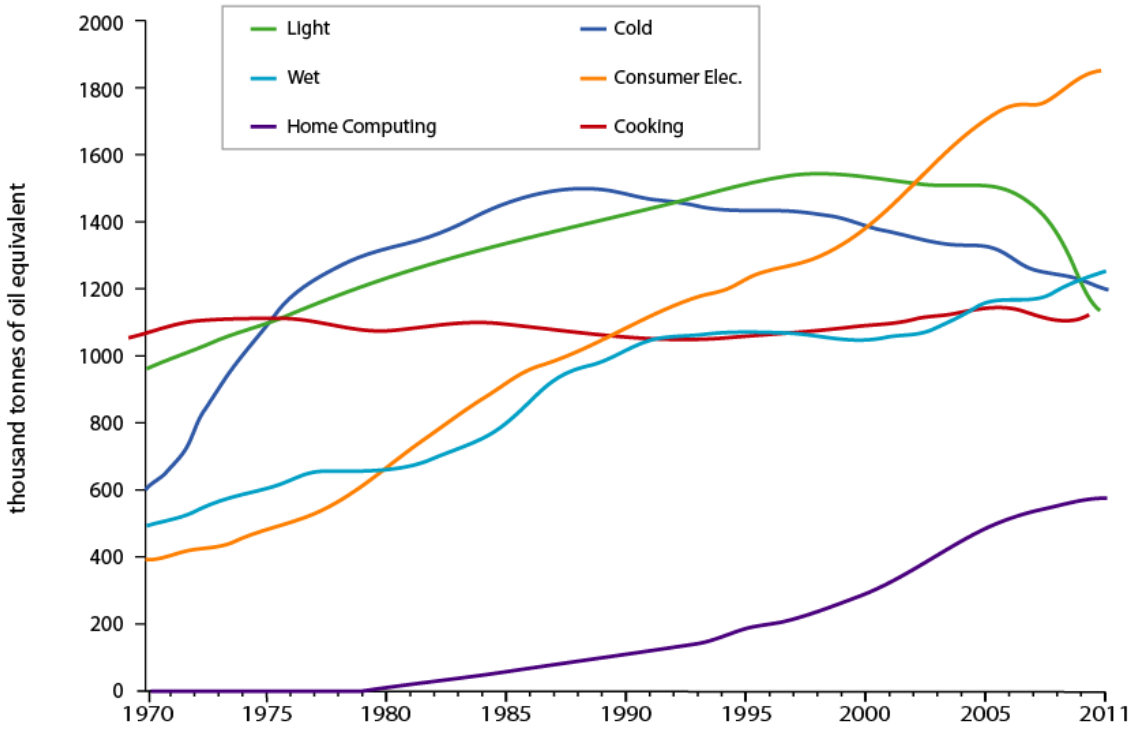
Table 3: Lighting savings

Room	Lighting in home (Watts)	Cost(£) per annum
Kitchen	249	22.18
Lounge	225	20.04
Dining	133	11.85
Bathroom	101	9.00
Bedroom	94	8.37
Office	89	7.93

Historical & Predicted Consumption Trends

As can be seen from Table 1 and Table 3, operating costs for lighting is less expensive than consumer electronics. This is reflected in the following graph from DECC, which shows that consumer electronics are responsible for an ever-increasing proportion of domestic energy consumption. In addition, lighting has recently fallen as new energy efficient technologies are available. However, the power consumption of consumer electronics and home computing continue to increase unabated.

Graph 2: Electricity consumption by household appliance, by broad type, UK, 1970-2011[1]

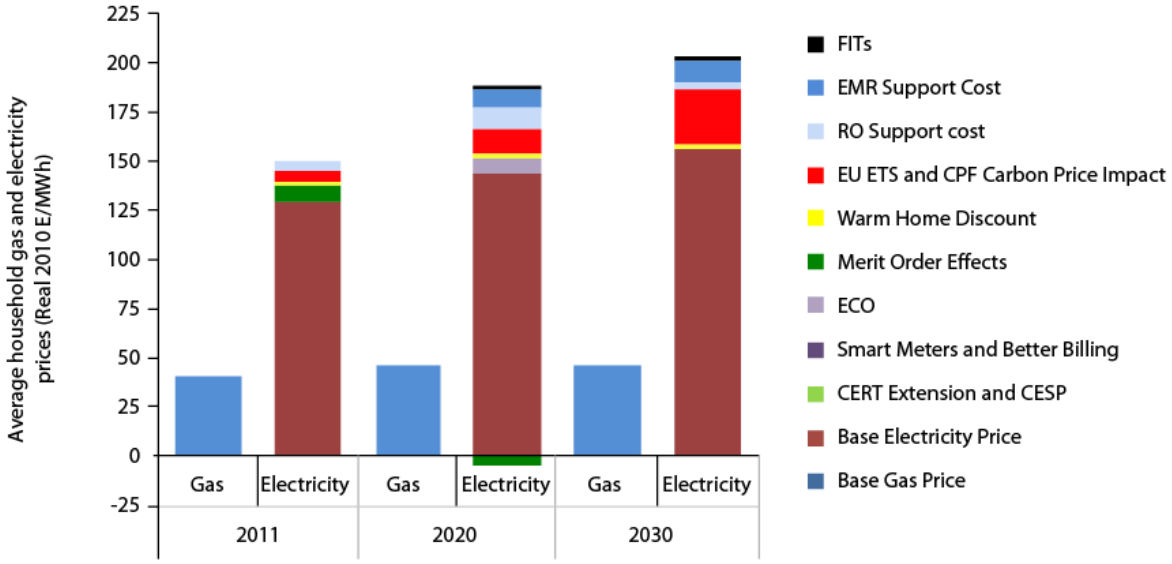


Electricity prices are also predicted to rise steadily over the next 20 years. The cost to the end user was £150/MWh in 2010, and will be closer to £180/MWh by 2020. Considering this

[1] http://www.decc.gov.uk/assets/decc/11/stats/publications/energy-consumption/2323-domestic-energy-consumption-factsheet.pdf

trend, it is reasonable to assume that wasted energy and the potential savings of an energyEGG will both increase over the next twenty years. See Graph 3:

Graph 3: Estimated impact of energy and climate change policies on average retail gas and electricity prices paid by UK households (including VAT)[2]



[2] http://www.decc.gov.uk/assets/decc/11/about-us/economics-social-research/3593-estimated-impacts-of-our-policies-on-energy-prices.pdf

Conclusion

The study has found that:

- 'Idle Time' is a major contributor to domestic energy waste
- It can be significantly reduced with the use of an energyEGG

The graphs from DECC indicate that energy prices look set to rise, and that consumer electronics are responsible for an increasingly large proportion of household electricity bills. These facts combine to indicate that the potential energy wasted through idle appliances is going to increase over coming years.

When used with an energyEGG, high end home entertainment systems and lights can achieve savings of up to £119. If, on top of this, lights are added, then the energyEGG could achieve an additional £20 of savings. This brings the potential annual **savings of an energyEGG device to £139**, at current electricity prices. This saving is set to increase significantly in line with rises in electricity costs e.g. SSE have announced a 9% increase in electricity costs for October 2012.

Our research indicates that appliances are left idle up to 28% of the time that they are switched on. The research suggests that idle time is twice as significant as standby in terms of energy efficiency.

Large amounts of energy are being wasted through wasteful consumer habits nationwide, that could be scaled back through a combination of energy saving devices and increased behavioural awareness. For example, if we apply a saving of £139 to the entire nation (across 25 million households, assuming one entertainment hub per home), we see a total net saving of over 9.5 kilotons of CO2 - equivalent to the output of 2.75 700MW power stations.

We recommend further study into occupancy sensing with consumption monitoring to provide a more definitive picture of nationwide user habits. It is important to gather more accurate data on the standby consumption of individual appliances and the idle time of individual appliances.

Quantifying the total cost of idle time, in terms of money and also carbon, could open up a new avenue of exploration for organisations that are looking to reduce energy consumption. Data on wasted electricity will become valuable as the public and private sectors continue to search for ways to reduce their carbon footprint.

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