



Electricity Consumption Around the Home

Posted by [Chris Vernon](#) on July 1, 2006 - 10:03am in [The Oil Drum: Europe](#)

Topic: [Demand/Consumption](#)

Tags: [electricity](#), [united kingdom](#) [[list all tags](#)]

The approaching [energy gap](#) will most acutely affect the electricity supply as nuclear plants are decommissioned, gas becomes scarce and environmental legislation closes older coal infrastructure over the next decade. I recently picked up a [Brennenstuhl](#) plug in power meter from eBay so I could quantify just where all those kWh were going and see what realistic potential there is for conservation.



The national energy debate tends to be focused on the supply side however it would appear the most effective actions (at least from the situation we find ourselves in now) are likely to be those focusing on the demand side.

I buy my electricity from [Ecotricity](#), which claim to invest the money they make in renewable energy projects. The [Which Green](#) league table supports that, reporting Ecotricity spending £117.19 per customer on renewable energy in 2005 compared with the next best spending just £16.98.

WhichGreen 2005 League Table		
Rank	Supplier	£ / Customer
1	ecotricity	£117.19
2	ScottishPower	£16.89
3	npower	£14.31
4	Scottish & Southern Energy	£3.81
5	Centrica	£3.25
6 =	EDF Energy	£0.00
6 =	Good Energy	£0.00
6 =	Green Energy UK	£0.00
6 =	Powergen	£0.00

Source: [Which Green](#).

My latest bill charged me 8.67p per kWh but there was also £12.87 quarterly standing charge making the actual cost for each of my 667 kWh used between 01 Feb and 30 Apr 2006 11.13p.

From that bill it would appear that I use an average of 7.4kWh per day at a cost of around 84 pence. Apart from the kettle, hot water is all heated with gas.

Some items have a single power rating that doesn't vary much, for example a light bulb, for items like that I've just listed that spot measurements. For some items the power consumption varies continually (computer, television) and other items have a discreet duty cycle where over a period of time they turn on and off (fridge).

The table below lists the manufactures stated figure (where easily available) and my measurements.

	Manufactures (W)	Standby (W)	Spot (W)	Variable (W)
25" CRT Television	137	14		88-104
14" CRT Television		20	40	
DVD Player			17	
Sky Digital Decoder		24	27	
VCR		7	14	
Stereo Amplifier			20	
Ikea DC Lamp		2	30	
Computer 1		22		180-270
21" CRT Monitor	135	27		85-95
Computer 2		10		83-90
17" CRT Monitor	130	30	98	
Laptop	75			28-62
Laser Printer	600	12	660	
Microwave (900W)			1150	
Fridge (A rated)	0.42 kWh/day			0.34 kWh/day
Freezer (A rated)	0.57 kWh/day			0.36 kWh/day
Kettle	3000		2870	
ADSL Wireless Router			9	
Phone Charger			10	
Total (w)		168		
Total /day (kWh)		4032		

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A little background information on the computers, computer 1 is an Intel Pentium 4 2.8C running at 3GHz with an ATI 9800PRO graphics card and four hard drives. Computer 2 is an AMD Duron 600MHz with a PCI graphics card and two hard drives. The laptop is a Pentium 4 M 2.0GHz.

The first point to note is the manufactures stated figures are on the high side, they should be taken as maximums rather than typical. Other than that the startling thing is just how much energy is consumed by devices on standby.

Of those measured the standby total comes to 168W, multiplying by 24 hours makes 4kWh per day. That's more than half my total electricity consumption! Just to sanity check that I've estimated some activity factors for the balance of power consumption between off/standby and consumption during usage and that totals less than 3kWh leaving a little bit extra for the compact florescent light bulbs, washing machine and a few other bits and pieces I didn't measure.

The potential here is enormous. If all ~20 million houses in the country are wasting 4kWh per day that's 29 TWh per year or around 7% of the countries total electricity consumption. Perhaps my house isn't typical (4 CRTs), my data does seem high compared to the 2000 Californian paper below but I doubt it's hugely atypical.

Looking at it another way this standby consumption represents 3.3GW of base load or 37% (29 TWh out of 80 TWh) of the output from the countries nuclear fleet. Over a third of our nuclear

fleet exists to serve the standby consumption of domestic devices? If commercial standby consumption was also considered (all the printers, photocopiers, monitors etc left on over night) I expect the figure would rise to over half of the nuclear fleet.

Perhaps this wouldn't be quite so alarming if it wasn't so avoidable. As far as I know there is no technical reason why any appliance can't have a standby mode consuming less than one watt. This is supported by the International Energy Agency's global initiative called the [One Watt Plan](#).

What is the IEA's 1-watt Plan?

In 1999, the IEA¹ proposed that all countries harmonise energy policies to reduce standby power use to no more than one watt per device. The proposal contained 3 elements:

- Participating countries would seek to lower standby to below 1 watt in all products by 2010
- Each country would use measures and policies appropriate to its own circumstances
- All countries would adopt the same definition and test procedure

The oldest item I own with a plug on it is around 12 years old so it is reasonable to expect that virtually all items with a plug could be replaced in less time than it would take to build the equivalent nuclear power stations to serve them.

There does seem to be movement in the right direction, unfortunately the improvements in standby consumption aren't happening fast enough with the common arguments of any UK unilateral action falling foul of EU trading legislation and the additional cost of manufacturing region specific versions of appliances. The low standby power consumption guidelines are currently voluntary.

In the meantime it would appear simple behavioural changes can have a dramatic impact. Turning appliances off at the wall when not in use would halve my electricity bill. To achieve widespread behavioural change however isn't easy, especially when electricity is just something paid for once a quarter and is still relatively cheap. Micro-generation and smart metering would help people both quantify their electricity usage and to understand where their power was going.

The numbers are clear, suggesting domestic appliances are responsible for wasting a large amount of electricity and supporting the argument it is easier to save a kWh than to generate one.

From one perspective there is also encouragement here since it shows just how much low hanging fruit there is, how much slack there is in the system, slack that we'll need to take up over the next decade so maybe it's a good thing it's there.

Further reading:

A paper entitled *Whole-House Measurements of Standby Power Consumption* was presented at The Second International Conference on Energy Efficiency in Household Appliances, Naples (Italy), September 2000.

Abstract:

We investigated the variation in standby power consumption in ten California homes. Total standby power in the homes ranged from 14-169 W, with an average of 67 W. This corresponded to 5%-26% of the homes' annual electricity use. The appliances with the largest standby losses were televisions, set-top boxes and printers. The large variation in the standby power of appliances providing the same service demonstrates that manufacturers are able to reduce standby losses without degrading performance. Replacing existing units with appliances with 1 W or less of standby power would reduce standby losses by 68%.

BBC News Online:

TV 'sleep' button stands accused 22Jan06

Britons waste the equivalent of around two power stations' worth of electricity each year by leaving TV sets and other gadgets on standby.

<http://news.bbc.co.uk/1/hi/sci/tech/4620350.stm>



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