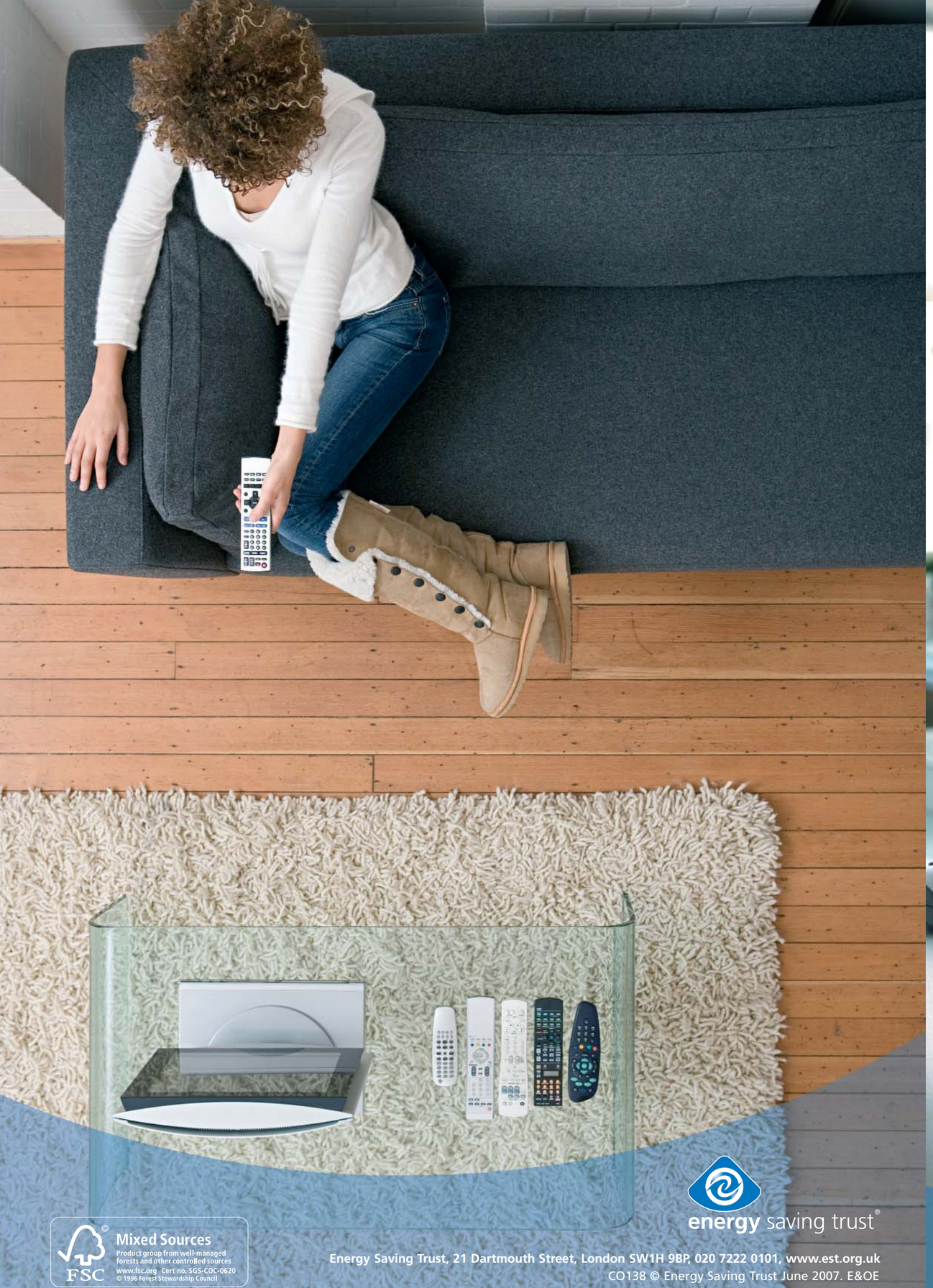
The ampere strikes back

How consumer electronics are taking over the world



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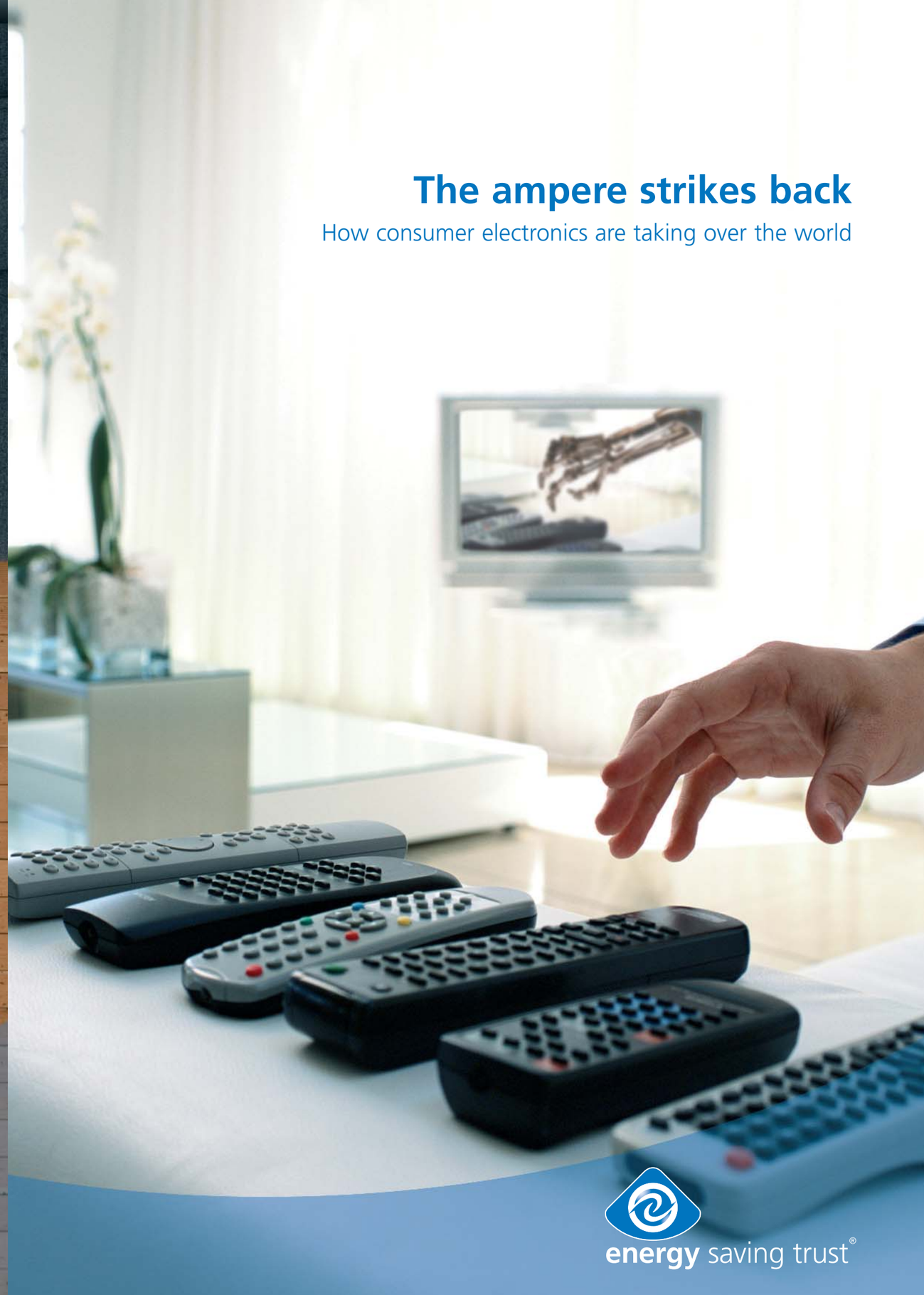

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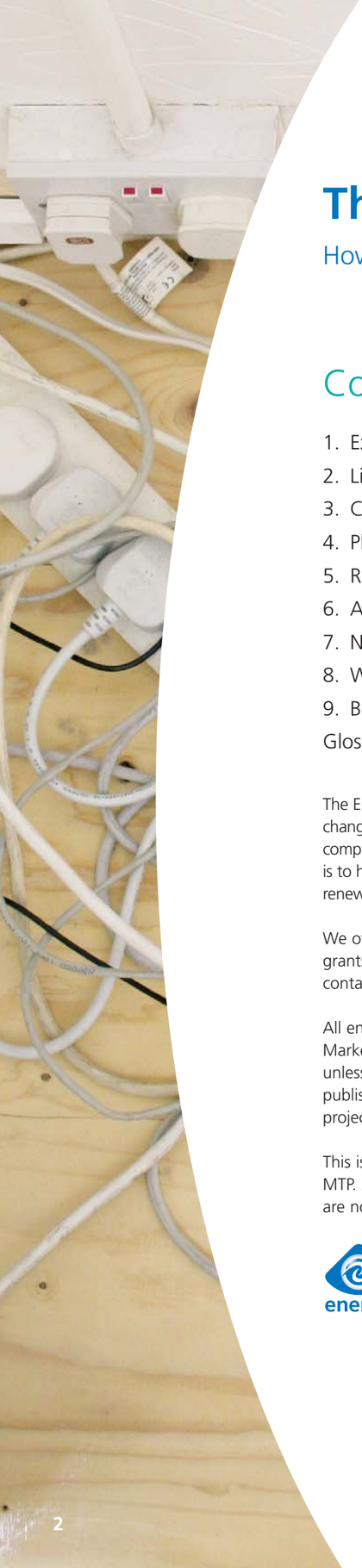

The ampere strikes back

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Contents

The Energy Saving Trust is one of the UK's leading organisations tackling climate change. Funded by Government and the private sector, we are a private limited company with offices in England, Scotland, Wales and Northern Ireland. Our purpose is to help reduce carbon dioxide (CO_2) emissions through energy efficiency and renewable sources of energy in the home, on the road and in communities.

We offer consumers free, impartial and expert advice on energy saving and grants via our network of Energy Saving Trust Advice Centres. They can be contacted by phoning 0800 512 012.

All energy consumption projections included in this report are from the Market Transformation Programme (MTP) 'What if' tool and other documents, unless otherwise referenced. All numbers and statistics were correct at date of publishing, however as many product areas are evolving, the numbers and projections are subject to continual review.

This is an Energy Saving Trust publication supported by information supplied by MTP. All views expressed in this report are those of the Energy Saving Trust and are not intended to represent the views of Government.

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MARKET TRANSFORMATION PROGRAMME
Supporting UK Government policy on sustainable products

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1.Executive Summary

In 2006, the Energy Saving Trust publication Rise of the Machines highlighted the issue of rising energy demand in the domestic sector. In particular it identified the increasing importance of the Consumer Electronics sector as the single most significant growth area of electricity consumption in the home.

Rapid technological advances and the plethora of new products mean that data about energy consumption and usage patterns for electronic products are often hard to come by.

This new report builds on the issues raised in Rise of the Machines, concentrating on the fast-moving Consumer Electronics (CE) and Information and Communication Technologies (ICT) sectors.

By 2010 the Consumer Electronics sector will be the biggest single user of domestic electricity, overtaking the traditionally high-consuming sectors of cold appliances and lighting. Furthermore, by 2020 the combined CE and ICT sectors are expected to use 49 TWh of electricity, compared with around 110 TWh for domestic appliances as a whole (excluding electric heating). That means that entertainment, computers and gadgets will account for an extraordinary 45 per cent of electricity used in the home and will need the equivalent of 14 average sized power stations[1] just to power them.

Just why have consumer electronics and computers become such a drain on the nation's energy supplies?

- New, more sophisticated and 'higher spec' versions of electronic gadgets tend to consume more electricity than the products they replace. This contrasts with trends in new versions of other domestic appliances, such as fridges and washing machines that are usually more efficient as they develop and evolve.
- It's easy to leave electrical products switched on 24 hours a day, 7 days a week. Standby functions tend to be used more frequently than the 'off' button. Indeed, some products no longer have a manual 'off' switch, making it impossible for users to switch off the gadget, except at the wall socket.
- Products are used in ways undreamt of just a few years ago. For example, digital television (which can in itself be two products: a set-top box and a TV) may be used to listen to digital radio stations. What used to be a low-energy exercise of listening to the radio is now a highly energy-intensive one.

The Ampere Strikes Back addresses these issues, concluding with a glimpse into the future of the Consumer Electronics sector. The Energy Saving Trust is committed to helping consumers make the best, most energy efficient choices when shopping for electronic equipment. This is our contribution to the debate.

By 2020, entertainment, computers and gadgets will account for an extraordinary 45 per cent of electricity used in the home.

1 Assumes a 700 MW Combined Cycle Gas Turbine (CCGT) power station

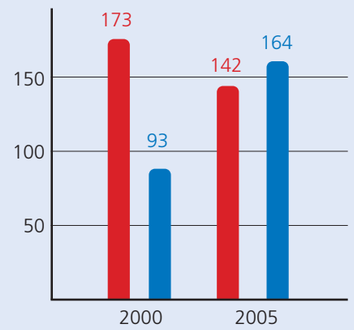
2.Living in the ICE age

Over the past two decades, the western world has seen a revolution in the popularity, variety and use of electronic entertainment and communication products in the home. You could argue that we are currently in the midst of a new ICE age!

Information
Communication
Entertainment

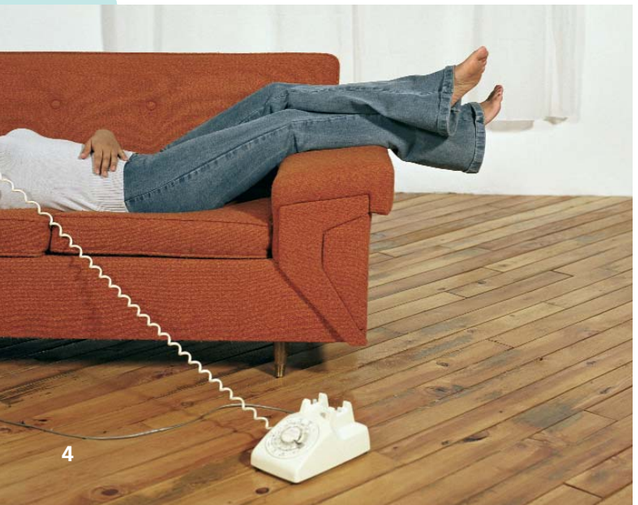
And yet, with climate change and global warming being the dominant concerns of the day, it seems perverse that this ICE age could be heating things up, not cooling them down.

Electronic devices in the home have liberated many people from the drudgery of daily life. Since the Second World War the amount of time that people spend on household chores has diminished significantly. And recently that trend has speeded up. Although historical statistical studies are few, figures from the Office of National Statistics (ONS) show that between 2000 and 2005, people spent less and less time on domestic chores[2] with just over two hours a day (142 minutes) in 2005 compared with nearly three hours (173 minutes) in 2000. Correspondingly, leisure activities are getting more attention, rising from 93 minutes a day in 2000 to 164 minutes in 2005[3].



Graph 1: A comparison of housework hours vs. leisure hours in 2000 and 2005.

Much effort and ingenuity was devoted to the development and marketing of labour-saving domestic products in the period after the war – and consumers were quick to take advantage. By 2004[4], just about every household owned a vacuum cleaner and microwave, more than half had a tumble dryer or washer dryer and dishwashers were making significant headway towards kitchen domination.



2 Defined as: cleaning, cooking and other household type activities – ONS categories from 2000 and 2005 domestic chores studies

3 From Office of National Statistics 'Time Use survey: How we spent our time in 2005' http://www.statistics.gov.uk/articles/nojournal/time_use_2005.pdf

4 All percentages sourced from DTI table: 'percentage of households owning domestic appliances 1970-2004' http://www.dtistats.net/energystats/ecuk3_12.xls

5 1977 was the first year that microwaves were recorded in this data set

6 The percentages for these 2 products have been added together with the assumption that households would not own both appliances

Labour saving device	Increase in ownership 1970-2004
Dishwashers	1 per cent in 1970 to 26 per cent in 2004
Microwaves	<1 per cent in 1977[5] to 84 per cent in 2004
Tumble dryers/washer dryers[6]	<1 per cent 1970 to 55 per cent in 2004
Vacuum cleaner	80 per cent in 1970 to 100 per cent in 2004

By 2005, the third most popular activity carried out by people in Great Britain, after sleeping and working in their main job, was watching TV/videos/DVDs or listening to music. Taken together, these three activities account for more than half the day[7] of the average person today, according to the ONS.

Luckily for the increasingly under-utilised homeowner bereft of cleaning, cooking and washing duties, the entertainment and IT industries have stepped into the void. Much research and development has been devoted to the invention of ever more ingenious gadgets and devices to enable people to happily while away the hours. The combination of increased leisure time mixed with technological advances and lower costs has led to a revolution in gadget ownership and usage. [See Table 1 opposite]

This all adds up to a substantial number of gadgets devoted to ICE age activities which would have been unheard of 20 or 30 years ago. Indeed, if we cast our minds back to the mid 1970s, the only similar products in common use in the home then were: a TV, radio, camera, 'Hi-Fi' sound system/cassette player and the telephone.

Even a cursory glance at this gadget list indicates where much of the UK's rising domestic energy demand is coming from. And this is at a time when other, traditionally high energy consuming, household appliances have embraced technological developments to improve energy efficiency[9]. Not only are there many more devices in the typical home, but many of them are in a permanent state of readiness to swing into action and entertain their owners. Some, such as Sky+, have to be on constant standby to receive software downloads – and you certainly can't turn them off if you have scheduled them to record a TV series. Other products have 'idle', 'standby' or 'sleep' modes, providing a temptation to not switch them off at all. By 2020 it is projected that Consumer Electronics products, combined with ICT equipment, will make up an extraordinary 45 per cent of all appliance related electricity use in the home[10].

By 2020 it is projected that Consumer Electronics products, combined with ICT equipment, will make up an extraordinary 45 per cent of all appliance related electricity use in the home.

7 13 hours and 38 minutes out of the 24 hours available

8 Typical modern working household: for the purpose of this illustration, consists of: 2 adults, 1 full-time employed, 1 part-time employed, 2 children, 1 teenager, 1 pre-teen. Please note: this is for illustrative purposes only to encourage debate. It should not be considered statistically robust.

9 For example, the 'cold' (fridges, freezers, etc) sector is forecast to reduce consumption from 14.9 TWh (in 2010) to 12.9 TWh (in 2020) in the reference line scenario of the MTP 'What If' model, this reduces even further (12 TWh in 2020) if all policy interventions are successful. MTP Policy Brief: UK Consumption of Wet Appliances, update 18/09/2006. Indeed, consumption due to cold appliances have been constantly falling since 1998 (DTI statistics http://www.dtistats.net/energystats/ecuk3_10.xls)

10 Sustainable Products 2006: Policy Analysis and Projections. Total excludes electric heating and gas cooking figures (which are bundled under general cooking appliances energy consumption figures)

Today's typical working modern household[8], is likely to contain many of the following ICE age gadgets:

Fill in the boxes to see how your home compares.

Gadget	Quantities	Found in:	Your home
Television	2-3	Lounge, kitchen bedroom(s)	
Video cassette recorder	1	Lounge, bedroom(s)	
DVD player or recorder	1-2	Lounge, bedroom	
Set top box/digi box/satellite or cable television receiver	1	Lounge	
Music sound system	2	Lounge, bedroom	
Mobile phone	3	Various	
MP3 player	1-2	Various	
Computer (PC or Mac)	1	Bedroom, study or communal space	
Laptop	1	Various	
Printer	1	Bedroom, study	
Scanner/fax	1	Study	
Cordless phone and handsets	3	Lounge, kitchen, bedroom	
Answering machine	1	Lounge, hallway	
Games console	1	Lounge, bedroom	
Broadband modem/router	1	Various	
Digital camera	1	Various	
Camcorder	1	Various	
Radio	2	Various	
		Total	

Table 1: Example of 'typical' modern home and the number and type of gadgets available

We now return to our ICE age proposition model and unpick what this looks like in 21st century society:

Information
The Internet has changed the ways by which people send and receive information forever. In 1982 just three per cent of the population owned a personal computer. By 2004, over 60 per cent[11] of UK households had at least one PC. At the same time printer ownership has risen from almost nothing (0.7 per cent) in 1983 to 58 per cent in 2004.

It is hence unsurprising that the total energy used by computers and associated equipment has leapt in recent years. Energy use for the whole of the ICT sector[12], doubled between 2000 and 2006. By 2005, almost a tenth (9 per cent or ~11 TWh) of total domestic electricity was used by computers and their peripherals[13]. Consumption is expected to increase by a further 30 per cent between 2006 and 2020. This is not only due to the continued growth of the home computer market, but also due to the increases in performance required for the latest more energy-intensive games, software and operating systems.

Communication
For the purposes of this ICE age model, the term communication refers to fixed and mobile telecommunication devices. Phones, in other words.

Mobile phones have transformed the way people communicate. Today they are small, neat and affordable – a truly multifunctional device that combines camera, games, music and mobile email and internet. An increasing habit that people are adopting is to plug in their mobile phones each night[14] even if not necessary, (a process that in itself can shorten the battery's lifetime). If all mobile phone users did this, it would equate to approximately 0.3 TWh per year for phone charging alone.

In 1985, the first year for which statistics were collated, just 0.6 per cent households owned a mobile phone. By 2004, almost every home had one (96 per cent). There were 63 million live[15] mobile phones in circulation in the UK[16] in 2006. As there are approximately 26 million households in the UK, and mobile phone penetration stands at about 96 per cent, this equates to an average of ~2.5 mobile phones per household.

Entertainment
Home entertainment is big business. Worryingly, it is also the single biggest source of growth of domestic electricity use in the UK.

Although most homes already have television sets, audio equipment and DVDs, demand appears to be insatiable. What was a £5 billion market in 2005 is projected to rise to £6 billion by 2010[17], even as prices of many products tumble. In short, we can't get enough of consumer electronics – the UK buys more of them than any other European country.

Although ownership of some of these products is almost universal – think of the humble television set – it is the incremental improvements to the devices that seemingly reinvents them and fuels further demand. Where once there was a bulky machine with a cathode ray tube consuming just over 100 watts of power when in use (and about three watts in standby), now there's a much larger flat plasma screen using up to three times the power when in use. Happily, the industry is making strides to improve plasma technology, with the newer generation of plasma screens becoming more energy efficient. Nonetheless, where 30 years ago, families were content to gather round the TV in the lounge, few modern households own only one television set.

Contrary to popular modern myth, LCDs, size for size, are not much less energy intensive than plasma screens. But, being generally smaller than plasma screens, they tended to consume less energy overall. The TV world has changed, though, as technological progress has resulted in ever-larger LCD screens and hence increasing energy consumption.

11 63.5 per cent of households owned a personal computer in 2004. Stats from DTI ownership statistics: http://www.dtistats.net/energystats/ecuk3_12.xls

12 Otherwise formerly known as 'grey goods', the Information and Communication Technology (ICT) sector includes: desktop personal computers (PCs); monitors; laptops; printers (impact, laser, inkjet); and multi-functional devices (MFDs).

13 MTP Policy Brief: UK Energy Consumption of Domestic Information and Communication Technology (ICT) Equipment published 12/12/2006

14 EST research on mobile phone chargers has show that a recharge takes, at maximum 2 hours to complete, hence the rest of the night the charger is in a 'no load' charging state. Approximately 6 hours per night.

15 Both contract and pay-as-you-go

16 Telecommunications market data tables Q3 2006, Ofcom

17 Datamonitor: Consumer Electronics in the UK – Industry Profile

Ownership of mobile phones has grown exponentially over the last 20 years: 0.6 per cent of households owned a mobile in 1985 (first year of recorded ownership figures) rising to 96 per cent in 2004.

Single occupied dwellings are thought to account for almost 70 per cent of the rise in household numbers in England between 1996 to 2016.

The Bridget Jones generation

Divorced. Widowed. Unmarried. The single-person household is taking its toll on energy use. In the 20 years up to 2016, there is predicted to be a significant rise in the total number of households in England. And 70 per cent of that increase will consist of people living alone[18]. By sharing heating, cooking and appliances, larger households in general use less energy per head than smaller ones. This demographic change has serious implications for energy use.

As an example, the young, rich, professional singleton, who can afford to be an 'early adopter' of all this new, exciting technology, and spend a significant amount of their leisure time using them, will find a larger and larger chunk of their home electricity bill will be due to ICE age activities. The illustrative example, featured at the end of this report, shows the potential cost of running these gadgets.

Similarly, a typical teenager's bedroom is analysed and running costs of the most popular items calculated. The resulting annual cost to power these products might come as a bit of a shock to parents throughout the land.

The increasing numbers of single householders, stereotypically the young professionals who are 'early adopters' of, the latest ICE gadgets and products, will ensure that the demand for ICE products will not diminish in the near future.

18 Holman A, 2001 Housing demand and need in England 1996-2016. Town and Planning Association

3. Cinema Paradiso – Televisions and set-top boxes

Televisions
One of the major success stories for electronics manufacturers and retailers, over recent years, has been the exceptionally buoyant sales of 'flat screen' TVs. Sales of these products have seen rapid growth [see Graph 2] with a significant milestone reached in 2006 when sales of LCD TVs overtook CRT[19] sales for the first time, this emerging trend being strong enough to encourage some retailers to discontinue sales of CRTs. Indeed, the John Lewis partnership was one of the first to implement this by discontinuing sales of CRT models in 2006.

Last year's football World Cup ensured that sales of large flat-screen TVs went through the roof in early summer, but notably there has not been any significant downturn since then.

The UK market for TVs seems to be driven by a combination of high consumer spending and the increased levels of innovation. The idea of 'obsolescence' (of older, non digitally integrated TVs) is also gaining ground and providing a powerful driver due to the imminent 'digital TV switchover' that is timetabled to take place between 2008 and 2012[20]. This is the process of changing the UK's entire television broadcasting service from analogue to digital. Digital switchover will involve converting the current television broadcasting network, and will necessitate everyone converting or upgrading their existing TV and recording equipment in order to be able to receive digital television signals.

In 2005 televisions accounted for 9.6 TWh of domestic electricity consumption[21], amounting to around 8 per cent of total domestic electricity use in 2005. By 2020, the total UK electricity consumption of Consumer Electronics style equipment is projected to reach 34 TWh, and, shockingly, it is projected that televisions will consume an estimated 16 TWh per year by then, i.e. almost half of the total energy consumed by the entire CE sector[22] will be used to power TV sets alone.

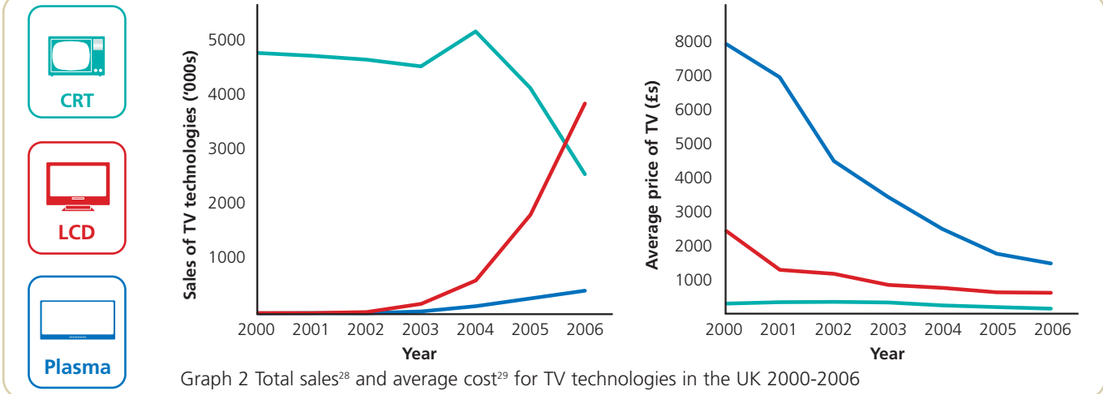
In addition, although the 'standby' mode of TVs consumes far less energy than the 'on-mode' (typically 1-4 watts 'standby' compared to 100(s) of watts 'on') the combined standby consumption of UK TV stock represents a significant proportion, 8.6 per cent, of total TV consumption, simply due to people not switching off their TVs when they finish watching[23]. By 2020, this could amount to ~1.5 TWh, i.e. 1.4 per cent of the total domestic electricity consumption of appliances[24] just to keep that ubiquitous red dot illuminated.

Apart from the initial, relatively large (but falling rapidly), purchase price[25] of new flat screen TVs, anything from about £600 for a small screen (28-32 inch) LCD through to £1.5k for a medium sized (30-40 inch) plasma and to a gigantic £8k for a 65 inch home-cinema sized plasma screen, the running costs of these TVs can be as much as three times the amount of the smaller (typical sized CRT) TVs they are replacing. This can add up to £90 (cf. around £30 for a CRT) to a typical household electricity bill in today's prices[26].

19 CRT = Cathode Ray Tube TVs – the traditional TV technology
20 http://www.digitaltelevision.gov.uk/
21 Total domestic electricity consumption in 2005 was ~117TWh
22 MTP Policy Brief: UK Energy Consumption of Domestic TVs. Update version 05/02/2007
23 MTP BNTV01: Televisions, future stock and energy trends V3 30/05/07
24 Taking 110 TWh as the electricity demand of household appliances (excluding electric heating) in 2020
25 2006 average prices taken from GfK data 2007
26 10.41p/kWh – EST average electricity price Autumn 2006

The combined standby consumption of UK TV stock represents a significant proportion, 8.6 per cent, of total TV consumption, simply due to people not switching off their TVs when they finish watching.

UK households will have an average of 2.6 television sets by 2020.



Graph 2 Total sales[28] and average cost[29] for TV technologies in the UK 2000-2006

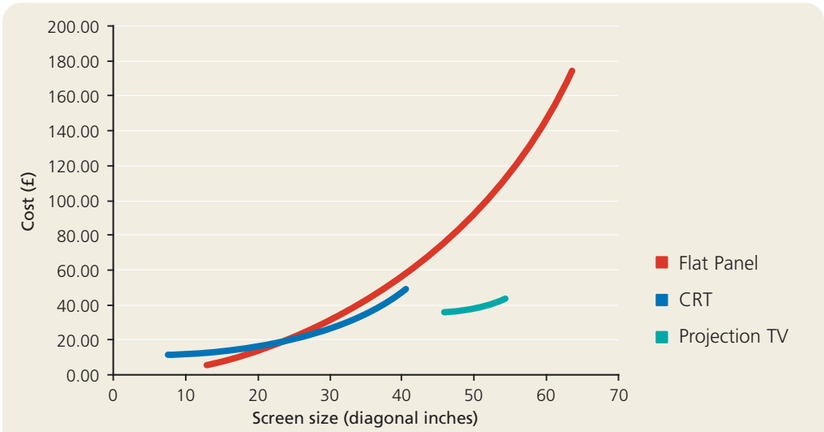
Indeed, the largest domestic plasma TV on sale in the UK today has a whopping 103 inch screen size, and has an on power rating of 1.5 kW – that's the equivalent of simultaneously running twenty-five typical lightbulbs[27] in your living room. Although with a current retail price of £50,000 it is not expected to become a best seller.

The scale of the market development over the last 6 years is astounding. Graph 2 above shows the growth in the market for LCD and plasma screens in terms of volume of sales, and also highlights the rapidly decreasing purchase price within the technology types.

Even generally, total sales of TVs have seen a dramatic 15 per cent rise between 2004 and 2006. This is somewhat surprising in a previously considered 'mature stage' market, where there is high and steady penetration in the domestic sector. Indeed the penetration of TVs has been at 90 per cent since the 1970s, rising to 98 per cent by 2003.

A proportion of this increase can be explained by the recent large reductions in relative price of these hitherto 'luxury' items. See Graph 2 for the relative cost of LCDs, plasmas and CRTs over recent years. The decrease in cost is bringing the possibility of ownership of these appliances into the realm of the average consumer (although they are still a very high value item), and that average consumer is eager to own these 'aspirational' products, without much thought to the ongoing running costs. This trend has potentially serious consequences for both household energy bills and CO_2 emissions.

If we consider the average energy consumption of these various TVs, whilst noting that it is difficult to compare 'like with like' due to the different size profiles of the diverse technologies, we can see there is a wide range of running costs. This ranges from about £30 per year for an average sized CRT, to around £90 for a larger flat screen TV.



Graph 3: Running costs of different TV technologies

Digital television adaptors accounted for some 2.5 TWh of electrical consumption in 2005

From: MTP Policy Brief: UK Energy Consumption of TV Digital Adaptors

27 60 watt incandescent lightbulb
28 All sales data from GfK 2007
29 All average price data from GfK 2007

Set top boxes

By 2012, all UK households will need a digital television adaptor if they are to continue to watch television. New televisions are increasingly beginning to feature a built in digital receiver which can decode terrestrial digital signals, known as Integrated Digital TVs (IDTVs). Older televisions will need a separate 'set-top box', as these adaptors are commonly known, if they are to receive cable, satellite or digital terrestrial channels.

An idea of the extra electricity demand required can be estimated if we consider the scenario that every existing TV set in the country[30] – an estimated 70 million – needed a separate set-top box to function. These boxes[31] consume, on average, 7.1 watts when on and 6.4 watts in standby. The resulting power requirement would mean the country would need an extra 1 TWh of electricity a year just to continue to watch television. Video and DVD recorders will also need an adaptor if they are to record one digital channel whilst simultaneously watching another. Already 18 million digital adaptors are in use in the UK. By 2020, it's projected that over 80 million will be in the UK homes.

Cathode Ray Tube Televisions

The cathode ray tube (CRT) system was, until the late 1980s, virtually the only television display technology in common circulation and still dominates the UK stock to this day.

The heart of a CRT system is the cathode ray tube itself which consists of an evacuated and sealed glass tube similar in appearance to a large domestic funnel.

The analogue nature of the CRT system has both strengths and weaknesses. While capable of producing extremely high quality and precise television pictures, the size of the electronics and the length of the tube required means that the scope to reduce the size of the CRT cabinet is limited. Unfortunately, bigger screen sizes require longer CRT tubes and screen sizes in excess of 36 inches require cabinets of sizes not deemed acceptable by consumers.

Plasma TVs

Plasma screens consist of a matrix of cells sandwiched between two glass panels, containing a mixture of xenon and neon gas. Electrodes in front of and behind the cells convert the gases into a plasma which excites a layer of phosphor material, displaying a picture on the screen.

The main attraction of plasma screens is that they are capable of producing very good quality pictures with a large screen size – typically over 40 inches but as big as 60-80 inches in some of the larger models. And indeed the largest domestic screen available is currently 103 inches.

The absence of any 'tube' means that they can be housed in a case as slim as 12-15cm depth. Despite this slim profile, they can be quite weighty (usually due to the metal chassis needed to support the delicate glass screen).

LCD

Liquid Crystal Display (LCD) screens exploit the ability of some materials to alter their crystalline structure when a voltage is applied, changing from being transparent to opaque.

Technical issues have until recently limited the size of these screens, but as manufacturing processes improve, screen sizes have begun to creep upwards and prices fall.

LCD screens are starting to rival plasma displays in terms of their picture quality at larger sizes. They now have similar size profiles to plasma displays but often are a fraction of the weight. Their potentially longer lifetimes and lower prices make them more attractive to the consumer.

30 Please note: this is a worst case scenario estimation, as there are a number of IDTVs in circulation today, and future sales of TVs will more commonly include the digital receiver function as standard

31 These estimates are based on the 'simple' set top box, i.e. Freeview and similar, not the more complex boxes such as Sky+ and Virgin, which generally consume more energy than the simple versions

Projection TVs

For the very biggest screen size, a television projector projects pictures across a room onto a screen. These projectors are often based on LCD or DLP (Digital Light Projection) technologies and are capable of displaying images several metres wide.

Unlike plasma and LCD televisions, there is no direct relationship between screen size and energy consumption. Large or small, they use about the same amount of electricity, so the largest are relatively very efficient in terms of watts per centimetre of screen.

The number of adapters in the UK is set to increase from around 13 million to over 80 million by 2020, consuming an estimated 13 TWh. This is expected to result in a 400 per cent rise in the energy consumption by these products (over 2005 levels).

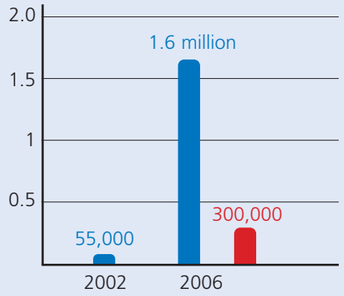
From: MTP Policy Brief: UK Energy Consumption of TV Digital Adaptors

4. Planet of the Tapes

The video recording equipment and digital television recorder sector includes ‘traditional’ Video Cassette Recorders (VCRs), Digital Versatile Disc (DVDs), DVD-Recordable (DVD-R) and Personal Video Recorder (PVR) technologies.

In 2005, the energy consumed by recording equipment was 2.1 TWh. By 2020, domestic video recording equipment is expected to consume an estimated 3.8 TWh per year[32], approximately 10 per cent of the total energy used by Consumer Electronics equipment.

On a more positive note, in the longer term past 2020, the rise of personal video recording (PVRs) equipment will begin to reduce the total amount of energy consumption, as the technologies become more efficient. As the sector migrates towards recording directly onto a hard drive, fewer resources are needed for the production of video cassettes and DVDs.



Graph 4: DVD-R sales in 2002 and 2006. PVR sales in 2006.

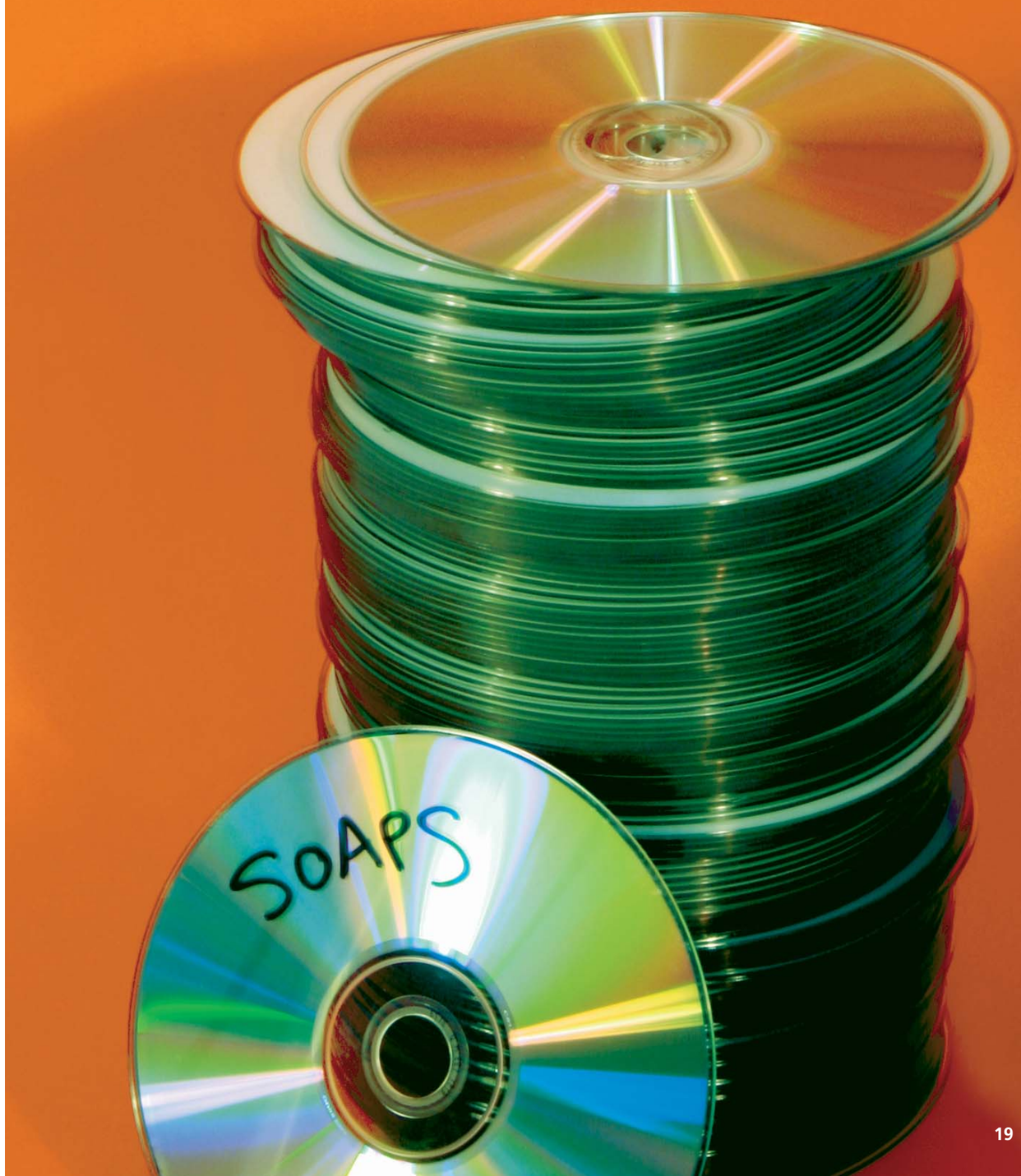
VCRs reached a peak in terms of sales in the year 2000, and have been steadily decreasing ever since; whereas DVD sales reached their peak in 2005, and 2006 saw the first year in which sales did not exceed the previous year’s. DVD-Rs have taken off where DVD sales have dipped, and have risen from 55,000 in 2002, the first year of popular release, to over 1.6 million sales in 2006[33]. The new boy on the block, the PVR, in 2006 had sales of around 300,000 units, more than double the previous year.

The introduction of new recording technology into the home could have significant consequences for energy use should the old devices not be disposed of. For example, as households acquired new TV sets, the tendency was for the older set to go into another room, often the bedroom. If this pattern is repeated with video and DVD recorders – machines that are often left on standby in order to make use of the time-shift recording function – household electricity bills could rise needlessly. Furthermore, with the TV digital switchover, many of these devices will be rendered useless unless they are attached to digital set-top boxes. The danger is a doubling of devices, spurred by a combination of recording equipment upgrades and analogue obsolescence.

32 MTP Policy Brief: Energy Consumption of Domestic Video Recorders

33 GfK sales data 2000-2006

DVD-Rs have taken off where DVD sales have dipped, and have risen from 55,000 in 2002, the first year of popular release, to over 1.5 million sales in 2006.



5. Radio Ga-Ga

Digital radios have been one of the biggest-selling consumer products of the past five years. From a standing start in 2000, sales were just short of two million units (a value of £154 million) in 2006, driven by superior sound quality, dozens of extra channels and rapidly falling prices.[34]

With digital radios now starting at about £50 and UK penetration far from saturated, sales are expected to continue to rise. With this rise will come a surge of domestic energy use, as many owners find that the product is in a continual state of standby unless turned off at the socket. They also use far more power than their analogue forebears.

Unlike TV broadcast, there are no current plans in the UK to switch off analogue radio and switch solely to digital, but, regardless of this, sales of digital radios are predicted to rise steadily over the coming years and pundits predict that it is only a matter of time before the UK government announces an intention to switch to digital airwaves.

Traditional analogue radios have an average on-power consumption of two watts, but digital radios consume, on average, more than four times this amount (8.5 watts)[35]. The residual power used when the digital radio is ordinarily considered 'off' (i.e. switched off at the unit itself), averages five watts[36], for the digital models tested, compared with less than one watt for analogue models. This power consumption whilst apparently 'off' is particularly worrying because, just as in the case of the External Power Supply unit[37] (EPS) 'no load'[38] consumption, it serves no useful function, and, annoyingly for the user, this consumption can only be avoided by switching the radio off at the wall – a practice that few digital radio listeners would ordinarily deem necessary.

People who listen to a digital radio for three hours a day, switching it off at the unit (but not at the socket) for the remainder of the time increase their energy consumption by over 300 per cent compared to analogue listening.

If every household in the country switched to digital radio and had a similar listening time profile, the added burden to energy demand would be over 920GWh a year, equivalent to the electricity required to power around 225,000 homes.

There is some good news however. 'Best in breed' digital radios tested had an 'on-power' consumption of 5.4 watts and 0.9 watts when turned off. Hence it is not beyond the technical capability of the manufacturers to increase the efficiency of these digital sets.

34 All sale and cost figures from GfK 2007.

35 Results taken are an average of all results from Intertek testing of 17 digital Radios for Which? 2006, and 10 analogue radios for EST Dec 06

36 Interestingly, even the analogue radios were found to have a residual power consumption in 'off' mode, but in this case its average was <1 watt.

37 The power supply units most commonly used with mobile phones, MP3 players, etc.

38 The residual power consumption of the power supply plug when not actively charging/powering anything, but switched on at the wall socket

A typical non digital radio has a on-power consumption of 2 watts, this compares to an average 'on-power' rating of 8.5 watts for a current digital variety.

Power consumption of listening to the radio through a digital television is generally between 10 and 20 times more energy intensive than listening to radio programmes through a digital radio.

Video killed the radio star

One extremely energy-intensive trend is the emerging practice of listening to digital radio programmes through the TV. To achieve this, both the set-top box and the TV, or the integrated digital TV, have to be switched on. Tests conducted by EST (see Table 2 below) have shown that the resulting power consumption is generally between 10 and 20 times more intensive[39] than listening to radio programmes through an average digital radio.

However, there is a way to enjoy digital radio over the television without using the maximum consumption necessitated by keeping the TV and set-top box on, although it is not yet widely available. 'Screen blanking' allows the selected channel to be received in audio only, reducing the amount of power needed by around 75 per cent. Only one manufacturer, Sony, has incorporated this technology into UK models, which is more prevalent in mainland Europe. Freeview owners can implement a blank screen whilst listening to BBC stations, which can cut energy consumption by more than half.

Recent research[45] has shown that around 40 per cent of people listen to radio stations through their TV sets. If we assume a three hours per day listening pattern, and use a 100 watts energy consumption figure, this equates to an extra energy load of ~1.7 TWh per year as opposed to the same number of people listening to the radio through their digital radio sets.

This is an enormous unnecessary extra energy demand that can be lessened through:

- making people aware of the high energy intensity of listening to radio in this fashion, and urging them to listen through a digital radio or stereo unit (with a set top box adaptor attached) instead
- pressure applied to the television manufacturers to enable the 'screen blanking' feature in all their TV models and ensure that this service is highlighted clearly in the instruction manual that is delivered with the TV set.

TV technology	Power consumption (watts)		
	(Freeview[40] with picture)	(Freeview with BBC black screen)	(Freeview with TV screen blanking)
28" CRT[41]+STB	110	102	N/A on model
26" IDTV LCD[42]	114	60	N/A on model
32" LCD[43]	105	104	24
50" Plasma[44]	183	86	N/A on model

Table 2: A comparison of energy consumed whilst listening to radio through various TV technologies

39 Comparing listening to an average 8 watt digital radio, to the smallest and largest wattage for the TVs tested.

40 Similar tests run with a Sky+ box rather than the Freeview box produced similar results.

41 28" conventional CRT (no digital processing) connected to an external set top box. Both models were popular brands in past years.

42 This size is gaining popularity in the LCD market. This was a fairly recent IDTV from a leading manufacturer, hence a better quality than many on the market.

43 A very recent, top quality model that boasted low energy consumption and featured a special screen blanking feature.

44 This is a recent example of a mid-priced plasma.

45 Rajar research on digital radio listening, results for Jan-Mar 2007, http://www.rajar.co.uk

6. Attack of the Phones

Mobile phones have changed the way in which people communicate and are now ubiquitous throughout the UK, with 96 per cent of the population owning a handset in 2004[46]. Live contracts[47] now number 63 million, hence there are now more mobile phone contracts than there are people in the UK.

The overwhelming environmental impact of mobile phones is in their 'charging' state through their useful lifetime. The energy efficiency of the 'external power supply' or EPS (more commonly known as the phone charger), is of crucial importance[48]. As more than a billion EPSs are sold globally each year[49], more than half of them for mobile phones, their efficiency can have a significant impact on energy consumption.

Typically, only five or so years ago, when the main purpose of a mobile phone was to make calls and send and receive text messages, the charge-up rate would have been around two or three times a week. However, in recent years as phones have transformed into cameras, MP3 and video players, games players, mobile email and electronic diary's, their use has increased along with their energy consumption.

Mobile phone chargers even use power when they are plugged into the socket, but no phone is attached – a state referred to as 'no-load' consumption – although there has been much debate recently about whether the power used, at about one watt, is significant. Undoubtedly, chargers have become much more efficient in 'no load' consumption over recent years. For example, five years ago they used about three watts on average, the best models today use less than 0.5 watts[50]. But this energy consumption is fundamentally of no practical use and the sheer quantity of the phones in circulation makes their contribution to household energy demand significant.

For example, if we consider the reduction of 'no load' consumption in the most modern phone chargers coming down from (say) 1 watt to 0.3 watts (one of the most efficient of the chargers tested), and if every household in the country keeps a phone charger plugged in but not in use, 24 hours a day, every day of the year, the amount of energy wasted could be used to power 16,000 homes for a year.

The voluntary EU code of conduct[51] on standby has helped to encourage manufacturers to reduce 'no load' energy demand, as well as to contain the 'load' consumption levels. Currently there is no EU legislation specific to EPSs. However, this is one of the first products to be considered under the Eco-design of Energy Using Products Directive (2005/32/EC) and so we may expect action in this area in the foreseeable future.

By comparison, in recent years Australia, New Zealand and California (with other US states following suit) have put forward mandatory standards for the energy efficiency of EPSs. Maximum 'no load' consumption will not be greater than 0.5 watts from January 2008[52]. China has also set mandatory standards to reduce consumption on EPSs and the United States also have voluntary standards, through an initiative called Energy Star.

Ideally, there is a need for a universal EPS charger that consumes almost no energy at all in 'no load' mode. This is technically feasible as some of the most efficient chargers can already get down to the milliwatt level, but do have higher production costs. However, if all chargers could fit the myriad of chargeable products available today, then the units could be sold separately reducing transportation and packaging costs as a new charger would not be needed each time a new product was produced.

46 DTI ownership statistics 2004

47 Includes both monthly contract and pay-as-you-go

48 This, of course, is true of all gadgets that are 'powered' by the use of an external power supply unit, and the debates around mobile phone chargers are equally valid for all other items.

49 PG&E (2004) Analysis of standards options for single-voltage, external AC to DC Power supplies – CASE Project, California.

50 Recent EST studies on a range of mobile phone chargers have seen the most modern devices with a no-load consumption of around 0.5 watts, compared to the 1 watt figure assumption taken from MTP data

51 IEA website on standby and 1 watt initiative: http://www.iea.org/textbase/subjectqueries/standby.asp

52 This is consistent with the EPA's Energy Star criteria which state that 'no load' consumption must be 0.3 watts for up to 10 watts output power and 0.5 for above 10-250 watts output power from January 2008.

7. War Games

Games consoles can be thought of fundamentally as computers that are used to play video games through a television monitor, and can also perform other functions such as DVD, CD and digital music playback, or for viewing digital photos.

Games consoles have come a long way from the simple Atari 2600 or Binatone devices that were introduced in the late 1970s. Today's sophisticated models demand the specification of a high-end PC, with graphics cards and superior sound that leads them to be very energy-intensive.

Tests[53] carried out by the Danish Electricity Saving Trust and supplemented by the EST for later models show huge differentials in the on-power mode, 'idle' mode and 'standby'[54]. Consoles were tested in two active modes: while playing games and while watching an animated movie.

The results of these tests show a large variation in the power consumption of these various consoles, but the most interesting and concerning element is the fact that in all cases the energy consumption in 'idle' mode varies very little from when the console is actively being used. The potential issue here is if a user forgets to switch the console off, they could be consuming in 'idle' mode constantly.

This means that even if a console is only used for an hour or two a day, but the machine remains on and in 'idle' mode for the rest of the time, it is the near equivalent of playing with the console 24/7 in terms of energy consumption. In the case of the Playstation 3 (PS3), this is similar to leaving three 60 watt bulbs on permanently, and at today's electricity prices that will cost the householder approximately £164 per year. Another consideration is the 'High Definition' (HD) feature of newer platforms, such as the PS3 and Xbox 360. Will this new technology encourage people to go out and purchase a HD–ready television set to enhance the experience of playing their games console? If so, the combined running costs of a High Definition game played on a 40+ inch plasma TV could get the pulse racing.

The message to consumers hooked on computer games is to ensure that the device is put into its 'off' mode at the end of every session, or better still, that it is switched off at the wall when not needed.

Brand/model	Power consumption (watts)			
	Active mode (playing game)	Active mode (watching movie)	Idle State mode	Standby
Microsoft Xbox 360	159.4	103.9	134.2	2.4
Sony Playstation 2	38.8	38.4	36.6	2.7
Sony Playstation 2 slim	22.9	22.9	21.8	1.2
Nintendo GameCube	22.6	n/a	22.6	0.1
Sony PSP	2.7	2.4	0.8	0.3
Nintendo Wii	17.6	N/A	16.7	2
Sony Playstation 3	187	174	174	1.8

Table 3: Power consumption of popular games consoles
(source: Danish Electricity Saving Trust and the Energy Saving Trust)

53 All tests carried out to Energy Star Program requirements for computers Version 4

54 http://www.elsparefonden.dk/publikationer/rapporter/testrapport-om-spillekonsoller/at_download/File

The energy consumption of games consoles in 'idle' mode varies very little from when the console is actively being used.

8. Nine to Five

The rise in the phenomenon of the home office and the popularity of working from home has led to an increase in the number of homes kitted out with a range of equipment that used to only be seen in the workplace.

Apart from the initial outlay of a PC or laptop, printer, scanner, fax (or a single 'multi-functional device' or MFD), phone and broadband connection, the operating costs can be a hidden drain on household finances.

Naturally, computers, and their associated peripherals, consume most power when they are in active use. However, generally they are only usefully working for a small proportion of the day. If we imagine a scenario where a home worker switches their computer on at 9am, and clocks off at 5pm; then during the intervening eight hours they are likely to be only actively using their machine for around half of this time if you consider other activities, such as telephone meetings, non-computer related work and lunch and coffee breaks.

If their computer is not set up to automatically switch into 'sleep' mode after a set time period of inactivity, for example after 15 minutes of the keyboard not being used, it can spend upwards of four hours per day doing nothing of any practical use and in a high energy consuming 'idle'[55] mode.

Generally for the rest of the 'non-working' day, the home worker will normally do one of two actions: they will either leave the computer on overnight and hence have the computer in constant 'idle' mode (unless it is programmed to switch to sleep mode automatically), or they will turn the machine off at the unit, and hence for the remaining hours, until it is turned on again, the computer will be in 'off' mode. This latter option is by far the more preferable.

Generally, the range of potential modes a computer is capable of operating in can be confusing to the average, non-technical computer user – Table 4 sets out the various modes and what they represent.

Mode	Definition
Idle	The state in which the operating system and other software have completed loading, the machine is not asleep, and activity is limited to those basic applications that the system starts by default. i.e. when the computer is on, but not actively being used.
Sleep	A low power state that the computer is capable of entering automatically after a period of inactivity or by manual selection. A computer with sleep capability can quickly "wake" in response to network connections or user interface devices.
Standby	The power consumption level in the lowest power mode which cannot be switched off (influenced) by the user and that may persist for an indefinite time when the appliance is connected to the mains electricity supply and used in accordance with the manufacturer's instructions
Off	When the appliance is connected to the mains electricity supply and used in accordance with the manufacturer's instructions i.e. when the computer has been switched off at the PC, but is still plugged in and consuming power (to a small extent).

Table 4: Definition of different potential states of PC energy consumption when not actively working[56]

55 As a rule of thumb, generally "idle" mode consumes approximately the same amount of energy as 'On' mode.

56 Taken from The Energy Star specification for computers, revised 20/10/2006.

Recent testing of a range of desktop PCs and laptops[57] shows a great variation in the energy consumption when they are not in active use (see Table 5). For example, variations in 'sleep' mode vary from a healthy 1.47 watts to 15 watts for two similar spec desktop PCs. And the 'idle' mode in a range of domestic PCs ranges from 71 watts to 221 watts. Results were more consistent for laptop computers with energy consumption comfortably lower across the various modes and different specifications of laptops compared with desktop PCs.

One alarming trend, seen in a worryingly large number of the desktop models tested, is the absence of a manual 'off' switch on the computer unit itself. This means that the user cannot physically switch off the PC except at the socket itself.

The area with most cause for concern is the wide difference in the 'idle' mode power consumption, as without 'power management' features activated on the computer, this is the mode it will remain in whilst switched on but not being used. The best desktop PC tested has an 'idle' mode consumption of 71 watts and at worst 220 watts. The desktop machine with the highest 'idle' power was, as is expected, a higher specification machine[60], but it still begs the question why its consumption is three times higher than its most efficient counterpart, whilst in a state where minimum processing activity is occurring.

Unsurprisingly, the overall energy consumption of this product sector has risen in recent years[61]. The total electricity use by domestic computers has doubled between 2000 and 2005. Indeed, in 2005 over 9 per cent (or ~11 TWh) of total domestic electricity was due to computers and their peripherals[62]. Consumption is expected to increase by a further 30 per cent between 2006 and 2020. This is not only due to the continued growth of the home computer market, but also because higher specification and therefore more energy-intensive machines are required to run the latest games, software and operating systems. Also, not forgetting, a significant factor is the energy consumption of the computer when it is not apparently doing anything of use.

Power management

Although 'sleep' mode power management functionality is available on the majority of computers on sale today, many machines are not configured to enter this mode automatically after a period of inaction. In fact, this feature is often disabled due to a lack of user understanding of how such low power modes operate. This results in the PC continuing to consume energy in its 'idle' mode for the rest of the time it is switched on, unless the user manually switches it into 'sleep' mode.

Type and spec	No. tested	Number of PCs with no manual 'off' button	'Idle' mode (watts)	'Sleep' mode (watts)	'Off/standby' mode (watts)
Domestic PCs – best	26	6	71[58]	2.95	1.61
Domestic PC – worst			221[59]	15	9.8
Business PCs – best	7	6	56.5	1.47	1.6
Business PCs – worst			78.1	4.5	3.5
Laptops - best	36	N/A	7.97	0.94	0.44
Laptops - worst			35.63	3.74	2.84

Table 5: Range of desktop PCs / laptops tested and differing energy consumption in different modes

57 MTP tested a range of computers and laptops for their energy consumption figures in a wide range of domestic and business desktop and laptop computers. Please note that the Best / Worst figures come from a range of computers tested, and there was no one computer that came out consistently Best or Worst over all modes

58 The best for 'Idle' power came from PCs in the 'Vista ready' category

59 The worst power consumer for 'Idle' mode came from the 'Quad core' category

60 2 hard drives versus 1, double memory capacity, 4 processors vs. 2 and 1000GB vs. 250GB hard drive storage

61 Commonly known as 'grey goods' or ICT sector which includes: desktop personal computers (PCs); monitors; laptop PCs; printers (impact, laser, inkjet); and mutli-functional devices (MFDs).

62 MTP Policy Brief: UK Energy Consumption of Domestic information and Communication Technology (ICT) Equipment

The best solution is to switch the computer off either via the PC menu, or preferably at the manual switch on the unit itself (where available and after the machine has been shut down through the menu function). However, even when a desktop PC is switched off by the user in this way, but still plugged in and 'on' at the wall socket, it can continue to consume energy at a rate of up to 3.5 watts. The only way to ensure a computer does not use power when not in use is to switch it off at the wall socket.

The difference in annual running costs of purchasing an energy efficient desktop PC and enabling the power management function as well as switching off after use, compared with a high energy consuming model with no power management enabled and left on 24/7 can be well over £100 per year (Table 6 below).

There are many ways for the consumer to ensure they minimise the energy consumption of their home PC.

When purchasing a new computer:

- Buy a laptop rather than a desktop if possible. On average laptops consume 70 per cent less energy than desktops.
- Look out for Energy Star labelled devices. Buying the most efficient Energy Star equipment could save as much as £100-£150 in energy over the lifetime of a PC and printer[63] compared to standard non Energy Star machines. Energy Star[64] labelled computers will help customers identify efficient computer products and retailers should also be able to advise.[65]
- Buy an energy saving mains controller – this is a device that automatically switches off peripherals when the computer is switched off.

When in use:

- Ensure sleep mode ('power management') is enabled on the machine to reap substantial savings.
- When finished for the day, or away from the desk for an hour or more, turn the computer off, ideally at the socket if accessible.

63 www.eu-energystar.org. New specifications for printers and computers become active this year, resulting in a label which highlights only the best performing approximately 25 per cent of products.

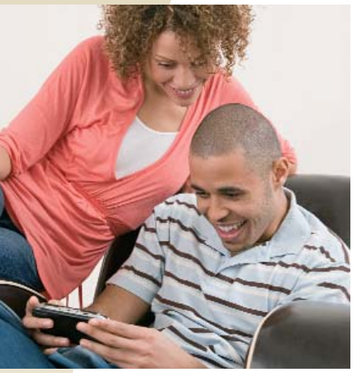
64 http://www.eu-energystar.org/

65 By checking the box or manual, if the device is not labelled itself.

Use	Worst → Best 1 PC without 'sleep mode' enabled, left on all the time	2 PC with 'sleep mode' enabled, left on all the time	3 PC without 'sleep mode' enabled, switched off (via PC) when not in use	4 PC with 'sleep mode' enabled, switched off (via PC) when not in use	5 PC with 'sleep mode' enabled, and switched off at plug when not in use
Active use (hrs) Idle use (hrs) Sleep use (hrs) Off Use (hrs)	4 20 0 0	4 0 20 0	4 4 0 16	4 0 4 16	4 0 4 0
Most efficient desktop PC Consumption per year (kWh per yr)	383	77	133	72	66
Least efficient desktop PC Consumption per year (kWh per yr)	1193	873	433	369	334
Best case cost per year (£)	40	8	14	7.50	7
Worst case cost per year (£)	124	91	45	38	35

Table 6: An analysis of energy consumption and running costs of different power management functionality in the most efficient and least efficient desktop PCs

9. Back to the Future



The coming decade will see even more changes in the home electronics sector, with commentators[66] predicting further 'convergence' as a major direction for products.

In the future there could be fewer 'single function' products – which will save both space and, potentially, cost for consumers. A key consideration will be however, how much effort and interest manufacturers invest in ensuring that these products are as energy efficient as possible both whilst 'working' and when the product is not in use.

One example of convergence is Apple's forthcoming 'iPhone', which combines phone, MP3 player, internet searching functionality and email into a single item that is small and portable.

It is suggested that the TV screen could reign supreme in terms of being a way by which to monitor and view the functions of the home. So, not only will people view TV programmes and play computer games through their TV, it could also be used as a computer display and even to monitor household functions or energy consumption through displaying 'smart meter' information. The computer may become the central device that controls systems and appliances[67] and could come to be viewed as the central hub of the home.

The consequence of this is that products like audio players and video recorders could become obsolete, or resigned to a niche sector, rather like turntables and separate tuners and amplifiers are today.

In terms of reducing energy consumption this could be very good news[68]. For example, instead of having a TV, video, DVD, set top box, and separate speakers all plugged in and requiring power both in 'on-power' mode and 'standby' mode, there could be a single appliance that satisfies all these individual functions, with only one power supply and only one standby function. The key aspect will be how efficiently these products are built.

The push for greater energy efficiency in these products within the European Union is primarily addressed by the 'Ecodesign of Energy Using Products Directive (2005/32/EC)'[69], which, among other objectives, aims to ensure that any new energy using products with sales of over 200,000 units will be designed to be as energy efficient as possible. One of the first products that will be addressed through this Directive is the ubiquitous external power supply (EPS) unit that powers everything from mobile phones to electric toothbrushes, to ensure in future it will be designed to be as inherently efficient as possible.

Interesting developments in the area of television technology, that have energy saving potential as compared to the existing LCD and plasma technologies, are 'Organic Light Emitting Diode' TVs or OLEDs and 'Field Effect Diode' TVs (FEDs).

OLED technology development is at an advanced stage of the development cycle, and the good news for energy efficiency is that they need much less power than LCDs and plasma screens to run. MTP intelligence suggests that OLED TVs could be available on the market in as little as 2-3 years[70].

The FED TVs are currently still in development, and there are no dates as to when they will enter the market at this stage, but are predicted to have an energy consumption profile similar to OLED screens and hence also hold promise of energy savings in the longer term[71].

66 Mintel Report 2006 "Impact of fashion on electronics in the home, Market Intelligence, June 2006"

67 For example, programming your heating system, or turning the cooker on

68 However, for the purposes of this report the projected energy consumption trends from CE are not including the future expected trends in convergence as there is currently no reliable data on this area

69 http://ec.europa.eu/enterprise/eco_design/index_en.htm

70 BNTV01: Future stock and energy trends. Version 3. Updated 30/05/2007

71 Note that the projected energy consumption of TVs to 2020, used in this report, does have first guess assumptions for the penetration of OLED and FED technologies, but these will be subject to review over the next few years as these technologies emerge and enter the market. Hence, if they do become very popular, very quickly, we will see a reduction in the predicted energy demand for TVs

Apple's forthcoming 'iPhone' combines: phone, MP3 player, internet searching functionality and email into one item that is small, portable and does away with the need to carry around three or more separate items.

Energy Saving Recommended Label
The Energy Saving Trust's highly successful energy efficiency consumer label – the 'Energy Saving Recommended' (ESR) logo – has been in existence for seven years and covers most of the cold and wet appliance sectors, as well as windows, kettles and lightbulbs amongst others.

EST recognises the demand from consumers for independent, trusted information on what are the most efficient products on the market, and to further address this need has extended the range of products covered to include consumer electronics.

In 2006 the scheme began covering integrated digital televisions (IDTV) and simple terrestrial set top boxes[72].

The ESR label can now be found on over 180 IDTVs from 11 manufacturers. Of the TVs endorsed by the scheme, the predominant screen technology is LCD, with a much smaller number of CRT, plasma and projection TVs. The criteria for inclusion were 'on-power' <250 watts and 'standby' <1.5 watts.

However, the criteria for IDTVs have recently undergone a revision and from the summer of 2007 will require a lower power consumption for passive 'standby' power of one watt or below. Furthermore, the 'on-mode' power consumption requirement will be updated to reflect a relative performance requirement in the future. This method of assessing the energy efficiency of televisions is currently being considered by the EU Eco-Label scheme and DEFRA's Retailer's Initiative.

A possible extra criterion that could be considered for future revisions of the IDTV label is the inclusion of the 'screen blanking' functionality for radio listening. The increasing trend of using TVs to listen to digital radio stations is highly energy intensive and such functionality will go far to help curb the rising energy demand.

There are currently just two simple terrestrial set-top boxes certified under the ESR Scheme. Criteria for these products are a maximum of 6.3 watts for on-mode power and two watts passive standby.

Criteria have also been developed for digital television recorders (PVRs, DVD-Rs) and intelligent mains controllers[73]. However, at the time of going to print there were no products of this type endorsed, although models are undergoing approval testing, and if successful will be in the shops shortly.

The future plans for ESR expansion include the development of endorsement criteria for DAB digital radios. It is likely that it will focus on the efficiency of the external power supply and the 'standby' power consumption that was highlighted earlier in this report as a cause for particular concern. ESR digital DAB radios should be available and in the shops by the end of 2007.

There are plans to expand into the ICT area in the next 12 months with the criteria for products such as laptops, desktops, monitors and imaging equipment currently in development and standards are expected by the end of 2007.

To conclude, we can safely say that the Consumer Electronics sector will have an impact on the UK's domestic energy demand. The size of that impact can be lessened through the combined interventions and actions of the government, manufacturers, retailers and consumers.
Each sector has its role to play, for example:

Government
- by providing clear signals and legislation on minimum standards for standby power functions
- by providing tools and advice to help manufacturers and retailers make the best choices in terms of the efficiency of their products

Manufacturers
- by reducing the power consumption of standby mode across the range of products
- by not phasing out the manual 'off' button facility on the unit
- by making the external power supply External Power Supply (EPS) unit as efficient as possible when not charging
- by creating new versions of products that are less energy consuming that their previous models

Retailers
- by only supplying ESR or Energy Star labelled products wherever possible
- by having well trained staff to advise and clear information on the energy consumption patterns of their product lines

Consumers
- by purchasing ESR labelled products where these are an option, and looking for Energy Star labelled products on computer equipment
- by turning the product off when not in use, never leaving things on standby
- by implementing power saving functionality where available

The following pages give a few examples of what the running costs of a selection of Consumer Electronic products can amount to if not switched off after use.

72 Digital converter boxes such as he Freeview model, not the more complex version such as Sky+ and Virgin TV

73 'Intelligent Mains Controllers' power down consumer electronic products, either automatically, via turning off the main product plugged into the "heart" of the multi-plug adaptor which, in turn, powers down the other peripheral equipment plugged into it, or via remote operation through a remote control or switch

Even a teenager's/child's bedroom is full of electrical gadgets:

The young technophile	Annual Cost
PS3	£23
14" CRT in bedroom	£6.50
Freeview STB	£6
1 Mobile phones – personal	£0.50
Digital radio	£5
iPod	£0.50
VCR	£11
PC & Monitor	£29.50
Printer	£2.50
Scanner	£5
PC Speakers	£3
Compact Hi-Fi	£8.50
Total annual running cost:	**£101**

John is your typical metropolitan, young, cash-rich, technophile with a penchant for gadgets, music and the latest in technological innovation. He has no idea or care for the size of his energy bills and feels life is too short to ‘turn things off’!

John the technophile	**Annual Cost**
Xbox	£14
42” plasma TV	£86.50
14” CRT in bedroom	£2
Sky +	£16.50
2 Mobile phones – work and personal	£1
iPod	£0.50
DVD Home Theatre	£8
VCR	£11
Digital radio (kitchen and bedroom)	£9
Personal organiser	£0.50
PC & Monitor	£29.50
Laptop	£9
Printer	£10
Fax/Scanner (MFD)	£7.50
Broadband router	£11
PC Speakers	£3

Total annual running cost: £219

Glossary

CE Consumer Electronics

CoC Code of Conduct

CRT Cathode Ray tube (TV)

DVD Digital Versatile Disc

EPS External Power Supply Unit

FED Field Effect Diode (TV)

GW Gigawatt (1 GW = 1,000,000 kilowatts)

GWh Gigawatt-hour (1 GWh = 1 hour of electricity consumed at a constant rate of 1 GW)

ICT Information and Communication Technologies

IDTV Integrated Digital TV

LCD Liquid Crystal Display (TV)

MTP Market Transformation Programme

MW Megawatt (1 MW = equals 1,000 kilowatts)

MWh Megawatt-hour (1 MWh = one hour of electricity consumed at a constant rate of 1 MW)

OLED Organic Light Emitting Diode (TV)

ONS Office of National Statistics

PVR Personal Video Recorder

TW Terrawatt (1 TW = 1,000,000 megawatts)

TWh Terrawatt-hour (1 TWh = one hour of electricity consumed at a contstant rate of 1TW)

VCR Video Cassette Recorder