

# Green IT – just as much about making money as saving the environment

## Background

We live in a world where two issues currently dominate debate. The first is Climate Change where the Intergovernmental Panel on Climate Change (IPCC<sup>1</sup>) has “unequivocally” affirmed the warming of our climate system, and linked it directly to human activity. The second is the continued rise in oil prices primarily driven by increased demand and potentially depleted stocks<sup>2</sup>. Both issues are obviously related in terms of encouraging dramatic reductions in energy consumption.

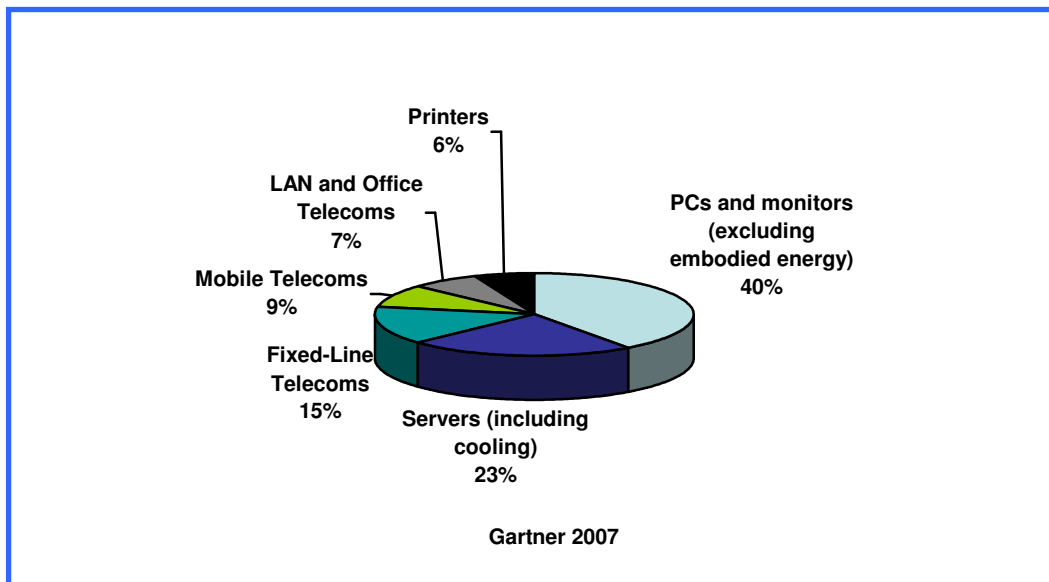
Governments around the world are making commitments to cut energy consumption and the generation of CO<sub>2</sub>. The KYOTO<sup>3</sup> agreements call for developed countries to reduce their green house gas emissions by at least 5% against the baseline of 1990 by 2012.

In the UK a draft Climate Change Bill aims to put in place a framework to achieve a mandatory 60% cut in the UK's carbon emissions by 2050 (compared to 1990 levels), with an intermediate target of between 26% and 32% by 2020<sup>4</sup>.

These targets are both essential and challenging and ICT has undoubtedly got its part to play. It might be surprising to many just how large that part could be. Gartner<sup>5</sup> estimates that the manufacture, use and disposal of ICT equipment accounts for 2% of global CO<sub>2</sub> emissions, equivalent to the much aligned aviation industry. It is calculated that this relates to 1 billion tonnes per year of CO<sub>2</sub> generated by this industry.<sup>6</sup>

In the UK ICT equipment accounts for 10% of the UK's total energy consumption and non-domestic equipment consumption is expected to grow another 40% by 2020<sup>7</sup>. This must be set against the UK's climate change bill which is expecting an overall reduction by about 30% in the same time frame. To put this in perspective BT alone consumes 0.7% of the UK's entire electricity consumption.<sup>8</sup>

So where is all this energy going and what can be done about it? Gartner have estimated the global distribution of CO<sub>2</sub> emissions from ICT<sup>9</sup>:



It is immediately obvious that ensuring that PCs and monitors are switched off when not in use could have a meaningful impact. Server efficiency and the use of green energy must be encouraged.

However ICT has another, more substantial, way in which it can impact on energy use and carbon footprint and that is in the strategic use of ICT. A recent report from the European Telecommunications Network Operators' Association<sup>10</sup> concluded that "The strategic use of ICT can contribute significantly to energy efficiency, sustainable economic growth as well as job creation. ICT can reduce the need for travel and transportation of goods by bridging distance problems. It can increase efficiency and innovation by allowing people to work in more flexible ways. It can also ensure a shift from products to services and allow for dematerialisation of the economy."

At a recent Symposium on ICT & Climate Change<sup>11</sup> it was noted that in Japan "In 2012 application of ICT to other sectors will contribute to reduction of 68 million tons of CO<sub>2</sub>, which is equivalent to 5.4% of CO<sub>2</sub> emission in 1990 in Japan." 6% is Japan's Kyoto target!

Thus ICT has an opportunity to be at the heart of the climate change issue both in terms of reducing its own contributions to carbon footprint (and making savings in energy costs along the way) but more importantly at helping countless others in making far more substantive savings.

### ICT Helping the World to Address its Carbon Footprint

Application of ICT can have a very large impact on energy use and the resulting carbon footprint. However some of the effects may be only indirectly related to ICT spend. (for example an increased use of teleconferencing could reduce air travel). This is a challenge for the ICT industry but one that is currently being addressed.<sup>12</sup>

There are three ways ICT can contribute:

1. to assist in effectively monitoring the degree of climate change
2. to reduce the amount of energy consumed by ICT equipment & services and improve energy efficiency
3. to mitigate the effect on climate change caused by energy consumption in various sectors of the economy through utilization of ICT

There are thus many ways that ICT can reduce energy consumption and carbon footprints<sup>13</sup>:

Consumption of goods	By reducing goods consumption (consumption of paper, etc.), CO <sub>2</sub> emissions related to goods production and waste and waste generation can be reduced.
Power consumption/energy consumption	By enhancing the efficiency of power and energy use to reduce consumption, CO <sub>2</sub> emission related to power generation and power transmission can be reduced.
Movement of people	By reducing the movement of people, consumption of energy and related CO <sub>2</sub> emissions required for transportation can be reduced.
Movement of goods	By reducing movement of goods, consumption of energy and related CO <sub>2</sub> emissions required for transportation can be reduced.
Improved efficiency of office space	By using office space efficiently, CO <sub>2</sub> emissions and consumption of power for lighting and air-conditioners, etc. can be reduced.
Storage of goods	By reducing storage space of goods, CO <sub>2</sub> emissions and consumption of power for lighting and air-conditioner, etc. and can be reduced.
Improved work efficiency	By enhancing work efficiency, resource and energy consumption can be reduced, thus reducing CO <sub>2</sub> emissions.
Waste	By reducing waste emission, consumption of energy required for environment preservation and waste disposal, etc. can be reduced, thus reducing CO <sub>2</sub> emissions.

Some specific examples are<sup>14</sup>:

**Flexi-work**

If 10% (19.3024 million) of EU-25 countries' employees became flexi-workers, then 22.17 million tonnes of CO<sub>2</sub> can be saved per year.

**Audio-conference**

If 50% (96.512 million) of EU-25 countries' employees replaced one meeting with one audio-conference call per year, then 2.128 million tonnes of CO<sub>2</sub> can be saved per year.

**Business travel replacement (video-conference)**

If 20% of business travel in EU-25 Countries is replaced by a non-travel solution (e.g. video-conference), around 22.35 million tonnes of CO<sub>2</sub> can be saved per year.

**Online phone-bills**

If all households, with Internet access, in EU-15 countries, and all mobile customers in EU-25 countries would get an online phone-bill, then 491.57 thousand tonnes of CO<sub>2</sub> can be saved per year.

**Virtual answering machine**

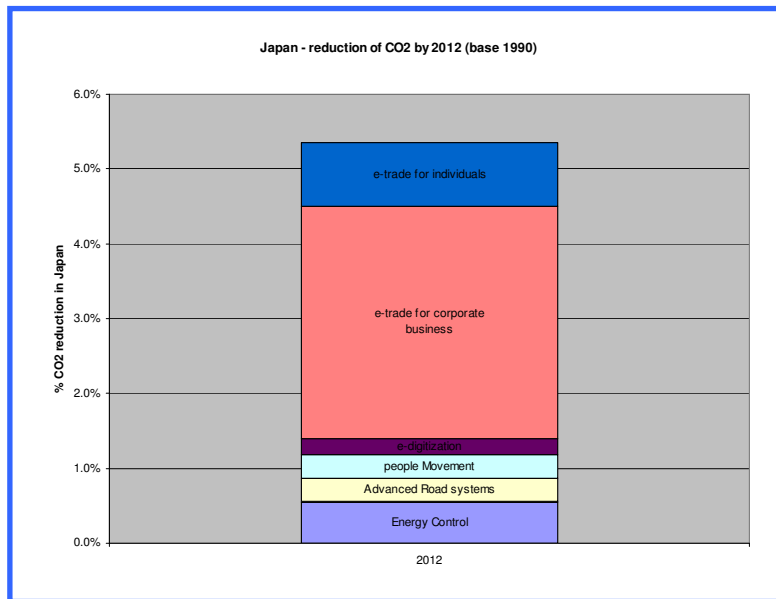
If 20% of households in EU-15 countries (31 million) use virtual answering machines instead of physical answering machines, then 1.03 million tonnes of CO<sub>2</sub> can be saved per year.

**Web-based tax return**

If all employees in EU-25 countries (193 million) deliver their tax return via the Internet, then 195.78 thousand tonnes of CO<sub>2</sub> can be saved per year.

Together this would mean saving approximately 50 million tonnes of CO<sub>2</sub> emissions per year. (This is equivalent to about 10% of the UK's total CO<sub>2</sub> emissions in 2006 from all sources<sup>15</sup>.)

This is confirmed by evidence from Japan presented at the recent Kyoto Symposium:<sup>16</sup>



Thus we can see that the ICT industries can make substantive savings by making strategic procurement decisions and by implementation of good energy saving practice.

ICT has the potential to deliver innovative solutions that can lead to significant energy and CO<sub>2</sub> emission reductions across a wide range of sectors. This gives the ICT sector the opportunity to be an integral part of developing new and profitable business opportunities.

## Reducing your IT carbon footprint at home and in the workplace

There are many simple ways in which you can save energy use in IT equipment. By implementing these at home and at work you will make energy savings and reduce your carbon footprint. There are many sources of advice on how to do this.<sup>17, 18, 19</sup>

### **Switch it off!**

Always switch off what you don't need. Use one socket strip (extension) for your computer, broadband modem, scanner, printer, monitor, and speakers. Switch it off when the equipment is not in use. If your printer, scanner, speakers or other peripherals aren't networked, keep them turned off until you need them? Ensure family, friends and colleagues do the same.

### **Use the Power Management Features**

*A modern 15" LCD monitor uses 15 watts in normal mode but only 0.8 watts in standby/sleep mode.<sup>20</sup>*

A utility called "power management" can save energy<sup>21, 22</sup>. When enabled, it puts your computer and monitor into a low-power mode after a certain period of inactivity. Also known as "standby," "sleep" or "hibernation," this low-power mode consumes 15-25% of the energy (or less!) that would be consumed in normal mode. Because CRT monitors can use two-thirds of the total energy of a computer system, it's especially important to enable power management for your monitor. Correct use of the Power Management features can "almost" be as good as switching it off.<sup>23</sup>

To enable the power management function on your computer. On laptops, be sure to activate these settings in the AC power profile — not just the DC (battery power) profile. We suggest setting computers to enter system standby or hibernate after 30 to 60 minutes of inactivity. To save even more, set monitors to enter sleep mode after 5 to 20 minutes of inactivity. The lower the setting, the more energy you save.

In Windows XP

[http://www.energystar.gov/index.cfm?c=power\\_mgt.pr\\_power\\_mgt\\_manual\\_act\\_winXP](http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_manual_act_winXP)

In Windows VISTA

[http://www.energystar.gov/index.cfm?c=power\\_mgt.pr\\_power\\_mgt\\_manual\\_act\\_winVista](http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_manual_act_winVista)

On a MAC

[http://www.energystar.gov/index.cfm?c=power\\_mgt.pr\\_power\\_mgt\\_manual\\_act\\_mac](http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_manual_act_mac)

Microsoft have designed the power management features of Vista<sup>24</sup> to be much better than XP hence it is worth factoring this into your upgrade considerations.

### **Minimise Printing**

Manufacturing one pound of office paper consumes 12 cubic inches of pulpwood, 13.5 gallons of water, 10.5 kWh of electricity and .3 pounds air pollutants. Use double sided printing and multiple pages per sheet if possible.

If you must print, ink-jet printers use 80 to 90% less energy to print than laser printers.

Change the font: modern computer fonts (eg Verdana) are easier to read on the screen than paper based fonts such as TimesRoman – you will be able to read more pages on-screen rather than printing them out.

### **Buy with Care**

- Consider energy saving when making buying decisions.
- Buy a laptop instead of a desktop. It consumes less electricity. (15 watts rather than 60 watts).
- If you need to buy a desktop, get an LCD screen instead of a CRT. But don't buy a larger screen than you need.

- Check the computer supports the more advanced Speedstep™ power management.
- Buy printers and other peripherals which automatically power down when not in use.
- Laser printers use more electricity than inkjet printers. Ink-jet printers use 80 to 90% less energy to print than laser printers.

The “Energy Star” web site (supported by the US Environmental Protection Agency) is an excellent resource for advice and product information when procuring energy efficient IT equipment:

<http://www.energystar.gov>

The Energy Star label may well appear on the equipment you are purchasing.

### **Culture Change**

- Have an energy saving plan
- Make sure the IT Manager owns his energy cost budget
- Have a green poster campaign at work  
<http://www.carbontrust.co.uk/publications/publicationdetail.htm?productid=PFL309>
- Turn off computers and/or peripherals when they are not in use.
- Make sure everyone hibernates and sleeps (their computers that is).
- Ban the use of screen savers - If screen saver images appear on your monitor for more than 5 minutes, you are wasting energy! A screen saver that displays moving images causes your monitor to consume as much as electricity as it does when in active use.

The Carbon Trust's The Low Carbon Culture Company can assist in helping to change your culture.<sup>25</sup>

### **The Bigger Picture - Servers and data centres**

Servers and data centres have become integral to business but as the size and capacity of these servers increase, so too does the energy consumed by them. The intensive power requirements needed to run and cool data centres now account for around a quarter of the ICT sector's CO<sub>2</sub> emissions.<sup>26</sup>

Data centers are also the most energy-intensive component of IT operations<sup>27</sup>. The U. S. Environmental Protection Agency (EPA)<sup>28</sup> estimated that data centers eat up about 1.5 percent of all electricity in the United States and that nearly a quarter of that power is wasted. The amount of electricity consumed by U.S. data centers doubled between 2000 and 2006 and is expected to double again by 2011. A typical 50,000-square-foot data center consumes about 57 barrels of oil per day. It is reasonable to expect the UK to mirror these trends.<sup>29</sup>

### Tips to green your data center<sup>30, 31</sup>:

- If you look under the raised flooring in your data center, you'll probably find pockets of cables clustered together. These could be inhibiting air flow. By re-cabling and deploying vented floor tiles in strategic locations, you can cut energy waste with almost zero capital expense.
- Consolidation of resources (such as storage, networks, databases) so they all sit on a single server. Analyze your server use to determine what can be shut down and consolidated. Identify and retire any unused or unnecessary storage capacity;
- Consolidate the servers you're using into one location and direct your cooling resources to that hot spot. Use virtualization to pack more physical servers onto fewer virtual ones. By some estimates, about 70 percent of servers in the data center are only supporting one application. Utilization rates of less than 15 percent on single servers are not uncommon. These are ideal candidates for virtualization.
- Cooling is responsible for the greatest energy waste. Implement intelligent design of the data centre room, such as 'dynamic cooling', which targets the hot spots within the room;
- Once you've isolated your most power-hungry servers, turn up the thermostat on the rest of them. Most servers can operate perfectly well at temperatures of as much as 100° (be sure to check with your supplier) and each 1° increase in temperature can save about 4percent in energy costs.

- Replace old resources with smaller, faster, more efficient technology.

The end goal of data centre optimisation should be to improve functionality, keep rack space to a minimum and reduce power requirements. This should in turn help to cut CO<sub>2</sub> emissions, save on energy bills and minimise physical space requirements.

Typical phases of data centre optimisation might include:

- A complete inventory of servers, storage and applications;
- An analysis of how the organisation uses technology and how technology underpins its activities;
- Identification of opportunities for optimisation, agreement on the desired outcome, and planning the process to achieve optimisation;
- Implementation, monitoring of progress and making adjustments where necessary.

If you wish to improve the performance of your data centre there are some whitepapers<sup>32</sup> at <http://www.thegreengrid.org/home> and a self benchmarking guide is available from [http://hightech.lbl.gov/documents/DATA\\_CENTERS/Self\\_benchmarking\\_guide-2.pdf](http://hightech.lbl.gov/documents/DATA_CENTERS/Self_benchmarking_guide-2.pdf)

## Reducing business carbon footprint

There are a number of resources to help business reduce their energy consumption.

- The Energy Saving Trust ([www.energysavingtrust.org.uk](http://www.energysavingtrust.org.uk)) will assist small businesses in assessing their potential for energy savings, offering advice and consultations.
- The Carbon Trust ([www.carbontrust.co.uk](http://www.carbontrust.co.uk)) will assist all sizes of business to assess their energy usage and suggest ways to reduce it. They will conduct a survey of your premises if required. They also have a wide range of publications relevant to energy saving and can offer SMEs loans to purchase more energy efficient equipment.<sup>33</sup>
- The US EnergyStar Web Site ([www.energystar.gov](http://www.energystar.gov)) although aimed specifically at the US has good information on energy saving IT equipment.
- The Green Grid ([www.thegreengrid.org](http://www.thegreengrid.org)) is a global consortium dedicated to advancing energy efficiency in data centers and business computing ecosystems.
- If you are into Blogs try <http://green-pc.blogspot.com/> and <http://green-broadband.blogspot.com/>

## LINKS

Organisation	Web	Reference
BBC	<a href="http://www.bbc.co.uk">www.bbc.co.uk</a>	<a href="http://news.bbc.co.uk/1/hi/business/7090664.stm">http://news.bbc.co.uk/1/hi/business/7090664.stm</a>
Berkeley National Laboratory	<a href="http://www.lbl.gov">www.lbl.gov</a>	<a href="http://hightech.lbl.gov/documents/DATA_CENTERS/Self_benchmarking_guide-2.pdf">http://hightech.lbl.gov/documents/DATA_CENTERS/Self_benchmarking_guide-2.pdf</a>
British Telecom	<a href="http://www.btplc.com">www.btplc.com</a>	<a href="http://www.btplc.com/Societyandenvironment/SocialandEnvironmentReport/pdf/2007/BT_CSR.pdf">http://www.btplc.com/Societyandenvironment/SocialandEnvironmentReport/pdf/2007/BT_CSR.pdf</a>
ByteStart	<a href="http://www.bytestart.co.uk">www.bytestart.co.uk</a>	<a href="http://www.bytestart.co.uk/content/15/green-computing.shtml">http://www.bytestart.co.uk/content/15/green-computing.shtml</a>
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		<a href="http://www.carbontrust.co.uk/publications/publicationdetail.htm?productid=PFL309">http://www.carbontrust.co.uk/publications/publicationdetail.htm?productid=PFL309</a>
Computer Power Saver	<a href="http://www.computerpowersaver.com">www.computerpowersaver.com</a>	<a href="http://www.computerpowersaver.com/calculator.asp#results">http://www.computerpowersaver.com/calculator.asp#results</a>
Department for Environment Food and Rural Affairs	<a href="http://www.defra.gov.uk/">www.defra.gov.uk/</a>	<a href="http://www.defra.gov.uk/Environment/climatechange/uk/legislation/index.htm">http://www.defra.gov.uk/Environment/climatechange/uk/legislation/index.htm</a>
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Energy Star	<a href="http://www.energystar.gov">www.energystar.gov</a>	<a href="http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&amp;pgw_code=CO">http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&amp;pgw_code=CO</a>
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Energy Saving Trust	<a href="http://www.energysavingtrust.org.uk">www.energysavingtrust.org.uk</a>	<a href="http://www.energysavingtrust.org.uk">www.energysavingtrust.org.uk</a>
Environmental Protection Agency	<a href="http://www.epa.gov">www.epa.gov</a>	<a href="http://yosemite.epa.gov/opa/admpress.nsf/e87e8bc7fd0c11f1852572a000650c05/4be8c9799fbceb028525732c0053e1d5!OpenDocument">http://yosemite.epa.gov/opa/admpress.nsf/e87e8bc7fd0c11f1852572a000650c05/4be8c9799fbceb028525732c0053e1d5!OpenDocument</a>
European Telecommunications Network Operators' Association	<a href="http://www.etno.be">www.etno.be</a>	<a href="http://www.etno.be/Portals/34/ETNO%20Documents/Sustainability/Climate%20Change%20Road%20Map.pdf">http://www.etno.be/Portals/34/ETNO%20Documents/Sustainability/Climate%20Change%20Road%20Map.pdf</a>
Gartner	<a href="http://www.gartner.com">www.gartner.com</a>	Gartner, 2007 press release
Global Action Plan	<a href="http://www.globalactionplan.org.uk">www.globalactionplan.org.uk</a>	<a href="http://www.globalactionplan.org.uk/upload/resource/Full-report.pdf">http://www.globalactionplan.org.uk/upload/resource/Full-report.pdf</a>
Green Campus, Harvard	<a href="http://www.greencampus.harvard.edu">www.greencampus.harvard.edu</a>	<a href="http://www.greencampus.harvard.edu/ceip/takeaction.php">http://www.greencampus.harvard.edu/ceip/takeaction.php</a>
Greenpeace	<a href="http://www.greenpeace.org">www.greenpeace.org</a>	<a href="http://www.greenpeace.org/international/campaigns/climate-change/take_action/your-energy">http://www.greenpeace.org/international/campaigns/climate-change/take_action/your-energy</a>
Intergovernmental Panel on Climate Change	<a href="http://www.ipcc.ch">www.ipcc.ch</a>	<a href="http://www.ipcc.ch">http://www.ipcc.ch</a>
International Telecommunication Union	<a href="http://www.itu.int">www.itu.int</a>	<a href="http://www.itu.int/dms_pub/itu-t/oth/06/0F/T060F0060080010PDFE.pdf">http://www.itu.int/dms_pub/itu-t/oth/06/0F/T060F0060080010PDFE.pdf</a>
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Kyoto Protocol	<a href="http://unfccc.int">http://unfccc.int</a>	<a href="http://unfccc.int/kyoto_protocol/items/2830.php">http://unfccc.int/kyoto_protocol/items/2830.php</a>
Microsoft	<a href="http://www.microsoft.com">www.microsoft.com</a>	<a href="http://download.microsoft.com/download/1/e/1/1e131973-a8e9-4a38-8965-2a9592e6a24d/EnergyStarBrochure.pdf">http://download.microsoft.com/download/1/e/1/1e131973-a8e9-4a38-8965-2a9592e6a24d/EnergyStarBrochure.pdf</a>
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SoftChoice	<a href="http://www.softchoice.com">www.softchoice.com</a>	<a href="http://www.softchoice.com/about/sustainable/ecotech/datacenter/">http://www.softchoice.com/about/sustainable/ecotech/datacenter/</a>

The Green Grid	<a href="http://www.thegreengrid.org">www.thegreengrid.org</a>	<a href="http://www.thegreengrid.org/gg_content/White_Paper_7_-_Five_Ways_to_Save_Power.pdf">http://www.thegreengrid.org/gg_content/White Paper 7 - Five Ways to Save Power.pdf</a>
Uptime Institute	<a href="http://uptimeinstitute.org">http://uptimeinstitute.org</a>	<a href="http://www.thegreengrid.org/home">http://www.thegreengrid.org/home</a> <a href="http://uptimeinstitute.org/images/stories/McKinsey_Report/McKinsey_Report_Uptime_Institute.pps">http://uptimeinstitute.org/images/stories/McKinsey Report/McKinsey Report Uptime Institute.pps</a>
<b>Blog</b>	<b>Web</b>	
green-pc	<a href="http://green-pc.blogspot.com/">http://green-pc.blogspot.com/</a>	
green-broadband	<a href="http://green-broadband.blogspot.com/">http://green-broadband.blogspot.com/</a>	
<b>TED</b>	<b>Web</b>	
Al Gore on TED (2008)	<a href="http://www.ted.com/index.php/talks/view/id/243">http://www.ted.com/index.php/talks/view/id/243</a>	
Al Gore on TED (2006)	<a href="http://www.ted.com/index.php/talks/view/id/1">http://www.ted.com/index.php/talks/view/id/1</a>	

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- 7 <http://www.globalactionplan.org.uk/upload/resource/Full-report.pdf>
- 8 [http://www.btplc.com/Societyandenvironment/SocialandEnvironmentReport/pdf/2007/BT\\_CSR.pdf](http://www.btplc.com/Societyandenvironment/SocialandEnvironmentReport/pdf/2007/BT_CSR.pdf)
- 9 Gartner Research paper ID number G00150322, 7Sept 2007. [http://www.itu.int/dms\\_pub/itu-t/oth/06/0F/T060F0060080010PDFE.pdf](http://www.itu.int/dms_pub/itu-t/oth/06/0F/T060F0060080010PDFE.pdf)
- 10 <http://www.etno.be/Portals/34/ETNO%20Documents/Sustainability/Climate%20Change%20Road%20Map.pdf>
- 11 [http://www.itu.int/dms\\_pub/itu-t/oth/06/0F/T060F0060080025PDFE.pdf](http://www.itu.int/dms_pub/itu-t/oth/06/0F/T060F0060080025PDFE.pdf)
- 12 <http://www.etno.be/Portals/34/ETNO%20Documents/Sustainability/Climate%20Change%20Road%20Map.pdf>
- 13 [http://www.itu.int/dms\\_pub/itu-t/oth/06/0F/T060F0060080025PDFE.pdf](http://www.itu.int/dms_pub/itu-t/oth/06/0F/T060F0060080025PDFE.pdf)
- 14 <http://www.etno.be/Portals/34/ETNO%20Documents/Sustainability/Climate%20Change%20Road%20Map.pdf>
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