



*National Computer Board*

# **GREEN ICT GUIDELINES FOR BUSINESSES**



## What is Green ICT?

Green ICT refers to an approach in reducing the energy and other resources consumed and the emissions and other waste produced across the ICT lifecycle – from manufacture, procurement and use of ICT in an organisation to its re-use and aims to improve environmental sustainability of organisations. Specifically, Green ICT as applied to the use of ICT resources aims to:

- Reduce energy consumption and CO<sub>2</sub> emissions during ICT use
- Reduce environmental impact of disposal of ICT waste products

In addition to the above, Green ICT also explores how ICT applications can be used to help other sectors conserve and optimise energy usage.

**2% of global carbon emissions come from the manufacture and use of Information and Communication Technology (ICT).**

**98% do not.**

*Is ICT part of the problem... or part of the solution?*

**The answer is both**



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The 2% of global carbon emissions from ICT is growing.

However, the other 98% of global carbon emissions is crying out for solutions...

... And ICT is an important one.

For starters, progressive ICT staff can make serious improvements to energy efficiency, resource consumption and business travel.

But for ICT to be taken seriously as a solution to address the other 98%, it must clean up its own act first.

This guideline will explain how to curb your ICT department's carbon emissions and harness the positive power of ICT in making your organisation more sustainable.

## 1.0 Key Facts on Green ICT

-  The **global information and communications technology (ICT) industry accounts for approximately 2 percent of global carbon dioxide (CO<sub>2</sub>) emissions**, a figure equivalent to aviation (*Gartner 2007*)
-  **18% of office workers never switch off their PC at night** or weekends, and a further 13% leave it on some nights each week, **producing about 700,000 tons of CO<sub>2</sub> emissions** (equivalent to the annual emissions of a typical gas-fired power station) (*World Economic Forum Green Technology 2009 Report*)
-  With the fast growth of ICT application in business operation and people's daily life, the total electricity consumption of ICT and other consumer electronics worldwide is predicted **to double by 2022 compared to the level in 2010, while tripled by 2030 to 1,700 tera (trillion) watts** – (*Gadgets and Gigawatts: Policies for Energy Efficient Electronics*)
-  The cost of **running data centre facilities is rising by as much as 20% a year**, far outpacing overall IT spending, which is increasing at a rate of 6% (*World Economic Forum Green Technology 2009 Report*)
-  **A data centre with 1000 servers** uses enough electricity in a single month to **power 16,800 homes for a year** (*Forrester Research*)
-  **A photocopier which is left switched on overnight** needs the same amount of energy as it does to **make 1500 photocopies**. (*Experton 2007*)
-  The total footprint of the ICT sector – including personal computers (PCs) and peripherals, telecoms networks and devices and data centres – **was estimated at 830 MtCO<sub>2</sub>e, about 2% of the estimated total emissions** from human activity in 2007. Even if the efficient technology developments are implemented, this figure seems to **grow at 6% each year until 2020**. (*Smart 2020 Report*).

## 2.0 Reducing Power Consumption of ICT equipments.

Saving on electrical power consumption is an easy, effective way to reduce energy waste coming from desktop computing equipments. Here are some simple steps that reduce desktop computer power consumption:

- ✿ Select the right-sized monitor for your needs. (the bigger the monitor, the more energy it uses)
- ✿ Shut down PCs and other devices after office hours. Over a Local Area Network, this may be enforced through Group policies
- ✿ Enable the standby/sleep mode and power management settings on your computer sets (CPU, monitor, printer and peripherals)
- ✿ Use LCD/LED monitors instead of CRT monitors as they provide up to 70% power savings and have a lifespan of up to twice as long
- ✿ Turn down the brightness of your display to the lowest setting you find comfortable. The difference in power usage between the highest and lowest brightness can be 20 watts or more
- ✿ Switch off the power of PDA, phone and laptop chargers when not in use.
- ✿ Avoid using screen savers as it does not reduce energy use and may keep the computer awake when it would otherwise doze off
- ✿ Configure low toner mode (economy or draft) settings on your printer as this saves ink as well as energy.
- ✿ Consider switching to thin client desktop devices/ notebooks as these equipments use up to five times less energy than desktop PCs
- ✿ Buy multifunctional equipments for tasks such as photocopying, faxing, scanning and printing, as multifunctional equipments save up to 50% in space and 20% in energy
- ✿ Wireless devices consume power for both transmitting and receiving data, and most laptop adaptors use their wireless devices even if they are not connected to an access point. Settings should be adapted so that the wireless device does not take excessive power when it is not in use
- ✿ Consider switching to blade servers as your server power consumption would be around 10% less than rack-mounted servers
- ✿ Implement efficient hard drives to reduce the amount of power they use through a number of mechanisms: e.g. calculating the optimum speed to use just the right amount of power necessary.

### TIPS

#### How do computers consume power?

Time the computer is on:

*Computers in sleep or hibernation mode use less power. Computers that are turned off use even less.*

#### Performance level:

*Machines that boost the highest performance tend to be power hogs. Most office workers do not need that blazing performance to do their jobs, although super-speed comes in handy when playing online games.*

#### Desktop/laptop:

*Desktop machines tend to use more power, — typically in the 100 to 150 watt range, versus about 25 watts for a typical laptop.*

#### Power supply efficiency:

*Each desktop computer includes a power supply that converts the alternating current coming from the wall outlet to the lower, direct current voltages the computer's chips consume. Higher efficiency power supplies cost a bit more but reduce total power consumption.*



## 3.0 Going Paperless

Paper documents are time-consuming and costly to create, process, distribute, file, store, retrieve, reproduce and dispose of. The benefits of digital documents outweigh the benefits of print in many cases. Consider the following:

- ✓ You can search digital documents electronically.
- ✓ Digital documents are much more portable.
- ✓ Audio, graphic, and video counts as digital, too.
- ✓ A non-paper method not only reduces paper but almost inevitably improves the process itself.

### Steps to be taken:

- ✂ Default to Duplex Printing which is printing on both sides of the paper. Some printers are equipped to do this automatically; others allow you to reinsert a page so the printer can print on the second side.
- ✂ Share printers as far as possible — don't distribute convenient printers throughout the building.
- ✂ Avoid printing in color (color printing of an A4-sized page costs at least five times more than black and white printing.)
- ✂ Print as little as possible. Review and modify documents on the screen and use print preview.
- ✂ Use Smart Web Printing software to conserve paper.
- ✂ Send documents as email attachments rather than printing/faxing.
- ✂ Buy and use recycled paper in your printers and copiers.
- ✂ Make full use of scanning documents and save on shared folders instead of unnecessary printing.
- ✂ Don't print hard copies of your e-mail messages unless you really need it.
- ✂ Scan all hardcopy documents. This may take time but will reduce storage costs and will also be beneficial in terms of making access to document easier, time savings for looking for lost paper work.
- ✂ Use ICT rather than paper with clients. Documents sent and received electronically and never printed can reduce both the time required to deliver a document, enable relatively easy editing, and reduce costs for both client and your organisation.

### TIPS

#### How to choose printers?

*What is the printer's expected duty cycle? How many pages will I print on a daily (and monthly) basis?*

*Do I need color printing or will black and white printing do?*

*Do I want ink jet or laser printing?*

Ink jet printers tend to cost less than laser printers, and they may also have better color, but they often use ink at alarming rates. Laser printers have a longer duty cycle and cost less to operate, but not always.

*Will this be a network printer, with its own IP address, allowing it to be shared directly over the network?*

Networked printers tend to be more expensive to buy because they require additional electronics to handle the networking, but that's a one-time expense.



## 4.0 Buying Energy-efficient ICT equipments

ICT equipments generate carbon dioxide emissions and this has an environmental impact. The more power consumed by a PC, for instance, the more CO<sub>2</sub> emissions that will be generated by this PC. In this context, it is important to consider purchasing energy-efficient equipments as this generate less power consumption which in turn leads to lower CO<sub>2</sub> emissions.

### 4.1 Purchase Energy Star qualified devices

Energy Star is an international standard for energy efficient consumer products that include computer products and peripherals, as well as appliances and other products. Energy Star-qualified devices cost about the same as standard ICT equipments but use less electricity. In fact, qualified equipment that meets the new specification (a computer or monitor, for example) can save money over the life of the product. Here are some other attributes of Energy Star-qualified devices:

- On average, 25 percent more energy efficient than traditional models
- Energy Star equipments are designed to run cooler and last longer
- Energy Star products will save billions over the next five years and avert greenhouse gas emissions equal to four million cars

(More details on Energy Star is available at <http://www.energystar.gov>)

### 4.2 Purchase Electronic Product Environmental Assessment Tool (EPEAT) registered product.

EPEAT is a procurement tool promoted by the nonprofit Green Electronics Council to:

- Help institutional purchasers evaluate, compare and select desktop computers, notebooks and monitors based on environmental attributes
- Provide a clear, consistent set of performance criteria for the design of products
- Recognize manufacturer efforts to reduce the environmental impact of products by reducing or eliminating environmentally sensitive materials, designing for longevity and reducing packaging materials

All EPEAT-registered products must meet minimum requirements in eight areas of environmental impact and be energy efficient to reduce emissions of climate-changing greenhouse gases. Under EPEAT, products receive a rating of bronze, silver, or gold. There is a summary of the IEEE 1680 criteria, along with ratings of many popular computers, on the EPEAT Web site at <http://www.epeat.net>.

### TIPS

**Check if the ICT equipments you want to purchase are certified as energy efficient. For e.g.**

- **If you are using an international product, check for the following mark**



- **If you are using a Chinese product, check for the following mark**



- **If you are using an American product, check for the following mark**



## 5.0 Disposal, Re-use and Recycling ICT Equipments

Computers have toxic metals and pollutants that can emit harmful emissions into the environment. Hence, It is crucial to discard unwanted electronic equipments in a convenient and environmentally responsible manner. Also, computers you're about to retire can still be productive for others. Although some effort is involved in finding new uses for old equipments, having such a reuse program in place can boost your company's image.



### Steps to dispose, re-use, donate or recycle ICT equipments:

- Reassigning old IT devices when possible:

Perhaps the simplest way to extend the life of ICT equipments is to find new uses for it within the organisation. Here are some ideas:-

- Old PCs, for example can be perfectly adequate for word processing, compiling spreadsheets and other non-memory intensive tasks.
- Older servers can be kept as standby units for use during periods of high demand. Remember to consider the costs of maintenance contracts or technical support.

- Reuse and repair ICT equipment before replacing
- Prepare and update on a regular basis, a disposal plan for ICT products that are no longer used.
- Donate ICT equipments:

Offering ICT equipment donations to a non-profit group – schools, library or others – that can use your old computers provides another way to extend their life. Here are some things to consider in setting up a donation program.

- Non-profit organisations only want reasonably recent machines in good working order.
- Machines with functioning hard drives — minus the previous owner's data — are much preferred.

- Recycle old ICT devices in an eco-friendly way:

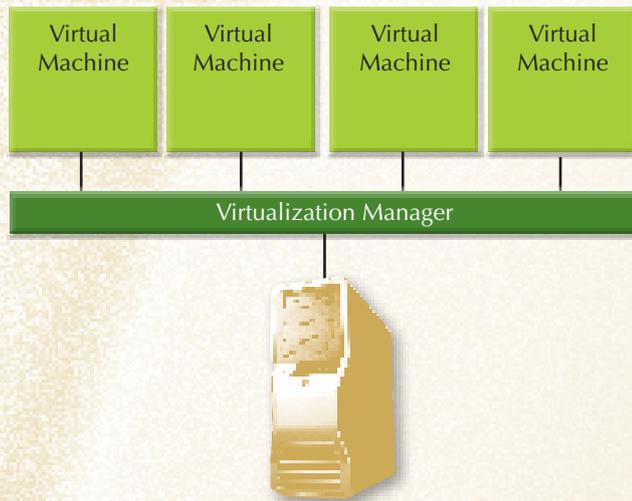
Select usable parts of old IT devices to make new items. (for example, old printer cartridges, cell phones and paper can all be recycled)

- Data Security and Recycling

Sensitive information stored on computer hard drives and non-volatile memory presents a major obstacle to reuse and recycling ICT equipments. It is essential that these hard disks are properly "wiped clean". The effective solution is to remove the hard drive from each computer before it is allowed out of the building.

## 6.0 Server Optimisation and Virtualisation

Virtualization is one of the easiest paths to Green ICT because when you run more than one *application on a server* — *application consolidation* — you reduce the number of servers required to support these applications. The reduction in the number of physical servers is referred as *server consolidation*. Fewer servers mean less power consumption and a lower energy requirement for cooling the servers.



### What's a virtualized server?

Basically, a **virtual server**, or Virtual Machine, is an instance of some operating system platform running on any given configuration of server hardware, centrally managed by a **virtual machine manager**, or **hypervisor**, and consolidated management tools.

**Note:** The software providing the virtualization is called the VMM (virtual machine monitor) or hypervisor. A hypervisor can run on bare hardware (native VM) or on top of an operating system (hosted VM).

### How to Build a Virtual Infrastructure:

**Step 1: Understanding application requirements:** The first step is to find out which applications run on which servers, as it is critical to understanding every application's requirements for memory and disk usage.

**Step 2: Hunting down underused servers:** Servers that are lightly used are target for application consolidation

**Step 3: Building virtual machines on target servers:** The administrator needs to supply only information about what resources the application requires for installation and operation and this includes the amount of virtual "memory" required to allocate to the application. After the virtual manager has this information, it builds a virtual machine of the correct size that is optimized for the operating system & application. This virtual container is empty at first, waiting for the administrator to (a) Install the operating system on which the application will run; (b) Install the application itself onto the newly installed operating system and (c) Restart the virtual machine —equivalent to rebooting a physical server

**Step 4: Testing the virtualized application:** The best practice is to test a new application on a physical server before placing it onto production. Some of the "testing" steps involved are:-

- Testing the application's performance under load — allowing some users to access and use the application to make sure it meets expectations
- Tuning the application — adjusting the application's configuration to optimize its performance under use
- Tuning the virtual machine so that it best supports the application

**Step 5: Replacing physical servers with virtual servers:** The basic steps to replace a physical server are:

- Configure virtual machines for the applications that will be installed on the host or target physical server
- Test the virtual server to ensure that it supports the installed applications
- Place the virtual server into production use
- Retire / repurpose the physical server that the virtual server has replaced

## 7.0 Indirect ICT Savings

Use of ICT can benefit various organisations in reducing their CO<sub>2</sub> emissions and leads to cost savings. Various initiatives leading to energy savings are as follows:-

- Use ICT to reduce the need to travel and increase the use of e-commerce and e-business. PCs with internet connections can influence travel habits by making it easier for people to work at home, enable virtual meetings, doing shopping online, paying all bills online, etc...
- Different forms of Conferencing reduce the need for travel, either locally or internationally. Conferencing can be categorised in terms of teleconferencing, web conferencing or video conferencing, as shown below:-

Tele Conferencing	Web Conferencing	Video Conferencing
Multi-persons teleconferencing is easy to use and relatively cheaper but takes time for an organisation culture to take on a regular basis. Teleconferencing significantly reduces emissions from travel	There are a number of web-based conferencing facilities that allow the use of VoIP or teleconferencing combined with a sharing of content on your PC. These systems can be extremely useful to reduce travel for both internal and external meetings and allow additional functionality such as sharing spreadsheets and detailed contents.	The video conferencing platforms include namely video conferencing from desktop computers. The various benefits are: - (a) Large savings on employee time can be immense AND (b) Significant reduction in emissions, especially when there is a need to hold meetings involving people based in a large area.

- Teleworking (telecommuting)** is another means of reducing carbon emissions. It implies getting a work done away from office and is of two main forms, namely working at home for a number of hours per week or mobile working, meaning working on the move, in the field, anywhere, in fact.

### *Use of Video Conferencing for a Greener Environment*

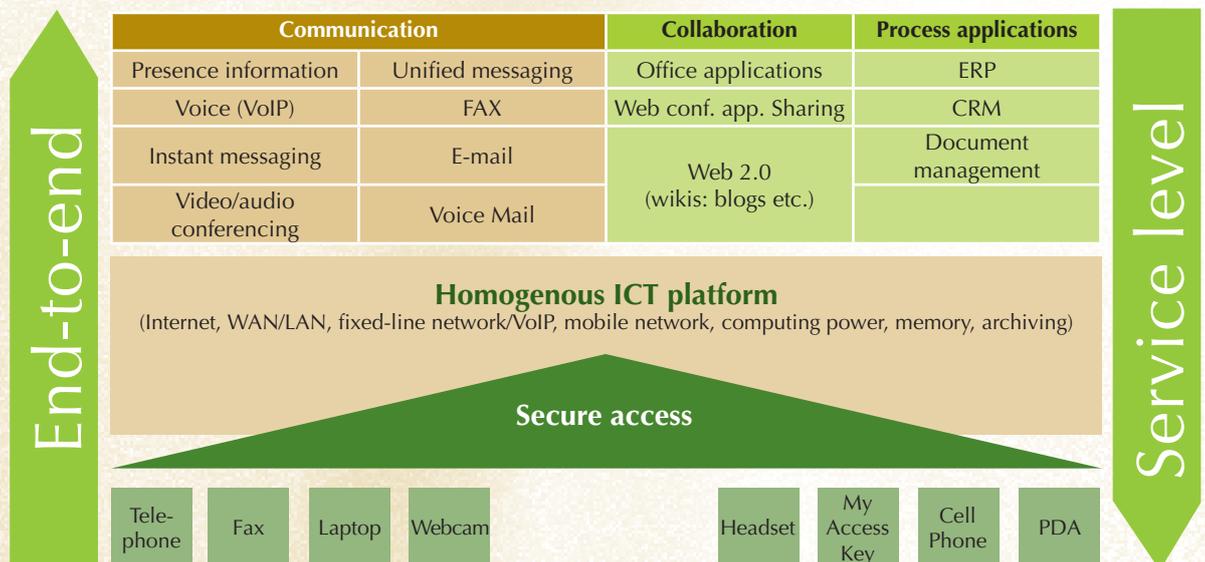


## 8.0 Unified Communications

Unified Communications is an emerging field and in time could be very important for carbon reduction as devices become smaller and less energy intensive. Unifying voice, video, and data transfer is sometimes called Unified Communications and refers to moving all the methods of traditional communications to integrated digital communications. For example, a company that does a lot of video conferencing and voice communications might find that unified communications saves loads of time and money by bringing the management of these separate systems to one “unified” view.

- Develop a unified communications strategy which implies using phone, messaging, email, faxes and other systems designed so that they can be fully integrated across the office.
- Use electronic data interchange (EDI) for business documents such as purchase orders, invoices and shipping notices between organisations.
- Implement an Intranet as it is a flexible system for communicating information across an organisation. The Intranet allows information to be changed effectively without the need to change lots of hard copies
- Consider implementing a Content Management System with the Intranet which opens the role of content management to people without the knowledge of HTML. This facilitates the addition of new content, the removal of old content, better organisation of data, management of text, articles, documents, images, files and other communications elements.
- Consider implementing VoIP email communications systems. In a VoIP environment, a voice call is treated as an email. Where email clients (e.g. Outlook) are configured to show the employees phone numbers and at which one they can be contacted. When a call or message comes through, the user can decide to take the call or route it through voice mail.
- Consider implementing electronic document management systems as this will encourage the keeping of electronic records and reduce the amount of paper records kept by organisations.

*The unified ICT infrastructure as the basis*





# LET'S START THINKING GREEN



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