GUIDE TO ICT –
DESKTOP ENERGY MANAGEMENT

Public Sector ICT Special Working Group

GUIDE TO ICT – DESKTOP ENERGY MANAGEMENT

This guide is one of a suite of documents on ICT energy efficiency resulting from SEAI's Public Sector ICT Working Group. It provides information on how to improve the energy efficiency of Information and Communications Technology (ICT) equipment and services in desktop environments.

This Guide is written for those responsible for managing and reducing ICT costs in an organisation. The Guide provides advice on managing ICT to minimise running costs and offers recommendations for purchasing efficient and environmentally preferable office equipment.

Using the techniques outlined in this Guide can reduce energy consumption in the desktop environment (PCs & laptops) by up to 30%, substantially reduce energy costs and increase the lifespan of desktop ICT equipment.

"Desktop energy consumption can be cut by up to 30%"

While it is appreciated that personal computers come in many shapes, sizes and operating systems, this guide focuses on x86 architectures and the Microsoft Windows environment. The term x86 refers to a family of instruction set architectures based on the original Intel 8086, launched in 1978 by Intel. Consult the operating system supplied with your hardware to understand the equivalent savings for alternative operating systems.

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OVERVIEW

The desktop environment accounts for a large part of total ICT energy costs, often surpassing that of a building's server room. It therefore offers a good opportunity to reduce energy consumption.

Many organisations are unable to enforce an end-user PC shutdown policy after business hours, leading to unnecessary power consumption and expense. With rising energy costs and increased awareness of the impact of CO_2 emissions, organisations are seeking to reduce this impact and eliminate the unnecessary cost.

ICT desktop and peripheral costs can be reduced through two main approaches:

1 More efficient use of existing equipment.

2 Purchasing more efficient equipment.

These approaches are outlined in more detail below.

Applications are available from the EU Energy Star programme www.eu-energystar.org and suppliers to help calculate the impact of ICT.

The EU Energy Star programme offers online tools for calculating ICT costs

Working Group results from office PCs using plug-in meters:

• Desktop unit consumption: 40–80W; average 80W.

• LCD monitors consumption: 40–150W; average 70W.

Rule of thumb for energy consumption of:

• Modern PCs, 80W;

• Laptops approximately 20W;

• Thin clients (terminals), 11–20W (+ monitor).

ASSESSING THE COSTS

One of the first steps in addressing energy consumption in the desktop environment is to assess how much it costs to run the equipment and how this can be reduced.

Desktop PC energy calculation example

• PC + monitor = 100W

• 9-hour business day

• 5-day week = 45 hours

• 45 hours x 100W = 4,500W per week

• 4,500/1000 = 4.5kWh per week

• 50-week year = 225kWh

Multiply by number of PCs, e.g.:

• 1000 PCs x 225kWh = 225,000kWh/year

• at 17c/kWh (example price) = € 38,250

Source: IBIT and SEAI ICT Working Group

A standard desktop PC with a 17" LCD monitor can use 70-150 Watts per hour; a single desktop PC powered on for an average of nine hours per business day can use: 150 Watts x 45 hours = 6,750 Watts per desktop per business week.

This calculation is accurate only for desktop PCs powered down outside business hours. You should increase the hours to match usage on your site and to estimate energy consumption.

"30% of PCs are left powered on unnecessarily after business hours"

OUT-OF-HOURS USE

SEAI's ICT Working Group for the Public Sector found that, on average, 30% of PCs are left powered on unnecessarily after business hours, greatly increasing the average weekly power consumption of these desktops to around 25 kilowatt-hours (25kWh/week):

• Using an electricity cost of 17 cents/ kWh, the annual energy running cost of a single workstation left powered on unnecessarily after business hours, could be up to €221 ex. VAT. For 1,000 desktop PCs, this translates into a cost of €221,000 per annum. Even a small reduction in power

consumption accumulates quickly into substantial energy cost savings.

COOLING COSTS

More efficient use of equipment not only saves direct ICT energy costs, it also reduces the need to cool the space and can therefore reduce air conditioning costs.

COMMON CHALLENGES

The SEAI Public Sector Working Group found a number of common challenges when attempting a Desktop Energy Management project. These are summarised as follows:

- The initial focus on ICT energy conservation tends towards servers and their environment. The perception is that it is easier to quantify savings and implement action in this area. In fact, many organisations have already begun or implemented server consolidation projects in the form of Hardware Virtualisation, which helps to reduce server energy consumption (see also SEAI Server Guide).

- Results from the SEAI ICT Working Group show that a typical desktop PC consumes 150W while powered on; roughly 80W by the PC and 70W by the LCD monitor. To check this for your own desktop PC set-up, buy a simple plug-in meter. Get one with battery back-up so it can be left in situ for long periods.

- Although many organisations perceive that it is difficult to determine which desktops do not have power management enabled and are consistently left powered on after business hours, in fact a Visual Basic (VB) script or simple audits or walk-arounds can identify this. Energy and monetary savings can therefore be quantified for implementing a Desktop Power Management Solution (DPMS).

- IT departments have an erroneous perception that, to implement a DPMS, investment in a third-party software tool is required, adding to financial and management overheads and possibly having a negative impact on the end-user experience. See below for alternative solutions.

- However, DPMS software is already in place for Windows systems and can be relatively easily configured for use. This solution should be examined before deciding to invest in third party software.

ENERGY MANAGEMENT

Energy management is an all-encompassing system of management and control, which aims to achieve organisational objectives at minimum energy cost. A structured approach to energy management is available at www.seai.ie/EnergyMAP. ICT can play its part in an organisation's energy management programme if the steps outlined below are taken.

ENERGY SAVING MEASURES

Many of the actions required to reduce desktop PC energy usage are already available on existing hardware and software. Some actions require expertise, for example, writing scripts. But much of the 30% savings mentioned are available through both no-cost and low-cost actions in operations and maintenance.

Consider these steps to improve desktop PC energy efficiency in your organisation:

ICT WORK PRACTICES

Update ICT practices to place an emphasis on energy efficiency by:

- Configuring and centrally controlling the Operating System Power Management settings of the desktop environment.
- Configuring and standardising the power management settings in the operating system on all hardware. Configure before the desktop is issued to the end user, and control and monitor centrally thereafter, e.g. using Group Policies in the Microsoft Active Directory.
- Performing software updates/patch deployments during business hours or use Wake-on-LAN technology to perform this task out of business hours.

DESKTOP ENERGY MANAGEMENT SOLUTIONS

Several approaches can be taken, including downloading new tools which are part of existing software licences, or purchasing a third-party solution.

Such software will perform safe power-downs (sleep, hibernate or shut down) of desktops after business hours and also provides accurate reporting to the ICT administrators. The investment in a third-party tool may be offset against the energy savings realised by using the tool.

With lower ICT budgets, investing in a third-party tool may not be feasible, but ICT departments can still implement a Desktop Power Management solution by leveraging existing ICT infrastructure.

Visual Basic scripts can power-down computers and monitor their usage

For example, use an existing Network Infrastructure or Software Deployment Tool to deploy Visual Basic scripts (or similar) to safely power down desktops after business hours, and realise substantial energy and cost savings without additional licensing costs.

Desktop maintenance tasks should also be updated – for example, conduct software update deployment during business hours, reducing the need to leave desktops powered on after business hours, or employ a Wake-on-LAN solution that will power-on desktops for maintenance tasks (note that desktops may not power down automatically after using Wake on LAN).

Perform regular Desktop Energy Audits

- Walk around after hours, log equipment left on, or alert users by leaving a notice. Alternatively a Switch-off campaign can offer small rewards or recognition for those who have switched off.
- Write or obtain a simple Visual Basic (VB) script and deploy after business hours to log which desktops are powered on. Collate the logs and quantify the energy consumption and costs of desktops being powered on unnecessarily after business hours. Deploy the VB script by using any software deployment tool or through Microsoft Active Directory.
- A Desktop Power Management Audit can also be conducted through a systems management tool or third-party software tool. Either will collate the required information and produce detailed reports on potential energy and cost savings.

Implement a Desktop Power Management Solution.

This can take many different forms:

- Enable Power Management directly on all equipment.

> ## "With power management disabled a PC can use 2.5 times more energy"

Multimedia PC + 18" LCD monitor	Energy consumption	
	Power management setting	
Average office use	'Energy saving'	'Disabled'
	75.7 kWh/yr	192.6 kWh/yr

Source: EU Energy STAR Programme www.eu-energystar.org

- With average office use, over a year, a Multimedia PC with an 18" LCD monitor uses 2.5 times more energy when the power management (PM) is disabled, than when PM is in the 'energy saving' setting.

- Obtain or write Visual Basic scripts to safely power down PCs each night. The safest option when using auto-power-down scripts is to hibernate the PC as this restores all settings, and opens documents when the PC is later powered on.

- There are many third-party Desktop Power Management software tools available, varying in price and functionality. When assessing any third party tool, consider:
  - Can it be deployed independently, or does it rely on a pre-existing systems management tool?
  - Does it have adequate reporting features so that statistics can easily be reported?

PROCUREMENT

Update your hardware procurement policy by introducing energy-efficiency criteria. For example:

- Purchase certified energy efficient hardware, e.g. equipment on the SEAI Triple E or ACA list, or Energy Star equipment.

- Purchase thin clients or laptops instead of desktops, wherever possible.

- Include whole-life/lifetime costs in evaluating equipment purchases, and not just capital costs. To avoid purchases being made solely on capital cost grounds, calculate the lifetime costs of the equipment, including energy running costs.

- If considering laptops as replacement for desktops, include the financial and energy costs of docking stations if they are needed, along with additional monitors, since all of these will use energy, and must be included in the energy saving calculation.

Thin Client Terminals[1]

Thin client terminals provide an energy effective alternative to PCs in many environments, typically delivering significant energy savings as compared to desktop PCs. This guide deals with PCs; if you feel terminals may be an option in your ICT environment, then consult with specialist suppliers.

> **Thin client vs. Desktop**
> - Sample Thin client with 30W consumption.
> - Sample desktop with 100W consumption.
>
> Over 36 months and fully on for 9 hours per working day, the Thin client will use 202.5kWh vs. desktop using 675kWh, giving a saving of 472.5kWh over the three year period.
>
> - A cash saving of €80+ [at €0.17/kWh] per unit.

> ## "A Desktop PC can use over 3 times more energy than a Thin Client"

> **Triple E and public procurement**
>
> The new public procurement procedures and guidelines require 'green' criteria to be at the centre of all State procurement.
>
> The European Communities (Energy Efficient Public Procurement) Regulations S.I. 151 2011 oblige public bodies when purchasing or leasing products to only procure products that:
>
> - are specifically listed on the Triple E Register, or
> - satisfy the energy efficiency criteria published by SEAI for the relevant product categories.

1 A thin client (sometimes also called a lean or slim client) is a computer or a computer program which depends heavily on another computer (its server) to run its software. The exact roles assumed by the server may vary. The alternative - a PC - is often known as a 'fat client'.

Therefore all* public sector tenders must include reference to Triple E compliance and suppliers must be able to demonstrate that their product offering is either on the register or complies with the relevant criteria.

Some exemptions exist relating to competition issues and Register criteria.

FINANCE

Innovative licensing, pricing and service models are now becoming available from established vendors; consult with your suppliers as to what new services are available to reduce the energy usage of existing ICT infrastructure.

ACA – ACCELERATED CAPITAL ALLOWANCE

The ACA is a tax incentive for companies paying corporation tax and aims to encourage investment in energy-efficient equipment. The ACA offers an attractive incentive, allowing companies to write off 100% of the purchase value of qualifying energy efficient equipment against their profit in the year of purchase.

Currently, the minimum expenditure is €1,000 and the following items are covered:

• Enterprise Servers
• Enterprise Storage Equipment
• Precise Cooling
• Heat Rejection
• Centralised Direct Current Power Distribution
• Power Management
• Uninterruptible Power Supply

Full ACA details and lists of qualifying energy efficient equipment can be found at www.seai.ie

DESKTOP ENERGY MANAGEMENT CHECKLIST

The table below summarises the actions which have been found to generate savings in ICT electricity usage and office cooling demand.

✓	Action Checklist	Tips and findings from SEAI's Public Sector ICT Working Group
	Senior management is committed to ICT energy efficiency.	... for resource allocation and policy change.
	An ICT Energy Co-ordinator has been appointed.	... with the necessary time and resources.
	Sufficient resources are allocated to energy management within the ICT team.	A set time per week should be allocated to this work.
	An ICT Energy Management Team has been established.	A small team of enthusiastic volunteers.
	Desktop	
	The PCs left on overnight are visible / reported.	Use central policy and controls or write scripts to report which PCs are left on after a set time.
	PCs are not left on after hours for updates.	If PCs are left on after hours for updates, then consider re-scheduling to during the working day.
	Software updates are carried out during business hours only.	This may be challenging, but can be both feasible and successful with adequate communication to staff beforehand.
	All non-essential equipment is switched off out of business hours.	Can save up to 60% of office equipment energy costs.
	There is automated shutdown after hours.	Write script to hibernate unattended PCs.
	Power management is configured (stand-by is enabled).	Can save up to 30% of PC and monitor energy use during the working day.
	Ancillaries	
	Train key staff to operate energy equipment effectively.	After maintenance, are power settings reset and/or checked to be correct?
	Conduct regular walk-arounds to check for energy waste in ICT.	Walk-arounds should be regularly scheduled as people often fall back into bad habits. Timely action will maximise savings.
	Turn off equipment when not required, especially in summer as it reduces heat build-up.	This improves comfort and reduces electricity use.
	Meter standard/model PCs to estimate total power usage.	Use an inexpensive plug-in meter to monitor over time.
	Fit seven-day time controls to equipment that is shared.	Up to 50% saving in energy use is associated with printers and copiers.
	Set defaults on printers to duplex mode.	Save on energy, toner and paper costs.
	Purchasing	
	Choose appropriate computer screens.	Replace CRT-type screens with LCD or other energy-efficient technologies.
	Choose equipment appropriate for the task.	Inkjet printers in sleep mode use 50% less energy than a laser printer.
	Purchase equipment with low energy options that match your requirements.	This could save around 10% of your printing costs alone.
	Have power management configured before delivery.	Make sure that it is the default setting.
	Purchase laptops or terminals instead of desktops: Laptop/Thin Client : PC ratio	Terminals and laptops use 20% of the power of a desktop PC.
	Renew ICT hardware whenever possible.	Newer equipment is increasingly more efficient than old.
	Specify equipment from SEAI ACA or Triple E equipment list.	Make this part of a Green Public Procurement initiative.