Green Public Procurement

Office IT equipment

Technical Background Report

Report for the European Commission – DG-Environment by BRE, 2011.

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Abbreviations

BFR	Brominated flame retardant
CPU	Central processing Unit
CRT	Cathode ray tube
DVI	Digital video interface
EMAS	Eco-Management and Audit Scheme
EP	Electro-photography
EU	European Union
EuP	Energy Using Products
IEEE	Institute for Electrical and Electronics Engineers
GPP	Green public procurement
LCA	Life Cycle Assessment
LCC	Life Cycle cost
LCD	Liquid crystal display
IT	Information Technology
MFD	Multifunctional device
MFP	Multifunction product
OM	Operational mode
PBB	Polybrominated biphenyls
PBDE	Polybrominated diphenyl ethers
PCs	Personal Computers
PVC	Polyvinyl chloride
TEC	Typical electricity consumption
VGA	Video graphics array
VOC	Volatile organic compound
UNEP	United Nations Environment Programme
WEEE	Waste Electrical and Electronic Equipment

1 Introduction

The European Commission has presented recommended GPP criteria for a range of different products and services.[1] Green Public Procurement is a voluntary instrument.

This Technical Background Report provides background information on the environmental impact of office IT equipment based on the life cycle data and outlines the key relevant European legislation affecting this product group. It presents market availability of this product group, some cost consideration and public procurement needs. It outlines the rationale for the core and comprehensive environmental purchasing criteria that are being proposed.

This report accompanies the associated **GPP criteria** that contain the proposed purchasing criteria and ancillary information for green tendering procedures and, as such, they should be read alongside one another.

[1] http://www.ec.europa.eu/environment/gpp

2 Definition, Scope and Background

Office IT equipment as dealt with in this document covers two sets of products:

- Personal computers and notebooks
- Monitors

Imaging equipment, which has been formerly under the scope of the Office IT equipment GPP criteria, is now being developed (2010/11) as stand alone EU GPP criteria and EU Ecolabel product criteria.

2.1 Computers

The definitions are taken from the *Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programs for office equipment*[2].

Computer means a device which performs logical operations and processes data, is capable of using input devices and computer displays, and includes a central processing unit (CPU) to perform operations. If a computer, on shipment, includes a monitor, a key board or any other input device these must also comply with the criteria.

Keyboard means a data input device which uses an arrangement of push-buttons, which can be used to insert discrete data into a computer.

External Power Supply means a component contained in a separate physical enclosure external to the computer casing and designed to convert line voltage AC input from the mains to lower DC voltage(s) for the purpose of powering the computer. An external power supply must connect to the computer via a removable or hard-wired male/female electrical connection, cable, cord or other wiring.

Internal Power Supply means a component internal to the computer casing and designed to convert AC voltage from the mains to DC voltage(s) for the purpose of powering the computer components. For the purposes of this definition, an internal power supply must be contained within the computer casing but shall be separate from the main computer board. The power supply must connect to the mains through a single cable with no intermediate circuitry between the power supply and the mains power. In addition, all power connections from the power supply to the computer components, with the exception of a DC connection to a computer display in an Integrated Desktop Computer, must be internal to the computer casing (i.e., no external cables running from the power supply to the computer or individual components). Internal DC-to-DC converters used to convert a single DC voltage from an external power supply into multiple voltages for use by the computer are not considered internal power supplies.

Desktop Computer means a computer where the main unit is intended to be located in a permanent location, often on a desk or on the floor. Desktops are not designed for portability and utilise an external computer display, keyboard, and mouse. Desktops are designed for a broad range of home and office applications.

[2] http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_381/l_38120061228en00260104.pdf

Integrated Desktop Computer means a desktop system in which the computer and computer display function as a single unit which receives its AC power through a single cable. Integrated desktop computers come in one of two possible forms: (1) a system where the computer display and computer are physically combined into a single unit; or (2) a system packaged as a single system where the computer display is separate but is connected to the main chassis by a DC power cord and both the computer and computer display are powered from a single power supply. As a subset of desktop computers, integrated desktop computers are typically designed to provide similar functionality as desktop systems.

Thin Client means an independently-powered computer that relies on a connection to remote computing resources to obtain primary functionality. Main computing (e.g., programme execution, data storage, interaction with other Internet resources, etc.) takes place using the remote computing resources. Thin Clients covered by this definition are limited to devices with no rotational storage media integral to the computer. The main unit of a Thin Client covered by this definition must be intended for location in a permanent location (e.g. on a desk) and not for portability.

Notebook computers comprise devices which have the following characteristics:

a) They perform logical operations and process data and are designed specifically for portability and to be operated for extended periods of time either with or without a direct connection to an AC power source;

b) They utilise an integrated computer display and are capable of operation off an integrated battery or other portable power source. If a notebook computer is delivered with an external power supply this power supply is considered part of the notebook computer.

Tablet personal computers, which may use touch-sensitive screens along with or instead of other input devices shall be considered Notebook Computers. However digital picture frames shall not be considered notebook computers.

***Discrete Graphics Processing Unit (GPU*)**: A graphics processor with a local memory controller interface and a local, graphics-specific memory.

2.2 Computer Monitors

A computer monitor is defined as a commercially-available, electronic product with a display screen and its associated electronics encased in a single housing that is capable of displaying output information from a computer via one or more inputs, such as VGA, DVI, and/or IEEE 1394. The monitor usually relies upon a cathode-ray tube (CRT), liquid crystal display (LCD), or other display device. This definition is intended primarily to cover standard monitors designed for use with computers. To qualify, the computer monitor must have a viewable diagonal screen size greater than 12 inches and must be capable of being powered by a separate AC wall outlet or a battery unit that is sold with an AC adapter. Computer monitors with a tuner/receiver may qualify as ENERGY STAR under this specification as long as they are marketed and sold to consumers as computer monitors (i.e., focusing on computer monitor as the primary function) or as dual function computer monitors and

televisions. However, products with a tuner/receiver and computer capability that are marketed and sold as televisions are not included in this specification.

Computer display means a display screen and its associated electronics encased in a single housing, or within the computer housing (e.g. integrated desktop computer), that is capable of displaying output information from a computer via one or more inputs, such as a VGA, DVI, Display Port, and/or IEEE 1394. Examples of computer display technologies are the cathode-ray tube (CRT) and liquid crystal display (LCD).

3 Market availability

With a collective annual budget of €2 trillion or 17% of the EU's GDP, Europe's public procurers are a highly influential group of bodies, who can contribute significantly to drive the establishment of sustainable production and consumption[3].

Most countries showed a wide variation across the level of GPP, but overall electricity, office IT and furniture attained the highest scores in 2006/2007.

The Information and communication technologies (ICT) sector accounted for a substantial part of EU GDP and employment. However, ICT is a ubiquitous technology and investments in ICT are also estimated to have been responsible for around half of the EU's productivity growth in recent years. It is a highly R&D intensive sector, accounting for around a quarter of EU R&D. As general purpose technologies, ICT goods and services are important drivers of productivity growth and economic performance across all sectors. ICT enables process and product innovation, and money spent on computing technology delivers gains in worker productivity, which are many times higher than those of other investments[4].

The market across EU lacks harmonization as some member states (Austria, Denmark, Finland, Germany, Netherlands, Sweden and the UK) have individual criteria and others usually apply the GPP office IT equipment criteria. This fragmentation increases administrative costs for businesses and hinders the internal market.

The Ecolabel document for notebooks[5] and personal computers[6] is finalised, and should be used in conjunction with this document if further details are required.

This market is heavily influenced by fashion trends, life span, and combination of all of these. For example, the current trend towards using tablet personal computers rather than other forms of notebook computers might be possibly environmentally advantageous by reducing initial impacts and running costs.

[3] AEA (2010) Assessment and Comparison of National Green and Sustainable Public Procurement Criteria and Underlying Schemes; Final Report, ENV.G.2/SER/2009/0059r
[4] http://ec.europa.eu/enterprise/sectors/ict/index_en.htm
[5] http://ec.europa.eu/environment/ecolabel/ecolabelled_products/categories/portable_computers_en.htm
[6] http://ec.europa.eu/environment/ecolabel/ecolabelled_products/categories/personal_computers_en.htm

4 Key environmental impacts

Given the diversity of the product group, the most relevant environmental impacts differ slightly depending on which product is being considered and its life cycle stage. Office IT equipment's life cycle typically follows these stages:

- Acquiring raw materials
- Transport
- Manufacturing of constituent parts
- Transport
- Assembly of parts into a final product
- Transport
- Operation and management of distribution network
- Use and servicing
- End of life disposal

Several main environmental and associated social (particularly associated with mining and manufacturing of some components) impacts are relevant to all products:

- Manufacturing of components
- Energy consumption of products
- Hazardous constituents in products
- Metals contained within batteries
- Waste reduction - Reuse/recycling and the guarantee of spare parts
- Noise emissions

For all equipment it is also important to consider upgradability. Therefore, criteria recommended in this document are set for each of the following aspects reflecting the above environmental impacts:

- Energy Performance
- Design for reparability
- Noise
- Hazardous substances (mercury, flame retardants, etc)
- Upgradability and durability (lifetime extension)
- Recycled content and recyclability
- User instructions and/or training courses for IT support on green management of IT products (comprehensive criteria)

For monitors, use of mercury in flat-panel displays is of concern.

Each of these issues will be addressed separately or in combination below.

4.1 Manufacturing

The manufacturing of PCs, notebook computers and displays can be split into various stages:

- Acquiring raw materials
- Transport
- Manufacturing of constituent parts
- Transport
- Assembly of parts into a final product
- Transport

Major environmental concerns for the main metals used as raw materials are[7] :

- Copper (used in cables, electronic modules, and computer chips) - Main copper producer is Chile. Copper mines cause severe environmental impacts through resource consumption and emissions. Although most copper mines are certified according to ISO 14001, local communities are affected by the mining activities. A major issue, for example, is the high water requirement of copper mining and the location of most copper mines in the Atacama Desert (the driest desert worldwide), which leads to water shortage and associated environmental complications.
- Cobalt (used in rechargeable batteries, integrated circuits, semi-conductors) - Main producer of cobalt is the Democratic Republic of the Congo (DRC). Although several foreign companies established codes of conduct to protect human rights and improve labour conditions, effective monitoring systems are absent. There are hardly any efforts to minimise environmental impacts, or to improve freedom of expression, or to reduce the risk of conflicts.
- Gold (9% of world production is used in connectors, solders, microprocessors, and memory chips onto the motherboard) – Gold mining activities require a very high resource consumption and entail a massive environmental load due to resource consumption and the use of hazardous substances as mercury or cyanide to dissolve the gold, which has also negative social effects. The efforts of the mining sector to reduce environmental impacts are estimated as low.
- Tin (used as solder on printed circuit boards). In the past tin-solder was mainly alloyed with lead, what is now in general forbidden (RoHS directive). As a result the demand for tin increased in recent years. Lead-free tin alloys contain copper, silver, zinc, or bismuth as replacement for lead. China and Indonesia are the two largest tin producers Mining in China has similar environmental issues as gold mining (see above). In Indonesia informal (artisan) mining has been growing because many fishermen and farmers have become miners, as the environmental pollution caused by tin mining has destroyed their original livelihood. Tin mining is one of the major causes of wide-scale deforestation in SE Asia.
- Aluminium (used in frames, casings, heat exchangers). Roughly one third of the global aluminium supply stems from scrap. Bauxite is the most common ore of aluminium and is the primary source for aluminium. Its mining contributes to environmental impact mainly via its vast land use (deforestation, water pollution, air pollution in urban areas, and forest fires).

Individual parts are assembled in the final manufacturing stage. A multitude of components is needed for assembly of each of the office IT equipment products covered in this document.

[7] LCA of an Ecolabeled Notebook (2011) GreenDeltaTC GmbH

Constituent parts of the final products typically are, for example, hard disc and optical drive, semiconductor memory, battery, casing, fan, power supply, motherboard, and so on.

Although the main environmental impact for a computer is energy consumption during the use phase, according to the 2003 United Nations University Report 'Computer and the Environment: Understanding and Managing their Impacts' manufacturing of computers is materials intensive when comparing products by weights. 'The total fossil fuels used to make one desktop computer weigh over 240 kilograms, some 10 times the weight of the computer itself.' This is very high compared to many other goods: For an automobile or refrigerator, for example, the weight of fossil fuels used for production is roughly equal to their weights. Also, substantial quantities of chemicals (22 kg), and water (1,500 kg) are used.

The environmental impacts associated with using fossil fuels (e.g. climate change), chemicals (e.g. possible health effects on microchip production workers) and water (e.g. scarcity in some areas) are significant. The report notes that there may be possible long-term health effects on workers, families, and neighbouring communities due to chemical exposure and emissions from production stages such as microchip fabrication. (Kuehr & Williams, 2003). However, an evaluation carried out by a Scientific Advisory Committee (SAC) for the semiconductor industry concluded there was no evidence of increased cancer risk to clean-room workers, although it could not rule out the possibility that circumstances might exist that could result in increased risk. An independent retrospective epidemiological study about increased cancer risk among wafer fabrication workers was commissioned by SIA (Semiconductor Industry Association) in 2005 and is currently conducted under the direction of researchers from Vanderbilt University[8].

Office IT equipment products contain many different metals which must be mined, plastics which must be mixed with additives as for instance flame retardants to reduce the flammability, or other substances with specific unique properties which are very difficult to be substituted acceptably, and which pose problems in production, or in disposal. The environmental impacts from manufacturing are significant but extremely difficult to address but should be pushed more prominently into the consumer's field of environmental and social consciousness. However, in the meantime, instead of substituting high-risk-or-impact parts, a better environmental performance of electronics can be achieved via life time extension, increase of recycling rates, and the increase of energy efficiency in the entire process chain, but it is still a long way to sustainable computers. Several Life Cycle Assessment studies identify use phase as the most environmentally detrimental phase. The operating mode and the energy saving mode during the overall use phase contribute to a significant proportion (more than 50%) of LCA impacts[9]. The following section addresses this issue in detail.

[8] http://www.sia-online.org/backgrounders_ohs.cfm

[9] Example LCA for colour monitors (2001, DOI: http://dx.doi.org/10.1065/lca2000.11.039) In the production phase, the cathode ray tube assembly process and the printed circuit board assembly process are the most contributing processes. Even in the home use case, which is the best case scenario, the use phase is one of the most contributing processes to the environmental performance of the colour computer monitor.

4.2 Energy consumption for Personal Computers, notebooks and monitors

For many office IT products the most significant environmental impact relates to the energy consumption during their lifetime[10]. This is particularly the case for office PCs, notebook computers and monitors.

According to the ENERGY STAR website[11], most studies report that for an office PC primary energy consumption during use is more than 3 to 4 times higher than the primary energy needed for manufacturing and materials production, whilst the energy costs/credits of waste disposal and recycling are negligible (<15% of production energy). This is the result for a typical office PC, used 8 hours per day (including Standby) over 260 days.

A notebook computer typically uses 50 to 80% less energy in use than a desktop, but it is also much lighter (1.1 to 3 kg compared to >8 kg for a desktop). Therefore, here also, the energy consumption during its useful product-life is expected to be the dominant factor.

Although there seems to be a trend towards small devices which use less energy, this might also mean that they have shorter lifecycles e.g. iPad2 came out a year after iPad1 and iPad3 is rumoured to be coming out a year after iPad2. The generic style is towards smaller, faster products that will respond to natural language input and will have high data storage capacity. Development of individual products is not in the public domain as it is subject to a fears competition.

Most office IT equipment now comes with energy saving modes (‘sleep’ / ‘standby’). However, such products also consume electricity even when they have been turned off, but are still plugged in. Additionally, user behaviour plays a critical role here. Although such modes tend to be included as standard, this function is often not enabled by the end-user. Delivering equipment with these modes already enabled, or ensuring IT staff configures the machines appropriately is highly important.

Whilst substantial improvements have been made in the energy saving modes of IT equipment, the same cannot be said for ‘active/idle’ mode requirements, i.e. when the machine is in active use. Large variations in active energy use exist between different models on the market (some devices consume twice as much energy as others), and the active mode is in most cases responsible for the majority of total energy consumption. Whilst energy consumption in the ‘active’ mode is principally determined by the functionality of the machine (powerful, high-specification models will consume more energy), differences exist between models offering the same level of functionality.

Products offered on the market differ quite significantly in their energy consumption in the different modes (‘on’/’sleep’/’off’ etc.) and introducing some simple requirements to procurement can make a big difference.

In the most recent version of the ENERGY STAR (version 5.0) products must meet stringent TEC (total energy consumption) requirements for estimated annual energy consumption. Small-scale servers and thin clients must meet energy use guidelines in ‘off’ and ‘idle’ modes

[10] Schmidt & Fryendal (2003): Methods for Calculating the Environmental Benefits of 'Green' Products in Erdmenger (ed.) Buying into the Environment – Experiences, Opportunities and Potential for Eco-Procurement, Greenleaf

[11] http://www.eu-energystar.org

of operation, and thin clients supporting sleep functions must meet requirements in this mode as well. These requirements ensure energy savings when computers are being used and performing a range of tasks, as well as when they are turned off or into a low power mode. ENERGY STAR qualified computers must also have efficient internal or external power supplies. The operational modes are set out by ENERGY STAR[12] and the EuP study[13].

4.3 Hazardous Constituents

Electronic and electrical equipment may contain a variety of hazardous substances. These include[14]:

- **Brominated Flame Retardants** (BFRs): used in printed circuit boards, cables, wires and plastic for computer casings. Certain BFRs can affect learning and memory functions in humans.
- **Mercury**: used in flat-panel displays, may be harmful to the nervous system and toxic in high doses. Approximately 0 to 50 mg mercury is present in each LCD monitor, due to the use of energy efficient CFL backlighting. However, there are trends towards LED and OLED backlighting in the market over the next 5 to 10 years which would not require mercury content.
- **Lead**: used in cathode ray tubes and batteries, can be harmful to the nervous system and poisonous in high doses.

The recently updated RoHS Directive (2002/95/EC – see section 10.4) has now severely restricted the use of a number of substances in electronic and electrical equipment: lead, mercury, cadmium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)[15].

Certain ecolabels also highlight the use of chlorine-based plastics in the casing (and packaging) of the product, the production and disposal of which can lead to emissions harmful to human health and the environment.

4.4 Noise

Computer noise is becoming more of an issue and PCs are loud enough to be distracting, especially if the workspace is otherwise tranquil and this can cause stress for those sensitive to such sounds.

Nowadays, PC makers are considering acoustics when they design systems. The main sources of noise are motors and spinning components such as the hard drive, CPU fan, case cooling fans, and power supply fan.

[12] http://www.eu-energystar.org/en/index.html
[13] European Commission DG TREN Preparatory studies for Eco-design Requirements of EuPs (2007), Lot 3 Personal Computers (desktops and notebooks) and Computer Monitors
[14] *OK Computer?* Nicola Scott and Mary Rayner, 2007
[15] RoHS Directive available at http://ec.europa.eu/environment/waste/rohs_eee/index_en.htm

4.5 Disposal and durability

The United Nations Environment Programme (UNEP) estimates that up to 50 million tonnes of waste from discarded electronic goods is generated annually. The disposal of electronic appliances in landfill sites or through incineration creates a number of environmental problems. Firstly a considerable amount of resources that went into making the products are lost. Improper disposal of electronic waste can also release hazardous chemicals and heavy metals into the environment (see hazardous constituents section above).

A key concern in the IT sector is the current limited life cycle of many devices and the need for regularly replacing devices. The design of the machine (i.e. how easy it is to simply upgrade parts) is also significant not only because this sector is producing 'revolutions' every six months and therefore design is now crucial to address 'design for disposal or re-use. It is important to ensure that sufficient warranty and spare parts availability is provided.

The life cycle of the product is also of key importance in reducing environmental impacts related to production processes (see section 4.6). However, it needs to be borne in mind that introducing more efficient equipment sooner may result in less energy impacts in the use phase leading to overall life-cycle reductions. The best option in each case will depend on the individual products involved, their waste impacts and the potential energy savings between the two options[16].

4.6 Packaging

Packaging is an integral part of the goods supply chain. It is used to protect goods from damage, allows efficient distribution, informs the consumer and in some cases, although less for office IT equipment, helps to promote goods. Environmental issues relating to the packaging include resource consumption, primary energy consumption whilst making the packaging, environmental effects of chemicals used in the packaging (particularly chlorinated plastics) and the process of making it and waste generation.

Although this represents a very small proportion of the total environmental impact of office IT equipment, as with any consumer products, it is important to consider packaging and it is also easy for procurers to put simple conditions in place when tendering. For example, the quantity and type of packaging used and the opportunities for recycling should be considered.

5 Cost considerations

As with any electricity-using product, purchasing energy efficient models is generally a win-win option – reducing running costs, and also reducing environmental impacts. Generally, the energy efficiency of the product also has relatively little impact on the purchase price, certainly if you are aiming for a model within the 25% most efficient on the market. The EU ENERGY STAR website has a useful tool for calculating the possible financial savings of buying a more efficient product[17].

[16] WEEE Directive available at http://ec.europa.eu/environment/waste/weee/index_en.htm
[17] http://www.eu-energystar.org/calculator.htm

The market of IT-equipment is constantly and rapidly changing. It is therefore recommended to focus on criteria that can be viable over a longer period of time. This could include using notebooks instead of desktops. Alternatively, thin clients can be used if the server system supports it.

It is recommended to apply a "total cost of ownership methodology" when awarding the contract. This means that instead of considering just the purchase price of the product when assessing the one offering best value for money, the contracting authority will consider the life cycle cost (LCC) over the estimated period of ownership of the device. This would cover the purchase price, the cost of maintenance and other services, the cost of energy consumption and other consumables (such as paper and ink) for a device, and any disposal costs. This will allow the authority to take into account environmental impacts in both the quality assessment (through environmental technical specifications and/or award criteria) and the price (through inclusion of the Life cycle cost).

It is difficult to provide a clear and up-to-date data for cost considerations as prices, and other economic implications are highly volatile. However, the information in the following subsections can be used as a guide[18].

5.1 Computers

For computers the differences between the green and the non-green version are calculated to amount to between 3% higher to 7% lower life costs for the green version. However, there are a number of uncertainties that might have significant influence on the results: users behaviour, costs for repair, influence of the on-site service for the overall product lifetime, and rapid changes in the market (e.g. due to prices and variability of components) lead to rapidly changing product composition and product prices.

5.2 Notebooks

For notebooks the differences between the green and the non-green version are calculated to amount to between 6% and 24% life cost, with the green version being more expensive than the non-green version. The energy savings of the green version have no major influence on the overall costs, with a typical saving of €8 over 4 years.

5.3 Monitors

The calculated differences between the green and the non-green version amount to 10% to 22%, with the green version being less expensive than the non-green version.

[18] *Study on costs/benefits of Green public procurement in Europe*, Öko-Institut & ICLEI 2007, available at: http://ec.europa.eu/environment/gpp/index_en.htm

6 Public Procurement Needs

The popularity, availability and increased functionality of computers have made them one of the most common piece of equipment found in homes and offices alike. The energy consumption of computers and monitors during their active life-time is the most significant environmental impact and it should be the focus of procurement considerations. Products offered on the market differ quite significantly in their energy consumption in the different modes ('on'/'sleep'/'off' etc.) and introducing some simple requirements to procurement can ensure environmental impacts are kept to a minimum[19].

All public bodies procure some form of information and communication technologies. These cover various products but some have individual GPP criteria, for example, imaging equipment. The office IT equipment here covers:

- Computer monitors
- Desktop computers
- External power supplies
- Notebook computers
- Workstations

Generally public bodies purchase rather than lease computers and monitors. Sometimes computer purchases are carried out by a central purchasing agency on behalf of a number of departments, often to a standard specification. This can help reduce costs because computers are bought in bulk. It also makes it easier to apply GPP procurement principles.

Servicing of IT equipment should be borne in mind during the procurement process. Some form of maintenance agreement will help to avoid the early failure and disposal of equipment. This may be in the form of a manufacturer's warranty or service agreement with another company. An on site servicing agreement is usually more convenient for the public authority.

7 Conclusions and Summary

For PCs, notebooks and monitors, the energy consumption of the products during their active life-time is the most significant environmental impact and should therefore be the main focus of the recommended criteria. Environmental impacts from acquiring raw materials, manufacturing components, final assembly, and transport amongst these stages are not insignificant, however, the nature of the value chain is such that focusing on user phase and end of life stage would deliver immeasurably higher environmental benefits. The focus of GPP should therefore be on extending the useful life of the product as it is a relatively simple and effective approach to reducing environmental impacts with user's behaviour.

The ENERGY STAR standards are the internationally recognised norm for energy efficiency for IT products (and aimed at the top 20-25% of products on the market), and there is a healthy supply of ENERGY STAR-labelled products on the market for all product groups.
The Blue Angel label (RAL-UZ 78), which applies to workstation, portable computers and upgraded thin clients, is awarded separately for system units, display units and external keyboards.

[19] AEA report, p. 124

There is a general move towards harmonising approaches of the various labelling schemes across EU, particularly in terms of energy use. In the coming months and years it is likely that the major eco-labels in Europe will adopt these energy efficiency standards. As such, the ENERGY STAR standard and EU Ecolabel criteria are recommended as the basis for Core and Comprehensive criteria for PCs, notebook computers and monitors.

The consumption of certain models is heavily dependent on the type of performance required by the product – for a PC, for example, the power supply, the processor and the graphics card, can make a significant difference to energy consumption. Thus, an exception may need to be made where high-performance models are required, energy consumption will necessarily be higher.

8 Recommended core and comprehensive GPP criteria

It is proposed to set core and comprehensive criteria for Office IT equipment. The proposed GPP criteria are designed to reflect the key environmental risks. This approach is summarised in the following table:

Key Environmental Impacts	GPP Approach
• Energy consumption and resulting Carbon Dioxide (CO2) emissions. • Air, soil and water pollution, ozone formation (smog), bioaccumulation or food chain exposure and effects on aquatic organisms due to hazardous constituents e.g. mercury content of LCD displays and flame retardants • Negative impact on the health of employees due to noise, causing stress for those sensitive to such sounds • Use of energy, finite resources and harmful emissions related to the production of IT products • Generation of waste material including packaging and final disposal	• Purchase energy efficient models • Purchase products with a restricted amount of hazardous constituents and promote take back options • Purchase products with a restricted noise level • Design for recycling, longer life and promote take back options • Ensure the recyclability of the packaging used • Increase the use of recycled packaging • Safe disposal (recycling, re-use) of final product

Please note that the order of impacts does not necessarily translate to the order of their importance.

The core criteria for PCs, notebooks and monitors focus on energy consumption in the specifications, based on ENERGY STAR requirements. Additionally simple criteria have been included addressing the lifetime of products.

The core criteria will therefore cover the following issues:

- Energy consumption

- Extending the useful life of the product

A number of other environmental issues can also be considered.

In the comprehensive criteria, a number of further aspects are included in the specifications and award stage:

- User instructions
- Energy management functions on the hardware itself
- Noise emissions
- The use of mercury in LCD monitor backlighting
- The disassembly of equipment
- Upgradeability and durability ('hard-ware' and protection, e.g. casings, transport cases, etc)
- Recycled content and recyclability
- The use of flame retardants with certain risk-phrases (carcinogenic, mutagenic or harmful to reproduction) in plastic parts

These additional criteria have been designed so that any of the major ecolabels may be used to prove compliance. The full recommended criteria sets can be found in the EU GPP criteria document.

9 Verification issues

9.1 Energy use

Compared to other products and service groups there are many office products on the market meeting Ecolabel standards for energy consumption. There are a large number of ENERGYSTAR labelled products available on the market[20].The energy consumption standards of the other major ecolabels are now starting to harmonise, based around the ENERGY STAR criteria (e.g. Blue Angel…' *The measurements shall be made in accordance with the ENERGY STAR Requirements for Computers, …')*[21]

As such, contracting authorities can be confident that all products offered in response to tenders including the ENERGY STAR energy consumption requirements and EU Ecolabel for Desktop and Notebook computers will provide a sufficient evidence of very good practice in terms of energy management levels.

9.2 Other environmental issues

For the other environmental issues discussed above, there are significant differences between the criteria sets of the main ecolabels. However, there are a number of areas of common ground between the labels, particularly in relation to:

- Extending the useful life of products
- Mercury in background lighting in LCD monitors
- Noise emissions
- The disassembly of equipment

[20] On the EU ENERGY STAR website (www.eu-energystar.org), there are currently 2361 desktop PCs, 4584 notebooks, and 2541 monitors labelled.
[21] http://www.umweltbundesamt.de/produkte-e/beschaffung/buero/buerogeraete/tragbare_computer.html

- The use of plastics containing flame retardants with certain risk phrases.

There is a relatively modest number of makes of computers[22] (though more than at the time of the last revision) with the latest version of the EU Ecolabel. However, there is a general awareness amongst manufacturers of energy use in particular and numerous other relevant regulations across the EU.

10 Relevant European environmental policy and legislation

This section provides information on EU legislation that is relevant for office IT equipment. It is important that contracting authorities are aware of it, as some of the responsibilities which Member States have agreed upon by voting through this legislation may have some consequences for contracting authorities. This is the case for example, if, according to this legislation, a product has to be disposed of in a certain way or if the manufacturer or supplier has to implement a take back scheme for a certain product.

Some of the legislation also requires products to be labelled or indicate, for example, if they contain a certain amount of a hazardous substance. This is useful information for the contracting authority and can ease verification of compliance with certain requirements.

10.1 Regulation on a Community energy-efficiency labelling programme for office equipment

The new EU ENERGY STAR Regulation was adopted on 17 December 2007 which makes the purchase of energy efficient IT products compulsory by central government authorities as well as the European Commission and other community institutions. This will only apply to contracts above the threshold values outlined in the Public Procurement Directives (2004/18/EC and 2004/17/EC).

The Regulation defines “energy efficient” to mean “not less demanding” than the ENERGY STAR requirements. As such it represents a significant step forward in driving the market towards the development of more energy efficient IT equipment. A similar ruling in the US in the ‘90s for all Federal Government agencies led to the then ENERGY STAR standards becoming the industry norm (in 2011 the latest version is 5.0 but the new version 6.0 is under development and public consultation is underway).

Depending on how “central government authorities” are defined within Directive 2004/18/EC (Annex IV), the Regulation may not, however, apply to regional and local authorities or semi-public authorities.

[22] The Blue Angel has 15 PCs, 19 printers, 29 MFDs, 2 monitors, 10 copiers. Nordic Swan has 3 companies supplying labelled personal computers and 3 supplying imaging equipment. TCO 05 has 8 labelled desktop computers (from one manufacturer), 17 TCO 06 and hundreds of TCO 03 labelled displays, but no TCO 05 notebooks.

10.2 Directive 2009/125/EC on the Eco-design Requirements for Energy-using products (EuP)

The EuP directive establishes a framework for the setting of eco-design requirements for energy-using products with the aim of ensuring free movement of those products within the internal market. The Directive aims to encourage manufacturers to produce products which are designed to minimise their overall environmental impact, including the resources consumed in their production and disposal.

The 2005 Ecodesign directive covered energy-using products, which use, generate, transfer or measure energy, including consumer goods such as boilers, water heaters, computers, televisions, and industrial products such as transformers. The implementing measures focus on those products which have a high potential for reducing greenhouse gas emissions at low cost, through reduced energy demand.

The European Union's Framework Directive on Eco-Design of Energy-Using Products (Directive 2009/125/EC**)** establishes a framework to set mandatory ecological requirements for energy-using and energy-related products sold in all 27 Member States. Its scope currently covers more than 40 product groups (such as boilers, lightbulbs, TVs and fridges), which are responsible for around 40% of all EU greenhouse gas emissions. The 2009 revision of the Directive extended its scope to energy-related products such as windows, insulation materials and certain water-using products.

The Directive does not as such introduce binding requirements for specific products, but it does define conditions and criteria for the adoption of so-called "implementing measures", which will establish requirements regarding environmentally relevant product characteristics. These binding implementation measures are now being established for several product groups including office IT equipment.

10.3 Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)

Directives 2002/96/EC on waste electrical and electronic equipment and 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive, see section 3.4) are designed to tackle the fast increasing waste stream of electrical and electronic equipment and complement European Union measures on landfill and incineration of waste.

The WEEE Directive is one of a series of 'producer responsibility' Directives that makes EU producers of new equipment pay for the recycling and/or safe treatment and disposal of the products they put on the market when they eventually come to be thrown away.
The WEEE Directive provides for appropriate channels for take-back, treatment and disposal of products at the end of life.

Once the Directive is fully transposed[23], waste electrical and electronic equipment, including the office IT equipment referred to in this study, can be disposed of free of charge, if the owner takes the product to the agreed collection point.

[23] http://ec.europa.eu/environment/waste/weee/index_en.htm

For contracting authorities, it will be important to refer to the relevant national regulations, legislation and/or agreements within the sector regarding the take back and recycling systems for products. However, contracting authorities can go considerably further in requiring certain characteristics which make the recycling of products easier, such as how easy it is to disassemble, limiting the mixing of different plastic types, the appropriate labelling of parts, and the use of easily recyclable materials.

10.4 Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

The Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment 2002/95/EC[24] (commonly referred to as the RoHS Directive) dictates that Member States shall ensure that, from 1 July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

There are, however, certain acceptable limit values and exemptions listed in the Annex to the Directive for these substances (e.g. the use of mercury in fluorescent lamps, lead in glass, etc.). This means that these substances still exist - to some extent - in electrical and electronic equipment. The Annex to the Directive has been amended several times (2005/618/EC, 2005/717/EC, 2005/747/EC, 2006/310/EC), altering the list of exclusions and limit values. The new Directive (in June 2011, Directive 2011/65/EU) applies to the same restricted substances as the original Directive. This will extend protection from dangerous chemicals to more electrical appliances and improve the safety of products such as mobile phones, refrigerators and electronic toys (62/10 +COR4, 8117/11 ADD1 REV1). There is a transition period for additional categories of EEE which are coming into scope of the Directive. There are also changes to exclusions, exemptions procedure and conformity, including CE marking obligations.

10.5 REACH Regulation (1907/2006)[25] and LSD 2008

The new REACH (registration, evaluation, authorisation and restrictions of chemicals) Regulation (1907/2006) was adopted in December 2006, and entered into force on 1 June 2007. It provides a new regulatory framework for the collection of information on the properties of chemicals on the European market, and also for future restrictions on their use.

The previous legislative framework had made a distinction between “existing” (over 100,000) and “new” chemicals (i.e. introduced after 1981), with no appropriate testing mechanism for the potentially harmful properties of existing chemicals. Furthermore public authorities, rather than industry were responsible for undertaking risk assessments, which meant a burdensome (and slow) evaluation process.

Under the new regulation manufacturers and importers will be required to gather information on the properties of their chemical substances (both existing and new), which will allow their safe handling, and to register the information in a central database run by the European

[24] http://ec.europa.eu/environment/waste/rohs_eee/index_en.htm
[25] *REACH in Brief*, http://ec.europa.eu/environment/chemicals/reach/pdf/2007_02_reach_in_brief.pdf

Chemicals Agency (ECHA) in Helsinki. It also calls for the progressive substitution of the most dangerous chemicals when suitable alternatives have been identified.

A new Agency acts as the central point in the REACH system: it will run the databases necessary to operate the system, co-ordinate the in-depth evaluation of suspicious chemicals and run a public database in which consumers and professionals can find hazard information. Substances with properties of very high concern will be made subject to authorisation. Applicants who wish to produce and/or market such substances will have to demonstrate that risks associated with uses of these substances are adequately controlled or that the socio-economic benefits of their use outweigh the risks. Applicants must also analyse whether there are safer suitable alternative substances or technologies. If there are, they must prepare substitution plans, if not, they should provide information on research and development activities, if appropriate. The Commission may amend or withdraw any authorisation on review if suitable substitutes become available.

The restrictions provide a procedure to regulate that the manufacture, placing on the market or use of certain dangerous substances shall be either subject to conditions or prohibited. Thus, restrictions act as a safety net to manage Community wide risks that are otherwise not adequately controlled.

In future, this will provide not only a rigorous testing and restriction procedure for all chemicals on the European market, but also provide a highly valuable centralised information source which could be used by public purchasers. However, it will take some years before the system will be fully operational and comprehensive.

10.6 Directive on Batteries and Accumulators and Waste Batteries 2006/66/EC

The 2006 Battery Directive, officially repealing the 1991 Battery Directive, was approved July 4, 2006 and became official on September 26, 2006. It gives European Member States until Sept. 26, 2008, to implement its national laws and rules on batteries.

The Battery Directive has an objective of reducing the amount of hazardous substances used in the manufacture of batteries e.g., lead, lead-acid, mercury, cadmium, etc., and better waste management of these batteries.

With the exception of “button” cells with mercury content of no more than 2% by weight, the 2006 Battery Directive restates the earlier Battery Directives’ prohibition of marketing all batteries with more than 0.0005% mercury and 0.002% cadmium and mandates symbols on battery labels that indicate the battery’s chemical contents if mercury or cadmium. Lead is no longer being totally prohibited from batteries.

Article 21 provides that labelling must indicate separate collections or recycling and the heavy metal content. Labels should state collection information and chemical content of batteries. They should show a symbol of the “crossed-out” wheeled recycling bin (Annex II, P. 13 of the new directive) to indicate that the battery should not go in the bin.

11 Existing Standards & Eco-labels and other information sources

There are many different voluntary environmental performance labels and declarations for office IT equipment including the EU Ecolabel, Blue Angel, Nordic Swan, TCO, and ENERGY STAR.

ENERGY STAR is a voluntary appliance specific label, identifying to consumers appliances that meet certain standards regarding energy efficiency. It was originally set up by the US EPA in 1992. In 2001 the European Union signed an Agreement with US EPA to introduce the ENERGY STAR in Europe as well (only for office equipment), thereby recognising each other as Partner in the ENERGY STAR programme. This allows potential partners in the European Union to sign up through the European Commission, who is responsible for the EU ENERGY STAR Programme.

The ENERGY STAR label undoubtedly has the largest spread of labelled products on the market, however it is focused specifically on energy consumption. The latest criteria can be found in the *Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programs for office equipment*[26]. The criteria are divided into two categories of products:

- Computers – covering both desktops and notebooks, together with other devices
- Computer monitors

Products meeting the specifications will be in the top 20-25% of the market in terms of energy performance.

As noted above the new EU ENERGY STAR Regulation makes the purchase of IT products meeting at least the ENERGY STAR standards compulsory for central government authorities (as defined in national legislation).

Some of the other main ecolabels available in Europe relating to computers are:

- EU Ecolabel for:
  - Personal computers (2011): http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:151:0005:0014:EN:PDF
  - Portable computers (2011): http://ec.europa.eu/environment/ecolabel/ecolabelled_products/categories/portable_computers_en.htm

- Blue Angel for Computers (RAL-UZ 78) (2006): http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm

- Nordic Swan – Personal Computers (also covers notebooks and monitors), version 5.0 (2007) http://www.svanen.nu/SISMABDesktopDefault.aspx?tabName=CriteriaDetailEng&menuItemID=7056&pgr=48

[26] http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_381/l_38120061228en00260104.pdf

TCO Development for:

- Desktops (TCO ‘05) (2005) http://www.tcodevelopment.com/tcodevelopment1200/Datorer/TCO05/TCO05_Desktopversion_1.0.pdf

- Notebooks (TCO ‘05) (2005) http://www.tcodevelopment.com/tcodevelopment1200/Datorer/TCO05/TCO05_Notebook_computers_version_2.0.pdf

TCO also has a label specifically for monitors/displays (TCO ‘03):

- http://www.tcodevelopment.se/tcodevelopment1200/Datorer/TCO03_Displays/TCO03_FPD_version_3_0.pdf) (updated in 2005 to be in line with ENERGY STAR requirements on power consumption).

The European Ecolabel, Blue Angel and Nordic Swan criteria for computers also cover monitors.

Table 2 below shows the products covered by some of these labels. Although these labels are similar, there are important differences between them, both in terms of the aspects covered and the wording used.

Table 2. Ecolabel coverage of office IT equipment										
	Label									
Product	Austria Ecolabel (Umweltzeichen-Bäume)	Czech Republic Ecolabel (Ekologicky šetrny výrobek)	Hungary Környezetbarát Termék (Environmentally Friendly)	EU Ecolabel	ENERGY STAR	German Ecolabel Blue Angel	The Nordic Ecolabel Miljömärkt – The White Swan	Spanish Ecolabel "AENOR Medio Ambiente	Slovek Republic Ecolabel (Environmentálne Vhodný Výrobok)	TCO 99
PCs		X	X	X	X	X	X	X	X	X
Notebook computers		X	X	X	X	X	X	X	X	X
Monitors		X	X	X	X		X	X	X	X
MFDs					X	X	X			X

11.1 Ecolabel criteria covering energy consumption and noise

The following analysis compares the key European ecolabels as regards their criteria addressing the most important environmental impacts identified in section 2.

11.1.1 Energy consumption – desktops, notebooks and monitors

Following the recent revision of the ENERGY STAR criteria for computers (including notebook computers and monitors), which are aimed at the top 20-25% of products on the market, these standards are now being recognised as the international norm for highly efficient IT products.

ENERGY STAR also now sets criteria for "idle/on" state for computers – i.e. 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. This is a significant addition, which up to now has not been covered by the majority of the ecolabels, as there was no agreed method of assessment.

Other ecolabels have and will take ENERGY STAR criteria as their basis in the future[27]. A comparison of the eco-labeling criteria for desktops, monitors and notebooks can be found in Tables 3 – 5 below.

A more detailed explanation of the ENERGY STAR criteria for computers can be found in Annex I. The full criteria are available on the EU ENERGY STAR website[28] and are outlined in the official EU ENERGY STAR Agreement[29].

The EU Ecolabel can be found at:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011D0337:EN:NOT

and

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:151:0005:0014:EN:PDF

[27] Blue Angel will, for example, adopt the Energy Star criteria for computers at the beginning of 2008
[28] http://www.eu-energystar.org/
[29] http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_381/l_38120061228en00260104.pdf

Table 3. Comparison of the key Ecolabeling criteria for desktops					
Energy criteria for Desktops	**Energy Star** 2009	**Nordic Swan** Version 6.1	**EU Ecolabel** April 2005	**TCO´05** Jul 2005	**Blue Angel** 2011
Sleep	Category A: <= 148.0 kWh Category B: <= 175.0 kWh Category C: <= 209.0 kWh Category D:	4W	4W	4W	≤ 2.0 W
Off	2W	2W	2W	2W	≤ 2.0 W
On/idle	50-95 W*	-	-	50-95*	Category A: ≤ 12 W Category B:

* Depending on category of PC

Table 4. Comparison of the key Ecolabeling criteria for notebook computers					
Energy Criteria for Notebook computers	**Energy Star** July 2009 (version 5.0)	**Nordic Swan** 2007	**EU Ecolabel** Apr 2005	**TCO`05** Jul 2005	**Blue Angel** 2011
Sleep	1.7W	3W	3W	1.7W	2W
Off	1W	2W	2W	1W	2W
On/idle	14-22 W*			14-22W*	
Power supply	84%	0.75W	0.75W	84%	

* Depending on category of PC

Table 5. Comparison of the key Ecolabeling criteria for monitors					
Energy criteria for Monitors	**Energy Star** Jan 2006	**TCO´03** (Updated Jan 2006)	**Nordic Swan** 2007	**EU Ecolabel** Apr 2005	**Blue Angel** 2006
Sleep	2W	*	*	*	*
Off	1W	*	*	*	*
Active mode	Y (1)	*	*	*	*

(1) If X < 1 megapixel, then Y = 23; if X > 1 megapixel, then Y = 28X. Y is expressed in watts and rounded up to the nearest whole number and X is the number of megapixels in decimal form. X = Megapixels. Y = Allowed power consumption * = Same requirement as ENERGY STAR

As for PCs, the criteria behind these recommendations are relatively complex and it would be difficult for a contracting authority to verify compliance. However there is a sufficient number of ENERGY STAR labelled products on the market; therefore contracting authorities can be confident of not having to go through this complex process. It is unlikely that products meeting these criteria would not be labelled.

11.1.2 Noise

In the EuP study consultation, the question has been raised whether noise is an environmental issue for IT equipment or not. The conclusion was that noise is considered as such in some situations such as in quiet offices and should be therefore included as a criterion. Table 6 below compares criteria for noise for the EU Ecolabel, the Blue Angel, Nordic Swan and TCO.

Table 6. Comparison of the key Ecolabeling criteria for desktops				
Noise levels	**The Blue Angel**	**Nordic Swan**	**EU Ecolabel**	**TCO**
Desktop computers				
Idle mode	4.0 B(A)	4.0 B (A)	4.0 B(A)	3.5B (A)*
When accessing a hard-disk drive / Operating mode	4.4 B (A)	4.4 B (A)	4.5 B(A)	3.9 B (A)* Operating mode
Notebook computers				
Idle mode		3.5 B (A)	3.5 B (A)	3.5 B (A) *
When accessing a hard-disk drive / Operating mode		4.0 B (A)	4.0 B (A)	3.9 B (A)* Operating mode

* If the product does not emit prominent discrete tones according to procedures specified in ECMA 74 Annex D a higher declared A-weighted sound power level (LWAd) is accepted but shall not exceed: Operating mode: 4.7 B Idling mode: 4.2B

11.2 Ecolabels criteria covering other relevant aspects

This section provides an overview of the 'other' criteria used by ecolabels such as hazardous substances, recycling, disposal, durability and packaging for computers and monitors.

11.2.1 Hazardous substances for PCs, notebooks and monitors

For hazardous substances, there is no direct way of comparing the ecolabels, especially for PCs/notebooks. This is mainly because of the complexity of the criteria and because they are presented in different ways. For example, the ecolabels go into detail on different aspects of hazardous substances and for different components of a computer.

The tables below show which issues are covered by the key ecolabels.

Table 7. Comparison of the key non-energy and noise Ecolabeling criteria for desktops

Criteria for Desktops	TCO'05	The Swan	Blue Angel	EU Ecolabel
Environmental Responsibility				
Company's environmental Responsibility	X	X		
Environmental hazards				
Mercury, cadmium, and lead	X	X	X	X
Flame retardants	X	X	X	X
Chlorinated plastics	X	X	X	
Preparation for Recycling				
Material coding of plastics	X	X	X	X
Variety of plastics	X	X	X	X
Metallisation of plastics	X	X	X	X
Material recovery of plastics and metals		X	X	X
Design for recycling - Mercury lamps	X	X	X	X
Easy to dismantle		X	X	X
Recycling information for customers	X	X	X	X
Guarantee and spare parts				
Guarantee		X	X	
Supply of spare parts		X	X	
upgradability/performance expansion		X	X	X
Packaging				
Requirements regarding packaging materials			X	X

(Source: EuP study)

Table 8. Comparison of the key non-energy and noise Ecolabeling criteria for notebooks

Criteria for Desktops	TCO'05	The Swan	Blue angel	EU Ecolabel
Environmental Responsibility				
Company's environmental responsibility	X	X		
Environmental hazards				
Mercury, cadmium, and lead	X	X	X	X
Flame retardants	X	X	X	X
Chlorinated plastics	X	X	X	
Preparation for Recycling				
Material coding of plastics	X	X	X	X
Variety of plastics	X	X	X	X
Material recovery of plastics and metals		X	X	X
Mercury lamps	X	X	X	X
Easy to dismantle		X	X	X
Recycling information for customers	X	X	X	X
Guarantee and spare parts				
Guarantee		X	X	
Supply of spare parts		X	X	
upgradability/performance expansion		X	X	X
Packaging				
Requirements regarding packaging materials			X	X

(Source: EuP study)

Table 9. Comparison of the key non-energy and noise Ecolabeling criteria for monitors

Criteria for Desktops	TCO'05	The Swan	Blue angel	EU Ecolabel
Environmental Responsibility				
Company's environmental responsibility	X	X		
Environmental hazards				
Mercury, cadmium, and lead	X	X	X	X
Flame retardants	X	X	X	X
Chlorinated plastics	X	X	X	
Preparation for Recycling				
Material coding of plastics	X	X	X	X
Variety of plastics	X	X	X	X
Metallisation of plastics	X	X	X	X
Material recovery of plastics and metals		X	X	X
Mercury lamps	X	X	X	X
Easy to dismantle		X	X	X
Recycling information for customers	X	X	X	X
Guarantee and spare parts				
Guarantee		X	X	
Supply of spare parts		X	X	
upgradability/performance expansion				

(Source: EuP study)

As noted in Section 3.3, the RoHS Directive has now restricted the use of most harmful substances in electrical and electronic equipment. However certain limit values and exemptions are set. The ecolabel criteria are still slightly stricter than the values in the RoHS Directive. Additionally, other potentially harmful substances may be included in office IT equipment which are not covered by the RoHS Directive such as beryllium, arsenic, phthalate Esters and organotins.

One area of agreement between the various ecolabels is in limiting the use of mercury in the background lighting of LCD monitors, which go beyond the restrictions set in the RoHS Directive, defining limits of 3 mg (EU Ecolabel & Blue Angel) or 3.5 mg (Nordic Swan). All four labels included in the table above also prohibit the use of flame retardant substances and preparations in plastic parts above 25g assigned with certain risk phrases (carcinogenic, mutagenic or harmful to reproduction). The EU Ecolabel goes further than the other labels as it also restricts flame retardant substances and preparations that are harmful to the environment.

The tables above list as an issue “company’s environmental responsibility”, for example the TCO label has a requirement that “Each manufacturing plant shall be certified in accordance with ISO 14001, or EMAS registered.” However, it is not possible for a contracting authority to specify such a requirement under the European Union public procurement Directives, because the link with the product which is being bought is not straightforward enough and therefore such requirements would call into question the basic principles of “best value for money” and fair competition amongst bidders, which are at the heart of the public procurement legislation.

11.2.2 Disposal

The end of life behaviour regarding computers and monitors is very much influenced by the WEEE directive. The WEEE directive puts the responsibility for Waste of Electrical and Electronic Equipment on the producer rather than the purchaser, however owners are responsible for bringing equipment to collection points.

The majority of the ecolabels also specify that the manufacturer shall offer, without any extra fee, the take-back for refurbishment or recycling of the product and for any component being replaced. Criteria are also specified for the easy disassembly and recyclability of equipment. Mostly the ecolabels use similar criteria for this

As referred to in section 3 on relevant European environmental policy and legislation, it will be important for contracting authorities to refer to the relevant national regulations, legislation and/or agreements within the sector regarding the take back and recycling systems for products.

11.2.3 Durability

Office IT equipment is one of the product groups where there are rapid advances in technology and products and spare parts for products can quickly become obsolete. According to the EuP study (2007) “*computers (but hardly monitors) can be upgraded to fulfil a better performance by changing processors, hard disk drives, graphics cards and other parts. This is an opportunity sometimes used by private consumers, but hardly by*

companies. The industry gave some figures saying approximately 2% of the customers use that opportunity."

As noted in this quote, the issue of upgradability is relevant for computers (PCs and notebooks), not monitors. The majority of ecolabels for PCs/notebooks, including the EU Ecolabel, Nordic Swan and Blue Angel, specify criteria for upgradability. These criteria are rather similar and concentrate on working memory expansion, installation, exchange and expansion of mass storage, installation and/or exchange of CD-ROM, DVD and hard disk drive and that the graphic cards are easily accessible. There are also specific criteria for notebooks such as criteria for ports[30] for external monitors, external keyboards and mice and at least two additional interfaces for external storage media and other peripheral devices. Additionally the Blue Angel and Nordic Swan, for both computers and imaging equipment specify a five-year availability of spare parts to extend the life-time of products by limiting the need to have them replaced.

Both the upgradability of the equipment and the availability of spare parts are straightforward and effective ways to limit the overall environmental impact of the sector, by reducing the consumption of resources and energy in production, together with harmful emissions related to the manufacturing processes, and the disposal of used products at the end of life.

11.2.4 Packaging

As can be seen in tables 6, 7 & 8, packaging is addressed by the EU Ecolabel and the Blue Angel. Some of the other labels do refer to adhering to relevant national regulations, legislation and/or agreements for packaging and ask for advice to be put in the instruction manual of products, such as the Nordic Swan.

The European Ecolabel stipulates that packaging shall meet the following requirements:

(a) all packaging components shall be easily separable by hand into individual materials to facilitate recycling.

(b) where used, cardboard packaging shall consist of at least 80 % recycled material.

The Blue Angel stipulates that plastics used for product packaging may not contain halogen-containing polymers. The plastics used must be marked in accordance with the German Verpackungsordnung (Packaging Ordinance, transcribing the EU Packaging Directive 94/62/EC).

11.3 Other Information Sources

Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programs for office equipment (ENERGY STAR criteria):
http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_381/l_38120061228en00260104.pdf

Blue Angel - Computers RAL-UZ 78:
http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm

[30] A "port" is a socket for connecting external devices, such as a monitor, keyboard, mouse or printer to the notebook

Preparatory studies for Eco-design Requirements of EuPs (Contract TREN/D1/40-2005/LOT3/S07.56313): Lot 3 - Personal Computers (desktops and notebook computers) and Computer Monitors. Final Report (Task 1-8). IVF Industrial Research and Development Corporation:
http://extra.ivf.se/ecocomputer/downloads/Eup%20Lot%203%20Final%20Report%20070913%20published.pdf

Nordic Swan – Personal Computers, version 5.0:
http://www.svanen.nu/SISMABDesktopDefault.aspx?tabName=CriteriaDetailEng&menuItemID=7056&pgr=48

TCO '05 – Desktops:
http://www.tcodevelopment.com/tcodevelopment1200/Datorer/TCO05/TCO05_Desktopversion_1.0.pdf

TCO '05 – Notebooks:
http://www.tcodevelopment.com/tcodevelopment1200/Datorer/TCO05/TCO05_Notebook_computers_version_2.0.pdf

TCO '03 – Displays:
http://www.tcodevelopment.se/tcodevelopment1200/Datorer/TCO03_Displays/TCO03_FPD_version_3_0.pdf

11.3.1 European legislation

Regulation (EC) No 106/2008 of the European Parliament and of the Council of 15 January 2008 on a Community energy-efficiency labelling programme for office equipment:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:039:0001:0007:EN:PDF

Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:285:0010:0035:EN:PDF

Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment:
http://eur- lex.europa.eu/LexUriServ/site/en/consleg/2002/L/02002L0095-20060701-en.pdf

http://www.europarl.europa.eu/sides/getDoc.do?type=TA&language=EN&reference=P7-TA-2010-0431

Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE):
http://eur-lex.europa.eu/LexUriServ/site/en/consleg/2002/L/02002L0096-20031231-en.pdf

For the recast of the Directive, see:
http://ec.europa.eu/environment/waste/weee/index_en.htm

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC:
http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf

Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC:
http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_266/l_26620060926en00010014.pdf

11.3.2 Studies, other information

- AEAT (2001) Revision of the EU ecolabel criteria for computers: A report produced for Department for the Environment, Food and Rural Affairs.

- Clement, S (2006) "The Procura+ Manual 2nd ed.: A guide to cost effective Sustainable Public Procurement". ICLEI, Freiburg, Germany.

- Edwards, R. 1995a. "Leak links power lines to cancer". New Scientist, 7 October 1995, p 4.

- Kuehr, R.; and Williams, E. (2003) Computers and the Environment: Understanding and Managing their Impacts, Springer.

- Meyer and Schaltegger (1999): Bestimmung des Energieverbrauchs von Unterhaltungselektronikgeräten, Bürogeräten und Automaten in der Schweiz, St. Gallen