Green ProcA

Green Public Procurement in Action

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Procurement and Climate Protection

Office Equipment

Co-funded by the Intelligent Energy Europe Programme of the European Union

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1. Introduction

According to a report issued by the Joint Research Centre (JRC), total electricity consumption across the EU is on the rise. Despite the panoply of measures adopted at both the EU and individual Member State levels to curb energy consumption and the ensuing CO_2 emissions, electricity consumption in the residential sector increased by 10.8% between 1999 and 2004, thereby offsetting all of the progress achieved over this 5-year period.
The same report indicated that energy consumption in the tertiary (services) sector rose even more (15.8%), while industrial consumption gains stood at 9.5%.

Over these past several years, energy consumption specifically tied to information and communication technologies (ICT) has also experienced significant growth. Another 40% rise has been forecast over the next 10 years [according to ISI 2003]. This figure belies the objectives adopted as part of the European Union's climate-energy package, and this contradiction becomes even more apparent when factoring in the "embodied energy" and associated emissions.
The office equipment category has thus become one of the most energy-consuming within the tertiary sector, as its share of overall electricity consumption typically varies from 20% to 40%.

A study conducted by Gartner and then updated by Greenit has demonstrated that computer equipment consumed 830 terawatt-hours of electricity worldwide in 2008 and is expected to reach the 900 TWh mark in 2012. Workstations and communication devices (phones, smartphones, etc.) would make up 60% of this global consumption level. Equipment left in "Standby" mode equals 47 TWh per year; this amount translates into a cost of €6.4 million and CO_2 emissions of 19 million tonnes. In the absence of regulatory measures, this level of energy consumption would be constantly rising. Consequently, the Eco-design Regulatory Committee approved the Commission's proposal to adopt regulations aimed at reducing electricity consumption, while in Standby mode, of all household and office devices. This Eco-design Directive is applicable to all electrical devices; it specifies the maximum allowable electricity consumption, e.g. for office equipment left in Standby mode. Since 2010, the targeted energy consumption for devices in Off/Standby mode is 1 watt, with the intention of reaching 0.5 watts in 2013. The objective behind this Directive therefore is to save 35 TWh of energy per year by 2020 [Eco-design Directive].

The first part of this Annex will highlight the most significant technological developments relative to energy for each category of office equipment, along with the standard annual energy consumption values used as the basis for calculating potential savings.
Next, the various energy and environmental labels will be presented; a comparison of their respective criteria will be performed along with a demonstration of the potential savings derived

from their implementation. These recommendations also provide functional references for purchasing office equipment, plus practical suggestions for integrating energy efficiency criteria into calls for tender and procurement procedures.

Objectives of this Annex:

The goal of the recommendations forwarded in this Annex is to establish a reasonable and efficient procurement policy that allows generating additional energy cost reductions as part of the office equipment procurement process. A rational use of energy resources serves to protect both the climate and the environment, thereby facilitating the introduction of a sustainable economy. It is obvious that the potential for positive results from this sector can then exert a positive impact felt more broadly among the population at large.

2. The equipment, its energy consumption statistics and environmental impact

Servers, data centres, photocopiers, computers and screens are the largest energy consumers within the ICT field. Moreover, some devices consume even more energy when placed in Standby mode (such is the case for printers and fax machines), while others consume electricity even after being turned off (shutdown/standby mode).

The considerable penetration of ICT throughout the world constitutes major environmental challenges that often fail to be recognised for their true potential: energy consumption and greenhouse gas emissions go without saying, but also depletion of non-renewable resources, discharge of toxic.

3. Targeted products and related criteria

Why purchase office equipment that's environmentally friendly and energy efficient?

- The possible rationale for taking environmental or energy efficiency criteria into account in office equipment procurement procedures are multi-fold:
  Energy efficiency and environmental protection are *de facto* both integral parts of EU policy governing energy supply security, climate change and other areas. EU Member States should therefore systematically incorporate both energy and environmental considerations into the promulgation of national policies regarding office equipment procurement. The EU has issued a reminder that 15 million computers are sold every year throughout Europe. The life cycle analysis (LCA) of a computer indicates that the manufacturing and end-of-life phases of this hardware account for the most serious environmental nuisances. Electronic wastes currently generate 4% of all municipal solid waste in France and are expected to increase by 3% to 4% a year.
- EU Energy Star Regulation (EC) No 106/2008 requires to buy energy efficient office equipment

In terms of energy characteristics and purchase price, the public sector has the advantage of not requiring top-of-the-line performance relative to graphic displays and therefore, in theory, consumes less energy. In general, the most important features consist of security, connectivity and compatibility.

The considerable penetration of ICT throughout the world constitutes major environmental challenges that often fail to be recognised for their true potential: energy consumption and greenhouse gas emissions go without saying, but also depletion of non-renewable resources, discharge of toxic substances, increased waste production, to name but a few. These impacts are primarily felt at the time of device manufacturing and end-of-life disposal, not to mention the social challenges raised by their production in emerging countries.
Electrical and electronic devices contain a wide array of components and materials. The emissions released during the manufacturing or dismantling of certain parts are highly noxious for both plant workers and the environment. Below is just a sample of the substances used to manufacture computers:

- screens: barium, lead
- cables and wires: lead (welds)
- chassis : polyvinyl chloride (PVC) (releases dioxins when burned).

The European Directive RoHS restricts, without fully banning, the quantities capable of being introduced into electronic equipment for the six following substances: mercury, lead, cadmium,

hexavalent chromium, polybromobiphenyls (PBB), and polybromodiphenylethers (PBDE).

The quantity of professional WEEE produced is increasing faster than our capacity to recycle or reprocess these materials.
Between 2006 and 2009, a total of 370,506 tonnes of professional electrical and electronic equipment (EEE) from Category 3 (computer hardware) entered the market, yet only 51,579 tonnes of professional Category 3 WEEE were actually collected and reprocessed[1]. This situation raises serious concerns since WEEE constitutes a major source of pollution and depletion of non-renewable resources. The lack of WEEE processing infrastructure has led to the disappearance of large quantities of copper, gold, silver, palladium 17, indium and other precious resources.

The EU (Green Public Procurement initiative, GPP) has stipulated that the chief environmental impacts of computer hardware are:

- energy consumption and, as a consequence, carbon dioxide (CO_2) emissions;
- air, soil and water pollution, ozone formation (smog), bioaccumulation or contamination of the food chain, and effects on aquatic organisms, all stemming from the use of hazardous substances, e.g. mercury in LCD monitors and certain flame retardants;
- the negative impact on worker health, due to the noise created, which causes stress for individuals sensitive to such background sounds;
- use of non-renewable energy resources, plus the hazardous emissions released during the manufacturing of computer products;
- waste generation, including packaging and end-of-life disposal.

Computers

The energy consumption associated with computers has radically changed over the past few years. This evolution is not merely a function of the main processor, but also individual components such as disk drives, graphics cards and the central processing unit (CPU). The expanded use of fans within computer assemblies, for avoiding CPU overheating, provides an indication of this rising energy demand. Moreover, in most instances, the disk drive and CD-ROM drive are only rarely running; their influence therefore on overall energy demand is limited.

Workstation computer	On	Standby	Off	Total
Electrical power [W]	78.2	2.2	2.7	--
Use time [hours/year]	2,279	3,196	3,285	--
Energy consumption [kWh/year]	178	7	9	194

Table 1: Average values for a computer equipped with a 3 GHz processor (or equivalent), an integrated graphics card, 512 MB of live memory (RAM) and an 80-Gbyte hard drive, 2007 [IVF]

The manufacturing of an office computer requires 100 times its final weight in raw materials[2] and generates more chemical pollution than the weight of the product[3]: 164 kg of waste, of which 24 kg

[1] GreenIT.fr, 2010, based on reports issued by ADEME (2006, 2008 and 2009). The 2007 volume figures have been estimated.
[2] "Computer and the Environment", United Nations University, Eric Williams and Ruediger Kuehr, October 2003.
[3] Science & Vie, June 2008.

is considered highly toxic. At the end of their useful lives, too many computers are still winding up in the dump. The toxic products they contain, particularly heavy metals, are prone to infiltrating soils, then the water table and ultimately entering the food chain.

Laptop computers

The electricity consumption of laptop computers is sharply lower than that of office workstations. This consumption drop is owed to a more energy-efficient architecture, which allows for longer periods of operation disconnected from the electrical network. The adaptation of operating frequency to meet use patterns reduces overall electricity consumption; however, the complexity of these computers and the architecture of their processor leads to higher production costs.

When laptop computers are used to replace office workstations, their use time within an office setting remains comparable. On the other hand, given that the laptop power supply needs to be activated more often than on workstations, laptops are (relatively speaking) more often left in Standby mode.

In comparing the 30 W consumed by a laptop (equipped for example with an LCD screen) with the 120 W allocated for an office workstation and the 80 W for a cathode ray tube (CRT) monitor, it seems plausible to save up to 80% of the energy required to run a computer by opting for a laptop. Even if the laptop planned as a replacement for an office workstation has been fitted with a larger screen (up to 16" or 17") and a less efficient power supply management system, the savings could still easily reach 50% [according to Energy Star].

Laptop computer	On	Standby	Off	Total
Electrical power [W]	32	3	1.5	--
Use time [hours/year]	2,613	2,995	3,153	--
Energy consumption [kWh/year]	84	9	5	98

Table 2: Average values for a laptop computer equipped with a 1.7-GHz processor (or equivalent), decent 3D graphics capabilities, a 15" screen, 512 MB of live memory (RAM) and a 60-GB hard drive, 2007 [IVF]

Screens

The market for screens is dominated by two technologies. Previously the most popular type, cathode ray tube (CRT) monitors are only rarely sold nowadays, except to graphic designers (due to their better colour presentation). For the most part, they have since been replaced by LCD (liquid crystal display) screens.

17" LCD screen (reasonably priced)	On	Standby	Off	Total
Electricity consumption [W]	25	1.2	1.2	--
Use time [hours/year]	2,586	3,789	2,375	--
Energy consumption [kWh/year]	52.2	4.3	3.6	60.4

17" CRT screen	On	Standby	Off	Total
Electricity consumption [W]	73	3	3	--
Use time [hours/year]	2,586	3,789	2,375	--
Energy consumption [kWh/year]	153.3	10.9	9	173.2

Table 3: Average values for standard screens in 2009 [Energy Star]

Printers

Within the office equipment sector, two types of printers are dominant: ink jet and laser. While laser printers have enjoyed increasing popularity, their energy consumption is nonetheless higher than ink jet printers; laser printers are primarily used in a network configuration for large-volume printing. They offer high-quality printouts with directly quantifiable operating costs (toner) that remain relatively low (which partially explains their success). The constant heating of the drum when placing the printer in Standby and On modes constitutes the greater source of energy consumption. The fixation of toner following transfer onto the printing plate must also be taken into consideration. The temperature drop when placed in an energy savings mode in standby could serve to lower energy costs.

Ink jet printers are often used for colour printing or as a dedicated workstation printer. A sizeable price drop has been observed for this category of printer over the past few years. Due to downward cost pressures placed on manufacturers, the deactivation buttons have for the most part been incorporated into the low-voltage electric power supply (which in reality prevents these devices from entering standby mode). For this reason, the devices produced remain unnecessarily energy inefficient when in standby mode, which accounts for a large percentage of their overall electricity consumption.

Ink jet printer, 11/4 images per min	On	Standby	Off	Total
Electricity consumption [W]	15	1	-	--
Use rate [pages/year]	3,000 B&W			
	1,000 colour			--
Energy consumption [kWh/year]	0.1	8.7	-	8.8

Laser printer, 32 ipm, B&W	On	Standby	Off	Total
Electricity consumption [W]	650	40	-	--
Use rate [pages/year]	100,000 B&W			
Energy consumption [kWh/year]	33.8	350.4	-	384.2

Table 4: Examples of average values of electrical power and electricity consumption of printers, in 2009 [Source: Energy Star]

Multifunction devices (MFD)

MFD consist of image processing devices available in retail stores that may be either physically-integrated systems or else a combination of functionally-integrated components. MFD are capable of performing at least two of the following functions: photocopying, printing, digitising or faxing. The photocopying function, as intended by the present definition, differs from the "makeshift" single-sheet copy function available through fax machines. These devices must be able to draw their power from the mains supply or a USB connection.

Under normal conditions, a printer, scanner, fax machine and photocopier would individually consume less energy than an MFD featuring similar specs. On the other hand, the energy consumption of an MFD will be 50% less than the cumulative consumption of these same four devices taken separately, for which the MFD has been designed as a substitute. This general rule does not only apply to small outputs performed by "all-in-one" machines in the home or for small-sized company offices, but extends to high-volume productions more typical of large office operations. The standby mode consumption of an MFD will be considerably less than the sum of consumption in standby mode of all four devices taken separately. However, should just one of the functions prove necessary, then it would be advised to purchase an individual device to lower the overall level of energy consumption [Energy Star].

MFD, duplex mode, 6 to 12 ipm	On	Standby	Off	Total
Electricity consumption [W]	500	15	-	--
Use rate [pages/year]	5,000 B&W			
	1,000 colour			--
Energy consumption [kWh/year]	4.8	131.4	-	136.2

Table 5: Examples of average values of power and electricity consumption for a typical MFD in 2009 [Source: Energy Star]

Fax machines mainly operating as such

Fax machines are always among the communication tools found in offices. The average time spent turned on is typically very short, making standby the predominant mode. Electrostatic charging and toner fixation lead to high electricity consumption during actual operations. Nonetheless, the standby mode, during which the fixation unit is being constantly heated, tends to be more energy-consuming than the "On" mode. Devices equipped with energy-saving modes can thus yield substantial savings. The "Off" mode is not relevant for such devices.

MFD + Fax machine, 6 - 12 ipm (Laser colour MFD, 6 - 12 ipm)	On	Standby	Off	Total
Electricity consumption [W]	600	15	-	--
Use rate [pages/year]	5,000 B&W			
	1,000 colour			--
Energy consumption [kWh/year]	4.8	131.4	-	131.9

Table 6: Examples of average values for a fax machine in 2009 [Energy Star]

Single-function photocopiers

With respect to energy consumption, the most critical parameters are drum size and temperature when left in standby mode. Drum size influences copying power, while the standby temperature serves to prevent excessive wait times during preheating of the fixation unit. Energy-saving buttons allow maintaining a minimum drum temperature in standby mode and thereby avoid heat losses while reducing electricity consumption. Yet this functionality may also have the downside of extending preheating time, which becomes a factor leading to user discomfort. Consequently, energy-saving functions are often circumvented or turned off. It is estimated that approximately only one device in four actually enters standby mode, thus resulting in greater energy consumption [Fraunhofer ISI]. Energy-efficient and innovative photocopiers strike a good balance between lower consumption in standby mode and shorter preheating times.

A digital copier is an image processing device sold as an entirely automated copying system featuring the stencil duplication method along with a digital reproduction function [Energy Star].

Photocopier, duplex mode	On	Standby	Off	Total
Electricity consumption [W]	1,000	10	-	--
Use rate [pages/year]	80,000 B&W			
	20,000 colour			--
Energy consumption [kWh/year]	53.3	87.6	-	140.9

Table 7: Examples of average values for a photocopier in 2009 [Energy Star]

Scanners

At the present time, flat scanners are the most popular models. The original document is placed on a glass plate similar to that of a photocopier. It is then calibrated by a combination system comprising a lamp and a sensor. The process employed is known as digitisation.

In the vast majority of cases, these devices are sold without an "off" button in order to keep prices as low as possible. As a result, scanners are constantly operating in standby mode whether or not the primary external cable has been unplugged. These devices therefore display high losses when operating in "no loading activity" mode, without any correlation to their limited frequency of use. Moreover, nearly all MFD integrate this digitisation function.
A French study measured the average consumption for some 20 office scanners and found 95 kWh/year, yet this figure was reduced to 48 kWh/year when discarding the two least efficient devices tested [Source: Enertech].

Telephone systems

Several studies have been released on the environmental impact of mobile telephone technology and even though government agencies and companies are working increasingly with cell phones, the share of offices equipped with land lines remains high, and very little information is available regarding the energy consumption of land line networks.

As for cell phone use, the number in circulation and their expanded functionalities have induced some alarming environmental impacts. As a case in point, each year over a billion cell phones are sold across the world [WWF]. Even if the amount of electricity consumption remains negligible [MEEDAT], cell phone manufacturing actually accounts for 79% of all energy consumed over the entire life cycle of a cell phone.

In order to reduce a cell phone's footprint, its life cycle needs to be extended as long as possible, with a prudent and efficient use of the phone charger and device disposal routed through a cell phone reuse and recycling specialist.

<u>New technologies and future trends:</u>

Since the office equipment market has become practically saturated and technological performance has nearly reached its limitations given the current state of knowledge (as efficiency has just about been maximised), only a slight decrease in office equipment electricity consumption has been forecast over the longer term. On the other hand, a spike in consumption can be avoided via the technological development of office equipment infrastructure, which entails an improved operational management of these facilities through optimising, for example, the shutdown or standby modes. From an overall perspective, a 42% increase had been predicted up until year 2010 [Fraunhofer ISI]. As such, all possibilities previously raised must now be employed to counter this rise and reduce the energy consumption of devices used in the ICT field. At present, this strategy does not apply to the quantifiable improvements introduced, for example, via servers. At the national level, potential savings approaching 25% can be obtained on office equipment; further gains of up to 50% are entirely feasible at the individual level [Fraunhofer ISI; Splitter].

4. The main labels focusing on energy and the environment

Labels play a role in identifying the products that exert the smallest impact on the environment throughout their life cycle. Labels have been classified into 3 categories by the ISO (International Organisation for Standardisation) as follows:

- **Official eco-labels (Type I - ISO 14024:1999)**: awarded by an independent third party following product compliance inspection against a benchmark for the criteria required by the classification;
- **Environmental self-declarations (Type II - ISO 14021:1999)**: environmental information provided by the manufacturer and/or distributor, without any independent oversight;
- **Eco-profiles (Type III - ISO 14025:2006)**: furnish standardised information on a given product, with emphasis on the life cycle analysis.

Note: The official nature of Type I eco-labels ascribes them more credit, especially in recognition of the independent certification process. Along the same lines, eco-labelled products awarded the Type I label are significantly rarer than either the Type II or III labelled products.

In addition to these three product categories is a separate "ecological label", which despite not being recognised as an official eco-label still carries great credibility and, as such, has earned the respect of authorities.
These designated eco-labels and ecological labels specific to energy and environment-related impacts thus offer the best guarantee of characteristics that lower energy consumption and mitigate environmental impacts. Such labels can also be introduced to help achieve practical and realistic objectives in the area of energy efficiency and/or environmental protection.

Moreover, some labels, like TCO and the European eco-label, take into account a set of broader criteria, including ergonomics, low radiation exposure, life span or even the environmental degradation caused by components.
Let's close this section by noting that the end-of-life-cycle recovery of office computer equipment waste can also be contracted by competitive bid to companies dedicated to social integration, which would provide the opportunity to complement environmental and energy strategies by a social dimension, all within the sustainable development rationale.

If just 5% of all computers sold each year in Europe had been awarded some kind of eco-label, then the resulting energy savings would avoid the emission of 11,220 tonnes of CO_2 per year, which would be equivalent to the emissions generated by a car circling the planet 1,700 times! (Source: "*The Direct and Indirect Benefits of the EU Eco-label*", *AEAT*, *2004*; *ADEME*, *2005*).

4.1 Energy Star (Type II)

Website: http://www.eu-energystar.org/fr/index.html

4.1.1 *Product / service targeted*

Office equipment carrying this label is now extremely widespread; this label solely addresses the energy efficiency rating of the specific computer hardware.

The range of office equipment in Europe eligible for this label includes:

- Image processing devices (printers, scanners, fax machines, photocopiers, etc.);
- Computers, laptops;
- Servers;
- Screens.

The Energy Star goal is to label 25% of the most efficient equipment currently available. New requirements have in particular included total energy consumption when turned off, in standby mode or in hibernation.

The "Energy Star" label has reached a point of universal recognition that now offers a very extensive supply and vast choice of computer hardware. The "Energy Star" criteria can be highly recommended as a minimum specification for these markets' requirements, with this set of criteria being imposed in all public procurement throughout the United States.

The Energy Star Website also proposes an energy efficiency calculator (http://www.eu-energystar.org/fr/fr_007.shtml) for PC systems as well as image printing and acquisition equipment. This functionality serves to demonstrate that higher performance equipment in terms of energy efficiency is associated with less heat production, an extended life cycle and lower air conditioning costs. Other calculator features allow for substantial space saving, not only in the office layout, but also in schools, hospitals, police stations, etc.

4.1.2 *Labelling certification bodies*

"Energy Star" is a programme originated (in 1992) by the U.S. Department of Energy and Environmental Protection Agency (EPA). This American programme was transposed for European use as of 2002 following an international agreement between the European Commission and the EPA, leading to a set of standardised criteria. Within the European Union, participation in the Energy Star programme remains voluntary and requires submission to the European Commission for approval.

4.1.3 *Control mechanisms*

Products carrying the Energy Star label are first tested on the label applicant's premises.

4.1.4 *Cost*

Participation in the Energy Star programme is not subject to a separate fee, but the various certification bodies, testing laboratories and simulation facilities bill the equipment manufacturers for their services.

The initial cost of comprehensive certification for an entire product line, including the full set of tests, simulations and verifications, might range from €15,000 to €20,000. The annual certification costs typically amount to approx. €2,500 per product line. These certification costs may be substantially less should existing in-house testing and simulation results be accepted by the certification body.

Market availability

A very extensive worldwide labelling programme is now in place; see for example the list (reminder: these lists are regularly updated) of "Energy Star"-certified equipment:

- For computers: (http://www.eu-energystar.org/fr/database/?cmd=selectform;table=ce_desktop)
- For laptops: (http://www.eu-energystar.org/fr/database/?cmd=selectform;table=ce_notebook)
- For screens (http://www.eu-energystar.org/fr/database/?cmd=selectform;table=monitor).

4.2 European "Ecolabel" (Type I)

Website: http://ec.europa.eu/environment/ecolabel/index_en.htm

4.2.1 *Product / service targeted*

This label is solely awarded to products that not only exhibit the smallest environmental footprint, but also show the capability of meeting the requirements and technical performance standards expected by the consumer.

As of 2012, this label encompasses 26 highly diverse product groups, chief among them television sets, office workstations and laptops for office use.

The criteria employed to measure office equipment performance (http://ec.europa.eu/environment/ecolabel/products-groups-and-criteria.html) focus on a wide array of environmental parameters:

- The equipment consumes less energy when running and in standby mode;
- It contains fewer hazardous substances for human health and the environment;
- It may be picked up free of charge by the supplier at the end of its useful life;
- It can be easily disassembled and recycled;
- Its life span is extended through the possible implementation of updates;
- It uses less polluting batteries.

Regardless of the type of product or service, the criteria are published in the European Union Official Journal (http://eur-lex.europa.eu). In order to receive the EU's ecological label, a product is required to satisfy the full set of criteria.

4.2.2 *Labelling certification bodies*

This label, introduced by the European Commission, has been valid in all EU countries as well as throughout all European countries since 1992.

Designated public authorities are responsible for awarding the label in each country; these authorities are empowered to process labelling requests received from manufacturers, resellers, service organisations and importers.

Certification request: The manufacturer, importer, service provider, merchant or retailer (both of whom sell under their own brand names) establishes contact with the competent national authority where the product is either produced or imported.

Request evaluation: The competent national authority evaluates the request based on test information and results (produced by an independent laboratory) provided by the label applicant and verified as to whether the product is compliant with the ecological criteria prescribed by the eco-label.

Eco-label award

The competent body concludes its intervention by establishing a contract with the applicant pertaining specifically to the label use conditions.

The ecolabel is valid up until expiration of the analysed criteria.

The ecolabel is administered at the European level by the European Union Committee for the Ecological Label (**EUCEL**) and at the level of each Member State by the competent national authorities. In France, this responsibility lies with the **AFNOR** Standards Association.

4.2.3 *Control mechanisms*

Eco-label operations entail: preparing and creating new criteria, awarding the label to the relevant products or services, and revising and extending existing criteria.

4.2.4 *Cost*

The requests received to assign the ecological label are contingent upon payment of a fee determined based on the costs to process the request. Use of the label is also subject to payment by the user of an annual fee:

- As per the November 10th, 2000 Commission Decision, the minimum fee amount to cover the cost of request processing is set at €300, with a maximum fee amount equal to €1,300.
- In France, the audit visit and administrative charges amount to €1,825.
- The annual fee is set at 0.15% of the sales revenue generated by the certified products.

- The minimum annual fee is established, depending on both the product group and label applicant, at €500, while the maximum fee is limited to €25,000. The fee schedule in France ranges from €800 to €25,000 (a 25% discount is offered to small and medium-sized enterprises).

The collegial ecological label award system has foreseen several possible ways to pay less in fees; one example favours small and medium-sized firms or companies already certified under ISO 14001 or EMAS criteria.

4.2.5 *Market availability*

The European ecolabel has been used since 1993; it represents an environmental certification approach that remains voluntary for manufacturers, resellers or service providers.
The eco-label offers a strong incentive to implement environmental criteria; moreover, since 1993, some 143 licenses were granted to use the logo. The zone of this eco-label assignment is naturally quite extensive, covering: Austria, Belgium, Denmark, Finland, France, Germany, Greece, the Netherlands, Italy, Portugal, Spain, Sweden and the United Kingdom.

According to consumer associations, 25% of consumers know where to find eco-labelled products, and requests are constantly received for access to increasing numbers of new products.
Unfortunately, the supply of computer equipment currently available and officially recorded serves to further constrain the consumer's choice (e.g. 45 brands of televisions, but not a single computer or laptop).
Other recommendations and product categories are being developed (equipment like printers, photocopiers, fax machines and scanners: http://susproc.jrc.ec.europa.eu/imaging-equipment/index.html).

4.3 TCO (Type I)

Website: http://www.tcodevelopment.com/pls/nvp/Document.Show?cid=4146&mid=651

4.3.1 *Product / service targeted*

This Swedish label, which incorporates environmental and ergonomic criteria, is solely focused on office computer equipment. Its criteria include ergonomics, energy consumption (along the lines of the Energy Star criteria), electromagnetic field emissions and ecology (heavy metals, hazardous substances found in packaging). Priority is assigned to workplace safety.

Section	Description
1. Organisation	Criteria oriented around the production phase, environmental management and social responsibility
2. Climate	Energy consumption compliant with the currently applicable Energy Star standard
3. Hazardous substances	Heavy metals, flame retardants, plastics
4. Product life cycle	Factors contributing to extended product life cycle

5. Preparation for recycling	Factors enhancing recycling practices
6. Packaging	Hazardous substances and recycling

Source: CNRS

In 1999 (TCO'99), nearly all office equipment could be labelled. Since that time, the criteria have become much more stringent while the list of eligible products has grown to include:

- LCD screens (TCO'03)
- cell phones (TCO'01)
- laptop computers, office workstations and tablets (TCO'05)
- "all-in-one" multifunction computers (TCO Certified All in one PC)
- multifunction screens and televisions (TCO'06)
- video projectors (TCO certified projectors)
- audio headsets (TCO'07).

To reduce environmental impacts even further, the "TCO Certified Edge" eco-label (http://www.tcodevelopment.com/pls/nvp/Document.Show?CID=4146&MID=575) imposes additional criteria on the set of "TCO Certified" labelled products.

4.3.1 Labelling certification bodies

TCO Development is the Swedish body responsible for this certification activity.

4.3.2 *Control mechanisms*

TCO is in charge of defining and revising the certification criteria; the manufacturer assumes responsibility for ensuring its product compliance with the TCO criteria. The verification step must be conducted within an accredited laboratory, and a follow-up test is needed in the event any equipment component undergoes a major change.

4.3.3 *Cost*

(http://www.tcodevelopment.com/tcodevelopmentnew/Tillverkare/PriceList_version_5_8.pdf)

The TCO certification cost can vary considerably depending on the type of equipment, number of products intended to be referenced, whether a previous certification has already been issued, etc. An individual assessment with TCO is required in order to provide a response to every cost query. As an example, a screen certification costs €5,700, with an annual dues amount of €2,850. Another €500 will be charged for a product revision or an additional tax beyond the typical 3-year period should you wish to extend your certification.

4.3.4 *Market availability*

TCO's initial labelling dates back to 1992 with the adoption of the first requirements intended to reduce electrical and magnetic fields, while raising energy efficiency and safety. In 1995, the labelling protocol was extended to all computer hardware and new ecological, ergonomic and use criteria were introduced. These criteria were made even more stringent in 1999 and others were added.

TCO has affixed its label to over 100 manufacturers across the world and over 900 screens are now certified TCO´92, whereas more than 1,000 has been awarded the TCO´95 label. A large number of screens, considerably fewer CPUs and just a single keyboard carry the TCO´99 label. The global share of screens on the market with a TCO label stands at roughly 50%.

For the time being, only screens are eligible for the additional "TCO Certified Edge" eco-label.

4.4 EC marking

Website: http://ec.europa.eu/enterprise/policies/single-market-goods/cemarking/index_fr.htm

The EC ("CE") marking is not an environmental or energy label; it simply stipulates that the given piece of equipment has been evaluated prior to its marketing and moreover that it complies with all requirements in the areas of safety, health and environmental protection (e.g. for office equipment in particular relative to electromagnetic radiation in accordance with Directive 2004/108/EC). This marking is mandatory for all computer hardware manufacturers. Processors, keyboards, mice, monitors and printers, along with their packaging, must carry this marking and individual components must respect the set of specifications.

The marking also mandates compliance with European measurement methods for calculating energy consumption. Equipment manufacturers are required to affix themselves the EC marking. Scheduled and random inspections are carried out to control use of the mark. Manufacturers must also declare the compliance of their products with all pertinent European directives.

Moreover, within the scope of Directive 2005/32/EC (energy-consuming products), studies are underway to determine the most appropriate measurement approach for office equipment.

4.5 Blue Angel (Blauer Engel) (Type I)

Website: http://www.blauer-engel.de/en/index.php

4.5.1 *Product / service targeted*

The Blue Angel is the first and oldest of the world's environmental labels for products and services; it was created in 1977 in Germany at the behest of the German Environment Ministry. Only products with the very least environmental impacts (http://www.blauer-engel.de/en/products_brands/search_products/search_for_products.php) are recognised by this label. Its aim is to popularise alternatives that are environmentally-friendly and thus contribute to improving the overall environment.

4.5.2 *Labelling certification bodies*

The Blue Angel environmental label is the property of the German Federal Ministry of the Environment, Environmental Protection and Nuclear Safety. Financing for the labelling programme is

handled through the Federal Environment Agency and the Institute for Quality Control and Product Labelling (RAL). All technical aspects associated with the label award are overseen by an independent jury for the label. RAL assigns the label in partnership with the Environment Agency and authorities of the State where the applicant's headquarter offices are located.

4.5.3 *Control mechanisms*

The label is granted by a jury that decides these awards in conjunction with international experts and the German Federal Environment Agency. It is applied in over 20 countries, including France, the United States, Austria, Switzerland and the Netherlands.

Criteria have been established for the majority of office computer equipment, except scanners, and are updated on the basis of current knowledge within a 2 to 4-year time period. These criteria take into consideration: recycling as of product design, pollution mitigation during manufacturing, energy consumption reductions (standby mode receives priority attention), chemical emissions, noise, and lastly end-of-life computer equipment disposal.

The period of validity for each criterion depends on the product category; at the time of criterion revision, all approvals automatically expire.

4.5.4 *Cost*

A €250 dues payment covers the cost of processing a label request. Moreover, an annual fee is also charged, the amount of which depends on the annual sales revenue generated by the labelled product (minimum of €270 for a sales revenue of less than €250,000, up to a maximum of €6,000 for sales revenues in excess of €25 million).

4.5.5 *Market availability*

A wide array of products and services now carry this label across the world.

4.6 Nordic Swan (Type I)

Website: http://www.svanen.se/en/

The Nordic Swan label is the official environmental eco-label for Scandinavian countries; it was established in 1989 and now covers over 60 product groups, including a large proportion of everyday consumer products and many services, like hotels, restaurants and supermarkets.

The evaluation criteria (http://www.nordic-ecolabel.org/criteria/product-groups/) for computer hardware are based in large part on: reduced water and energy consumption, fewer toxic chemical products, recycling, and waste reuse.

4.6.1 *Labelling certification bodies*

The NMN (Nordiska Miljömärkningsnämnden, or the Nordic Eco-labelling Council) determines the potential products eligible for labelling as well as the set of criteria they must meet. Within the NMN,

decisions require unanimous consent. Panels of experts stemming from the various Scandinavian country members are responsible for proposing the criteria. When the NMN body approves a new criterion, it must consult with representatives of the various governments, environmental protection organisations, trade and industry.

4.6.2 *Control mechanisms*

In order to obtain the eco-label, each applicant company must furnish the results of independent tests and technical documentation on the given product.

In most cases, the criteria are valid for three years, at the end of which they are revised and the company must resubmit a certification request. Along the same lines, should the criteria change, the products would also need to evolve accordingly.

4.6.3 *Cost*

The main expenditures pertain to administrative costs, inspection visits and annual fees. These costs serve to cover: the development of new criteria, product verification, and general public information campaigns focusing on Nordic Swan's work. The rates charged differ from one country to the next (between €500 and €2,000 plus approx. 0.4% of total sales revenue).

4.6.4 *Market availability*

The Website provides the list of certified products (http://www.svanen.se/en/Buy-Svanenmarkt/Ecolabelled_products/) and services (http://www.svanen.se/en/Buy-Svanenmarkt/Svanenmarkta-tjanster).

4.7 EPEAT (Type II)

Website: http://www.epeat.net/

4.7.1 *Product / service targeted*

EPEAT (which offers an electronic equipment environmental rating tool) is an American label that serves to identify computers and other electronic devices with a limited environmental impact. In order to evaluate hardware, EPEAT relies on 23 mandatory criteria and 28 optional ones, classified into 8 distinct categories (http://www.epeat.net/learn-more/criteria-discussion/pc-display-criteria/), i.e.:

- reduction of environmental impacts and elimination of hazardous substances (e.g. compliance with the RoHS Directive);
- choice of environmentally-friendly components (share of recycled plastics, weight, etc.);
- acknowledgment of equipment end-of-life issues as of the design stage (identification of equipment requiring special end-of-life processing, paints unsuitable for recycling, ease of disassembly and reuse, recording of hazardous components, minimum 65% potential recycling rate, possibility of battery recycling, etc.);
- equipment longevity (possibility of warranty extension, possibility of adaptations, etc.);
- lower energy consumption ("Energy Star" obligation);
- recycling potential;
- company commitment to a sustainable development approach (corporate environmental certification);
- packaging (elimination of toxic products from packaging materials, minimum percentage of recycled elements contained in packaging, etc.).

Epeat proposes three types of labels to manufacturers:

Labels	Description of the label
logo_epeat_gold	Gold label (all 23 mandatory criteria and at least 75% of the optional criteria satisfied)
logo_epeat_silver	Silver label (all 23 mandatory criteria and at least 50% of the optional criteria satisfied)
logo_epeat_bronze	Bronze label (all 23 mandatory criteria satisfied)

4.7.2 *Labelling certification bodies*

The American non-profit organisation GEC, founded in 2005, manages the EPEAT label.

4.7.3 *Control mechanisms*

The EPEAT label is granted on the basis of a self-declaration by the producer, which indicates that its product meets the criteria and then affixes the label onto all qualified products. A series of independent inspectors perform, according to a set schedule, audits of the labelled products, the results of which are submitted to the Product Verification Committee (composed of experts empowered to decide whether the label should be retained or withdrawn).

The inspections are carried out by independent monitoring bodies, yet the final decision regarding label retention remains entirely with the Product Verification Committee.

4.7.4 *Cost*

The labelling process is a paid service charged by GEC; rates vary from one country to the next.

4.7.5 *Market availability*

EPEAT provides a list of eligible equipment and their references for 41 countries (the majority being European) across the globe (http://ww2.epeat.net/searchoptions.aspx). At present, over 1,200 products feature one of their three labels.

4.8 RoHS Directive

The European RoHS Directive (2002/95/EC) seeks to limit the use of 6 hazardous substances (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0019:0023:fr:PDF).
In 2011, a revised Directive expanded the scope of electrical devices (the focus here is on computer and telecommunications equipment). Since 2006, all new products marketed in the EU, whether imported or manufactured in a Member State, must comply with this Directive.

4.9 Comparison of these labels

The primary label characteristics are compared in Table 8 below. It is remarkable to note that at the present time, no mandatory label exists for corporate office equipment, as opposed to the EU label for personal computer hardware. For the first time, the new Energy Star label lists the minimum requirements established in the area of energy consumption, including a breakdown by use category.

	Energy Star	Blue Angel	Ecolabel	TCO
Label characteristics	In Europe, office computer equipment only	Nearly all office equipment	Computer hardware for individual households, office equipment	Office equipment, supplies, telephones
Consumption in operating mode	Yes	No	Yes	No
Consumption in sleep mode	Yes	Yes	Yes	Yes
Consumption in standby	Yes	Yes	Yes	Partially
Workplace security	No	Yes	Yes	Yes
Noise emissions	No	Yes	Yes	Yes
Mandatory / optional	Optional	Optional	Optional	Optional
Cost of the labelling application	No	Yes	Yes	Yes
Geographic zone of coverage	Worldwide	Germany, also open to foreign producers	Worldwide	Europe and North America

Table 8: Comparison of the criteria adopted by the various labelling authorities

6. Practical procurement and use instructions that comply with the sustainable development criteria applicable to office equipment

6.1 Guidelines for procurement of Office equipment

Since the adoption of European Directives 2004/18/EC and 2004/17/EC, eco-labels may be included in public-sector contract awards subject to the following conditions:

- A buyer cannot request a specific label, but instead merely insist on knowing the particular label's given characteristics. The mention "or equivalent" is thus mandatory.
- A buyer can only request the technical specifications inherent to a particular label for the object in question and not for the operations of the company itself.
- An eco-label's specifications are established on the basis of scientific knowledge.
- Eco-labels are adopted by virtue of an agreement reached between the various stakeholders, public authorities, consumer organisation representatives, manufacturers and environmental associations.

Beyond these eco-labels, the European Union has made available a set of tools for 19 categories of products (http://ec.europa.eu/environment/gpp/toolkit_en.htm), whose requirements were defined by means of compiling various criteria, for the most part stemming from the European Eco-label, the Blue Angel or the Nordic Swan, with a focus on office equipment; for the time being, only available in English (2012 version) (http://ec.europa.eu/environment/gpp/pdf/criteria/office_it_equipment.pdf);

Two levels are proposed herein:

- Core GPP criteria
- comprehensive GPP criteria.

Buyers thus have the opportunity to rely on either the eco-labels (adopted in their entirety or by choosing only certain criteria depending on their specific needs) or a number of technical documents that had already been proposed as very comprehensive summaries of various eco-labels or recommendations originating from multiple sources (EU toolkit, UNEP Guide).
Within the scope of the Green Proca project, we are providing herewith a brief sample of the types of technical specifications and recommendations that we find essential, along with the required minima dictated by the computer hardware procurement process.

6.2 Practical for procurement instructions for Office equipment

a. Get support

It is advisable to implement a green procurement policy for your institution or company before the actual procurement procedure begins. The procurement directives should also comprise the evaluation basis of the most economic offer with the calculation of life cycle costs. Choose a green title to communicate the policy to your staff and the outside world.

b. Purchase of equipment to meet actual identified needs

Before searching for equipment that exerts fewer environmental impacts or reduces energy consumption, the first step will consist of determining actual office equipment needs. In other words, renewing workstations should not proceed automatically, but instead on a case-by-case basis. The age and use patterns, both current and future, of each workstation must be studied in a rational manner. The buyer must therefore be in constant contact with the information services department in order to ensure, based on in-house technical certifications, the validity of alternative solutions to a new product purchase.

This step thus begins by inventorying all of the existing equipment, along with the corresponding use patterns (see Appendix 1 for an example of an equipment analysis grid to yield a baseline assessment), potential improvements introduced by means of combining, for example, the various print stations, using multifunction equipment or subcontracting certain types of tasks (e.g. large print jobs).

Efforts to reduce pollution and limit the depletion of non-renewable resources due to office equipment focus in priority on maximising their effective use life in order to scale back on the production and purchasing of new equipment. By extending the use life, for example, from 3 to 6 years, both the environmental footprint left by computer workstations is effectively cut in half. To lengthen a workstation life cycle, a necessary step calls for selecting a piece of equipment in association with a warranty extension of at least 5 years and then agreeing to forgo some of the software update versions. Beyond the environmental issues involved, this approach proves to be more economical by allowing for a decrease in migration costs, which make up a major share of the overall workstation ownership cost.

At the end of the workstation's life cycle, collection of the salvaged equipment by a certified professional represents another means for mitigating environmental impacts.

It is also possible to lower energy consumption and reduce environmental impacts through a series of "cleaning" operations:

- Remove all unnecessary programmes
- Delete unnecessary files
- Cancel unused services
- Choose an operating system that requires fewer computing resources
- Select only low-consumption applications

The demand for office equipment must therefore be assessed carefully prior to all purchases (a step that is not always automatic), as per the advisory issued in the public procurement code, as well as elsewhere, in addition to insisting on the importance of defining actual needs (a partial replacement scheme is another possibility, e.g. change of hard drive).
Further along the lines of this identification of actual needs, key information might include the average number of copies per employee and required screen sizes. Given that greater power consumption goes hand in hand with higher energy consumption, the excess (hence unnecessary) power consumption drawn by certain computer equipment must therefore be eliminated.
A simple comparison of operating costs for the various devices will immediately reveal the potential savings generated (e.g. from a flat screen purchase relative to a more conventional monitor). It is possible to compare these consumption levels and the savings induced by introducing certain labels (these savings vary depending on the required labels and their corresponding performance criteria).

c. Enhanced user awareness and contribution

The technical solutions intended to "green" office equipment supplies prove insufficient as long as users continue to operate their machines inappropriately. To ensure the right use habits, it is first and foremost necessary to associate end users with the procurement process (see below) as of the contract preparation stage. This essential coordination time will serve to adapt and adjust the initial objectives in terms of energy consumption reduction or environmental protection with respect not just to the set of equipment actually in place, but also to the level of acceptance and maturity on the part of the relevant personnel.
Such a coordinated effort must then lead to:

- building user awareness of the impact of their daily use patterns;
- defining an appropriate set of tracking indicators;
- extending the equipment life cycle;
- reducing the volume of printouts and expanding the use of virtual resources;
- creating synergies between departments.

d. Selection of equipment offering energy management options and a reduced environmental impact : define technical specifications

Once the set of actual and fundamental needs has been identified and once the pertinent personnel have been mobilised around the procurement project, it then becomes possible to undertake the task of defining both the environmental and energy criteria.
This goal consists, above all else, of purchasing responsibly by requesting that the equipment satisfy the criteria associated with ecological or equivalent labels (since such labels provide the best guarantee for the buyer) or by building one's own procurement benchmark through selecting criteria adapted to the specific procurement guidelines.

Moreover, it is obviously quite necessary, as part of the equipment selection criteria, to ensure a streamlined control (from a practical as well as theoretical standpoint) of energy consumption during operations. As such, it would be useful to activate (or at least facilitate) this functionality as of equipment delivery as well as to optimise its operations. The most comfortable energy management system at present is undoubtedly the ACPI (Advanced Configuration and Power Management Interface) system. Once it has been activated, all components are shut down except for the main menu. Nonetheless, the PC returns to a fully operational mode between 10 and 30 seconds later[2] [IBM].

As indicated above, several summaries have been released after being derived from eco-labels. Special mention goes to the European Union's toolkits, when applicable (http://ec.europa.eu/environment/gpp/toolkit_en.htm),

Otherwise, a few of the possible technical guidelines are worthy of mention (non-exhaustive list, see previous documents released) as a means of reducing energy consumption and mitigating environmental impacts:

- Defining and limiting needs (number, type, power, equipment);
- Reducing energy consumption: the Energy Star label remains one of the best possible ecological labels, indicating that the device saves energy whether operating or in standby (the standby mode often accounts for sizeable discrepancies);
- Laptop computers consume between 50% and 80% less energy than workstations;
- LCD screens consume 60% less than monitors when in operating mode;
- Ink jet printers consume much less than laser printers and do not require a preheating phase (not to mention cartridge replacements);
- Thermal photocopiers are the most energy efficient;
- When choosing a fax machine, remember to verify its consumption in standby mode;
- Internal modems consume less than external models;
- A multifunction device consumes less than the sum of the various machines it is designed to replace;
- Protecting user health and safety by: mitigating nuisances due to noise and electromagnetic radiation, preventing contact with certain noxious substances, and making ergonomically-designed equipment available to enhance user comfort;
- Limiting resource consumption during product manufacturing through reliance on recycled raw materials and on product designs featuring sustainability and ease of recycling;
- Reducing equipment end-of-life waste volumes through possible functional extensions.

e. Energy savings recommendations as part of daily practices ("eco" practices)

Beyond the initial preparation of a procurement contract, even if this step takes place in close coordination with end users, the actual participation of these users will eventually determine in part the success of an office equipment purchase that's both environmentally-friendly and energy efficient. Ensuring this participation necessitates instituting "eco practices" as part of the user's daily

routine. This notion refers to a succession of daily tasks that help stimulate the greatest energy savings: more than anything else, the user ultimately holds the key to achieving energy savings.

As a reminder, let's recall some of the possible technical guidelines (non-exhaustive list, see previous documents) leading to reduced energy consumption and fewer environmental impacts during the equipment life cycle:

- Verify the settings and effective activation of equipment standby modes, immediately upon delivery;
- Unplug the device or connect it to a socket with a switch in order to avoid unnecessary consumption when no longer in use;
- Do not mistake a screen saver for an energy saver;
- Turn off all ink jet printers after use since they do not require preheating;
- Shut off all screens that do not experience wear from repeated off/on sequences;
- Only turn on peripherals as needed;
- Save paper by opting for two-sided printing, recycling paper, reading documents on the screen rather than on printouts, and by using e-mail to communicate rather than printed correspondence;
- Extend savings by using recycled cartridges;
- Avoid leaving Internet connections open (consumption, security);
- Request that your suppliers recover your used electronic equipment;
- Donate computers with some effective use life remaining to an association or social service corporation.

f. Define award criteria

Determine award criteria, e.g. better eco-efficiency, and their weighting when evaluating the tenders. The award criteria must relate to the subject matter of the contract. Describe how you will calculate the life cycle cost and how it will be weighted.

6.3 Procedural proposal: How to conduct a tender procedure aimed at environmentally-friendly and energy efficient office equipment?

This guide outlines the procedure to follow in order to hold a competitive bid that takes into account sustainable development criteria. Just the main steps and key points will be recalled herein. For France especially, the guide published by the sustainable public-sector procurement network would also be an appropriate reference source given that it indicates the method to be implemented: (http://www.raee.org/administration/publis/upload_doc/guide_cde_publique_oct2008.pdf)

Process preparation (preliminary to the bid)

- Establish a baseline assessment of the existing equipment and uses by type of device;

- Define, in conjunction with end users, the actual needs (see for example Article 5 of the French Public Procurement Code), and avoid all unnecessary purchases;
- Conduct market studies to determine whether new technologies, new products or innovative suppliers would be capable of fulfilling your requirements;
- Explore possibilities that would enhance efficiency of the procurement process by means, for example, of bulk purchasing, framework agreements.

Technical details, execution conditions, set of specifications (see Appendix 3 for examples)

- Indicate explicitly, once your procurement has been identified, your environmental expectations (e.g. "Competitive bid for the supply of ecological computers and workstations");
- Draft your call for tender by specifying, above all, your anticipated requirements, particularly in terms of energy and environmental performance, rather than any precise technical characteristics;
- Express these expectations by noting the eco-label criteria (e.g. see Article 6 of the French Public Procurement Code) or else customise your criteria using the eco-label as a reference;
- As regards the use of renewable raw materials, energy consumption during use, greenhouse gas emissions and atmospheric pollutants, life cycle, end-of-life recycling/reuse, packaging and transport, wastes, etc.);
- Envision the introduction of specifications based on energy or environmental performance for the purpose of promoting innovation (e.g. see Articles 14 and 53 of the French Public Procurement Code);
- Authorise variants (e.g. Article 50 of the French Public Procurement Code) to allow your suppliers to submit innovative bids;
- List in the technical specifications the most widespread minimum characteristics making it possible to receive bids and eventually assign bonus points to those bids that surpass the minimum threshold The technical constraints imposed in the set of specifications cannot, by definition, be used to qualify or disqualify bids; these specifications however can be surpassed, in which case their use is limited to distinguishing between qualified bids.

Supplier selection

- Ensure that the tender has in effect incorporated sustainability criteria and moreover that these criteria have been accurately correlated with the contract objective;
- Meet with the small local contractors and set forth the requirements that will allow them to submit a bid and adapt to the request;
- Feel free to widely disseminate the call for tender, advertise over a wide geographic area in order to take advantage of the best offers;
- Be sure to communicate in full transparency the bid selection criteria.

Life Cycle Costing

The cost efficiency of an offer does not only depend on the purchasing price, but also on the operating costs. For the comparison of the offers the purchasing, operating and disposal costs are evaluated over the expected useful lifetime (life cycle costs).
Calculation tools are provided for each product to compare the cost-efficiency of the offers. The following factors have to be considered if energy-related environmental interests are included in the calculations:
Providers must guarantee the maximum level of power and energy consumption for the calculation.
Factors such as yearly utilisation periods in different operating modes should be realistically measured and empirically secured if possible.
Technical measures to reduce the energy consumption should be considered if possible e.g. energy management in PCs and auto power off function.

Bid evaluation

- Use the total cost approaches based on a life cycle assessment;
- Opt for a strategy that assigns points on the basis of a product's environmental or energy performance (see the example for metropolitan Roanne in Appendix 2);
- Define a targeted minimum threshold in terms of performance so as to assign additional points as a means of encouraging suppliers to submit an innovative bid.

Contract implementation

- Set forth the procurement execution conditions required of the bidder that enable taking into consideration environmental impacts or social aspects (collection of used packaging, deliveries in reusable containers, 5-year minimum warranty periods, recovery of used equipment, delivery conditions designed to reduce atmospheric pollution and clutter, job preservation, employment of the disabled, respect of labour union rights and international human rights, abolition of child labour, etc.);
- Create a series of performance and monitoring indicators.

7. List of abbreviations

W	Watt
EU	European Union
EMAS	European Management System

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