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Green ICT:
a trade union approach

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Introduction

According to one influential report, climate change "must be regarded as market failure on the greatest scale the world has seen"[1].

There is scientific consensus that the world community has only a very short period of time left to tackle the growth in greenhouse gas emissions and to confront global warming. Much is being pinned on a successful outcome to the UN Climate Change conference, being held in just a few weeks' time in Copenhagen.

Trade unions know that they can, on occasions, become so involved with helping members with their everyday concerns in the workplace that the big strategic topics get put to one side. With the issue of climate change and energy sustainability, unions cannot afford to be silent. This is, to put it starkly, an overarching challenge for the world which we have to get right. Get it wrong, and the threat is not only to jobs and economic prosperity, but also to the ability of humans to continue to live comfortably on our planet. As UNI europa affiliate UNITE (UK/Ireland) has put it, "The outlook is very clear. No employer will make money from a dead planet and no workers will gain from being part of a poisoned population".[2]

This report focuses on the ICT sector, and in particular on what is increasingly being called Green ICT. Recent years have seen a number of initiatives being taken by a range of organisations: the OECD, for example, has been actively researching the relationship between ICTs and the environment and earlier this year produced a key document *Towards Green ICT Strategies.* The European Commission has identified the ICT sector as playing a potentially important role in reducing carbon emissions. NGOs such as Greenpeace and the WWF have produced significant studies. From industry, Digital Europe (EICTA) through its UK affiliate Intellect, and the industry consortium the Global e-Sustainability Initiative (GeSI) have each produced major reports.

Individual ICT companies have also taken up the Green ICT banner. Motivations may vary: some may be genuinely concerned to reduce their energy consumption and carbon footprint, some see this as good PR, some are attracted more by the opportunity to cut costs. (Furthermore, the provision of 'Green ICT' services is already turning into a profitable business, a nascent market which one firm of business analysts predicts will be worth USD 4.8 billion by 2013[3].)

Certainly, when it comes to energy consumption, the ICT sector is greedy and getting greedier. Worldwide, it contributes about the same amount of carbon emissions as the aviation industry[4]. The electricity used by ICT equipment more than doubled in the years between 2000 and 2005[5].

However, ICT has also been identified as a key set of technologies which can help very significantly in the struggle to reduce greenhouse gas emissions throughout the whole of the economy. In the long run, ICTs are seen by many as essential tools in the world's response strategies to climate change.

There are some major challenges ahead, which the world community will have to tackle together. What has to be achieved is frighteningly radical: we have to decouple economic growth from energy usage. In this task, ICTs have a significant role to play.

The ICT sector and the environment

It is generally accepted that the ICT sector is responsible for about 2% of the world's current carbon emissions. This figure, widely quoted, originates from research undertaken by Gartner in 2007[6].

2% may seem like a small percentage, but it should certainly not be treated as negligible. As the UK technology trade association Intellect has put it, "2% of global emissions is a lot of carbon"[7].

In terms of actual numbers, the ICT sector was directly responsible, in 2007, for estimated annual emissions of about 0.83 billion tonnes of carbon dioxide equivalent (the standard measure used for assessing carbon footprint). This represents an increase of more than 50% on the 2002 figure, of 0.53 billion tonnes. If the world continues with a 'business as usual' approach, one well-researched study suggests that emissions by 2020 will have increased to 1.43 billion tonnes[8]. (Since this would fly directly contrary to the increasingly urgent attempts by the world community to *cut* carbon emissions, 'business as usual' is not acceptable if the issue of climate change is to be tackled.)

There has been an inclination by industry and governments to focus on a few particular areas of ICT usage where energy usage is seen to be particularly high. One of these is the issue of unnecessary energy consumption. Intellect's study reports "The average desktop computer wastes nearly half the power delivered to it, primarily through power supply inefficiency and cooling fan demands"[9].

The Swedish trade union federation TCO through its long-standing certification wing TCO Development has made a particular study of the issue of energy consumption when ICT equipment is on standby or not being used: "Each computer monitor or notebook that is unnecessarily switched on is in itself not a problem. However, when we consider that worldwide computer sales in 2007 totalled 268 million units, it becomes clear that the difference between optimal operation of an energy efficient product and sub-optimal operation of an eco-deficient product can create vast differences in carbon dioxide emissions… The one billion computer monitors in use around the world today result in an annual 53 million tons of carbon dioxide emissions. PCs, printers, servers, hubs and switches, routers, wireless networks, wireless mice and keyboards, and running the Internet, create additional emissions"[10].

TCO wrote this report in 2008. It is worth bearing in mind that the number of PCs is expected to increase rapidly, and that more than *four* million PCs are predicted by 2020[11].

Data centres have been another area of focus in relation to the Green ICT debate, with good reason. Data centres' power consumption is, proportionately, enormous. Forrester Research suggest that data centres consume 45% of total IT energy consumption; Forrester also quotes the US Environmental Protection Agency assertion that US servers and data centres alone accounted for 1.5% of total US energy consumption.[12]

There were 18 million servers in 2008 producing 76 million tonnes of carbon dioxide equivalent emissions, according to GeSI/the Climate Group; they predict 122 million servers in 2020, potentially able to produce 259 million tonnes of emissions[13]. They also make the following observation: "Only about half of the energy used by data centres

powers the servers and storage; the rest is needed to run back-up, uninterruptible power supplies (5%) and cooling systems (45%)."

One reason for the focus on data centres is because ways are already being found to reduce overall emissions. These include improvements in hardware and cooling technology and also ways in which different users can share data centre functions, through various kinds of virtualisation (generically, virtualisation in this context means consolidating a number of virtual servers on to one physical computer, while maintaining the ability to run each virtual server independently). Different degrees of data centre sharing and virtualisation are possible; terms such as 'thin client' computing, grid computing and cloud computing are currently used to describe some of the options[14]. It should be noted that one reason for the particular Green ICT focus on data centres is because a number of ICT companies see considerable business opportunities available here for them.

Trying to bring down the energy consumption, and therefore the carbon footprint, of the ICT industry in these ways is certainly necessary, but by itself is inadequate. What is needed – and what the ICT industry is perhaps more reluctant to undertake – is a whole-of-life approach, starting at the point where designers begin work on new technologies, taking in the sourcing of materials, the manufacture stage and the period when the equipment is actually being used, and also including the final waste disposal processes.

TCO Development in its report *Your Computer and the Climate* quotes a European study which breaks down the lifecycle carbon dioxide emissions of a notebook computer as follows: usage 73%, materials 21%, production 3%, transport 3%.[15] It would certainly *seem* to be common sense that the bulk of the carbon emissions created from use of ICT equipment occurs during the use phase. But there are other sources which suggest that this may, in fact, not be the case. Intellect reports "one well-cited study [which] suggests that 81% of the energy requirement of a desktop computer is absorbed in the manufacture and disposal stages, and only 19% during the in-use phase".[16] The OECD in *Towards Green ICT Strategies* includes the following comment: "Environmental impacts occur during the use of ICTs, but higher environmental impacts often occur before and after the use phase… For instance, Greenhouse Gas emissions of California's residential and commercial PCs in 2005 were estimated to be 4.18 [million tonnes of carbon dioxide] a year in the *manufacturing* phase, 1.72 [million tonnes] a year in the *use phase*, and 0.004 [million tonnes] a year in the *disposal phase.*"[17]

There is currently a lack of reliable data which looks at the environmental footprint of ICT products throughout the whole lifecycle. As Greenpeace International says, "There is an urgent need to work towards an industry-wide standard of lifecycle analysis that encompasses the use of energy and natural resources across the entire chain of production – from mining, manufacture and distribution to consumption and end-of-life treatment. In the meantime, companies should develop their own analysis that covers the entire product lifecycle."[18]

As Greenpeace makes clear, such an approach would be likely to turn the focus beyond just the usage phase of ICT products, encouraging the reduction of the environmental footprint upstream (ie, in the materials sourcing and manufacturing stages). At the other – downstream – end of the process, there are also issues of concern. The EU

Waste Electrical and Electronic Equipment Directive (WEEE) has certainly helped to oblige ICT companies to take more responsibility for their unwanted end-products, but e-waste continues to be responsible for unacceptable environmental and labour standards. Electronic waste has been cited as the fastest growing segment of global landfill waste.[19]

Like so many other industries, the ICT sector has been built on extremely short product lifecycles and rapid obsolescence. Longer lifecycles would seem to be a necessity for a genuine Green ICT approach. Nevertheless, there is a potential contradiction here, in that older equipment tends to be less efficient in terms of energy use; faster product cycles allow for efficiency improvements and for the introduction of new technologies more quickly. There is a difficult trade-off, therefore, between retaining existing equipment for longer, and investing in more efficient new equipment but discarding the old.

One final point needs to be made. The focus in this section so far has been on energy usage and carbon emissions. However, as the OECD has reminded us, a focus solely on energy use and global warming ignores other environmental impacts. Its 2009 report on Green ICT strategies points out the potential effects of ICT in these other areas:

- Toxicity (that is, all kinds of toxic degradation of air, water and soil), with direct or indirect effects on human health and biodiversity. ICT equipment can include toxic and hazardous substances
- Non-energy resource depletion, for example resources such as lead, tin and copper (used for example for solder and printed circuit boards)
- Land use (the effect on the environment through land occupation and transformation). Data centre facilities in particular can occupy very large areas of land.
- Water use. The ICT sector is estimated to be one of the six most thirsty industries, in terms of water consumption. It is reported that around 1,500 kgs of water are used in the production of a single PC. Cooling requirements for data centres in particular require considerable water consumption.[20]

The role of ICT in other industries

The ICT industry has a clear responsibility towards tackling the 2% of global emissions for which it is directly responsible. It also, however, has a role to play in reducing the remaining 98%.

Technology, particularly ICTs, will be central to the strategies which will have to be adopted if the world is to successfully tackle the challenges of climate change. This means looking beyond the ICT sector itself, to see how ICTs can be harnessed more effectively in other industries and sectors. "It is more important to concentrate on the 98% than the 2%," argued John Higgins, Director General of Intellect at a 2009 conference, and he went on to make the more controversial assertion that "ICT should perhaps even increase its own emissions to decrease the emissions from the other sectors". (He did, however, add the rider that "ICT should at the same time set an example").[21]

The OECD, in a comprehensive review of Green ICT initiatives being taken by governments and industry bodies, found that the majority of such initiatives were currently focused just on the '2%'; only a third were looking at the wider role which ICT could play in improving environmental performance in the economy as a whole.[22] But there are signs that this is changing.

The European Commission, for example, has looked in detail at the role ICT can play in helping Europe meet its agreed targets for a sustainable energy and climate policy. (These are for a 20% reduction in emissions by 2020, compared to 1990 levels; a 20% share of renewable energy in EU energy consumption; and 20% savings in EU energy consumption compared with projections). The Commission sees ICT s helping in two ways – firstly by enabling energy efficiency improvements in other sectors and secondly by providing the measuring and metering tools which can make up the quantitative basis for energy-efficiency strategies[23].

A large part of the 98% non-ICT carbon emissions comes from power generation and from fuel used for transportation. Any strategy to use ICT to effect reductions is therefore going to be focused on sectors which are major users of power. The European Commission calculates that *buildings* account for approximately 40% of energy end-use in the EU; *transport* systems account for another 26%. The energy transformation sector, primarily electricity generation, uses around one-third of all primary energy. The Commission has initially suggested initiatives focusing on the power grid (where ICTs can help create a much more efficient 'smart grid'), on promoting energy-smart buildings and homes, and on promoting smart lighting. Manufacturing and the transport sector are also identified for attention, both seen as having considerable energy-saving potential.

The environmental NGO WWF has published a strategy for ways in which ICT can help achieve 'the first' billion tonnes of carbon emission reductions, looking in some detail at smart buildings, transportation, commerce and services, industrial production and energy supply.[24] The Intellect report also covers similar ground, in its case distinguishing between *enhancing* technologies (helping do the same things more efficiently), *enabling* technologies (doing things differently) and *transforming* technologies (letting us do different things altogether).[25]

However, the most detailed work in relation to the role ICTs can play in

helping reduce the '98%' carbon emissions has been undertaken by the Global e-Sustainability Initiative (GeSI) and the Climate Group. It is to be found in their report *Smart 2020*, published last year. GeSI/Climate Group attempt a detailed calculation of possible carbon emission reductions, and their headline figure is that annual savings of 7.8 billion tonnes can be achieved by 2020 through ICT usage.

This figure is not quite as encouraging as it might initially seem, since the reduction is based on the projected 'business as usual' global total of 52 billion tonnes. Nevertheless, GeSI believes that, with other non-ICT enabled savings, the total emissions for 2020 could be got down to 30 billion tonnes. (It should be borne in mind that the highly regarded Stern report has suggested that by 2050 the world's total emissions should be no more than 20 billion tonnes per year.)[26].

The GeSI/Climate Group report looks in detail at the enabling effect of ICTs in a number of areas. These include 'smart' logistics, building design and construction and industrial motors, industrial process automation, more efficient vehicles and traffic flow, and the 'smart grid' idea for energy transmission (that is, the use of software and hardware to enable generators to route power more efficiently). Dematerialisation is also considered: this includes the replacement of physical objects by electronic ones (as in e-commerce), the use of videoconferencing to replace physical travel, and the extension of the use of teleworking.

Steve Howard, CEO of the Climate Group, sums up the report's findings as follows: "When we started the analysis, we expected to find that ICT could make our lives 'greener' by making them more virtual – online shopping, teleworking and remote communication all altering our behaviour. Although this is one important aspect of the ICT solution, the first and most significant role for ICT is enabling efficiency. Consumers and businesses can't manage what they can't measure. ICT provides the solutions that enable us to 'see' our energy and emissions in real time and could provide the means for optimising systems and processes to make them more efficient."[27]

Unfortunately, a note of caution has to be added. There is a risk that efficiency gains could actually lead to increased, rather than decreased, carbon emissions. For example, improved transport efficiency could result in lower manufacturing costs, lower prices, greater purchasing power and therefore increased demand for products and services. This is what GeSI calls the 'rebound' effect.[28] The WWF also draws attention to this risk, or what it calls 'high-carbon feedback': "As we need rapid reductions [in carbon emissions] on a large scale, this will transform societies and we need to understand the services that strengthen further investments to increase emission reductions – and avoid the opposite"[29].

Green ICT: a trade union issue

Whilst governments and industry have increasingly been active in discussing Green ICT, the trade union voice has – with some honourable exceptions – been less audible. It is time to tackle this. The remaining part of this report looks at some of the key topics which unions are likely to want to address.

Engaging and negotiating on Green ICT

Forrester Research reported in 2008 that more than 50% of IT organisations claim to have a Green IT plan in place. Forrester went on to make the following observation: "But don't be fooled: The driving force behind green IT is financial, not environmental"[30]. It is primarily the prospect of cost savings which is driving this interest, Forrester found.

Whilst it would be pleasant to think that companies were more concerned to combat climate change than to improve their profit margins, in this instance it may be that both objectives can be achieved at the same time. Nevertheless, an opportunistic focus just on cost savings suggests that business interest in Green ICT could disappear if the anticipated savings failed to materialise. This is a point made by the OECD in the report *Towards Green ICT Strategies*: "With the global recession, energy prices have fallen sharply (in May 2009, oil prices were less than 40% of those in July 2008), capital and credit have tightened to choking point, and both public and private sectors may be less likely to invest in green ICTs and ICT applications"[31].

Even where the motivation is commendable, there can sometimes be a considerable reality gap between the rhetoric and the practice. One telecoms company has proudly announced its commitment to reduce its carbon footprint by 80% by 2020, a move which has, quite rightly, been widely welcomed. But the experience of one of UNI europa's affiliates organising in this company is that implementation can be problematic: in the words of one of their union organisers, "I must say that I see almost zero publicity for this initiative on the ground - I would say that the vast majority of employees are aware that the company is trying to reduce its emissions but are not aware of the huge 80% target. Similarly, I see little practical drive on the ground to reduce energy use, eg where I work I see lots of desktop PCs still left on 24x7 and much more lighting that is actually required. I think the problem, as in all very large organisations, is that the leaders find it hard to make things actually happen on the ground."[32]

There is considerable scope, therefore, for trade union engagement with companies' green ICT policies, both in the planning stage and later when the policies come to be implemented. Strategies for reducing a company's energy usage and its carbon footprint can appropriately be a subject for consultation in European and national works councils, and for negotiation through social dialogue.

Naturally, unions will be interested in the employment opportunities which may come from a Green ICT approach. The OECD recently reported that employment in ICT manufacturing in the second quarter of 2009 was down by around 6%-7% year-on-year and it warns that ICT employment may be slow to pull out of the current global recession. However the OECD also identifies particular opportunities for employment creation linked to Green ICT initiatives[33]. Particular examples

mentioned include server virtualisation and energy-efficient semiconductors.

The idea of promoting teleworking (in other words, substituting ICT-enabled remote working for the requirement for workers to commute to a central physical office) features prominently in several reports on Green ICT, including the GeSI/Climate Group study. Considerable policy work on teleworking was undertaken by trade unions in the 1990s and early 2000s (including by UNI europa and its processor FIET), and the basis for the introduction of teleworking was negotiated through European social dialogue structures. The *European Framework Agreement on Telework*, agreed between the ETUC and European employers in 2002, provides a valuable guide for good practice. It covers issues such as employment conditions, data protection, privacy, equipment usage, health and safety, training and work organisation. It also states that telework should be voluntary for the individual worker, not compulsory[34]. The core principles in the European Framework Agreement have been applied (or should have been applied) through national agreements between the social partners in EU member states.

Union engagement in Green ICT should extend beyond the traditional union agenda. There is much opportunity here for some creative thinking. In Finland, for example, Toimihenkilöunioni has begun work on a statement on Green ICT. It includes a number of practical suggestions, including one to discourage private car usage by employees driving to work: "The idea would be to develop a 'green day' campaign at the workplace, where the employer could cover the cost of public transport for its employees… Employer-subsidised commuter tickets are a good idea in Finland, although there is currently no incentive to the employer"[35].

Unionen (Sweden) and the Association of Nordic Engineers (ANE) are among other unions to have developed good practice in relation to Green ICT issues. The Greek telecom union OME-OTE also reports a range of initiatives designed to encourage the telecom operator OTE to reduce energy usage[36].

In the UK, the Trade Union Sustainable Development Advisory Committee (TUSDAC) has worked with the Advisory Committee on Business and the Environment on the Sustainable Workplace initiative, linked to a dedicated website[37]. The UK Trades Union Congress has produced its own guide, *How to 'green' your workplace*, which identifies detailed practical steps which can be taken by union members. The TUC also strongly encourages unions to elect Union Environmental Representatives (UERs), either as a standalone role or as one held by existing union reps. The TUC wants union reps to have the same legal rights to represent members on environmental issues as they already do on health and safety and learning issues.[38]

A very similar point is made by UNITE (UK/Ireland) which argues for the appointment of what it calls 'environmental champions/ambassadors/representatives'. UNITE argues that union reps should have statutory rights to gain access to environmental impact information on companies. Its report *How Green is my Workplace?* also offers a Model Environmental Agreement. The Agreement's preamble states "The parties to this agreement in the spirit of partnership and with a desire to act in the best interests of the company and its staff also recognise the benefit to the environment in agreeing a positive way forward on environmental action"[39].

Significantly, UNITE adds that companies reporting on the carbon footprint should include their supply chain and transport costs. As mentioned earlier in this report, a lifecycle approach – taking in the whole process of design, production, use and disposal of ICT equipment – is essential if a comprehensive approach is to adopted towards Green ICT.

This links particularly well with trade unions' own approach, which would seek to emphasise the connectivity of social and environmental goals. In the case of the ICT sector where some 75% of ICT manufacture is outsourced mainly to low-cost destinations in Asia, the reality 'upstream' is that working and employment conditions during the manufacturing stages can often be very poor. The excellent report *The Dark Side of Cyberspace*, from German NGO World Economy, Ecology and Development (WEED), identified poor environmental and employment conditions at plants in China producing equipment for (among others) Lenovo, Dell, Fujitsu Siemens Computers, Intel, Apple, Sony and Nokia. The report talks of an "intimate links between environmental standards and workers' health".[40]

There can be similar issues 'downstream'. The developed world's unwanted ICT equipment is frequently shipped to developing countries such as India for dismantling in conditions which give rise to concerns for workers' health. Toxic materials, particularly cadmium (in batteries), lead and mercury (in LCD screens) are all to be found in IT equipment.

Too narrow a focus, therefore, on Green ICT in the context just of ICT usage or data centre virtualisation can hide the broader social and environmental costs elsewhere in the ICT supply chain. A comprehensive Green ICT approach should consider the environmental and labour implications throughout the lifecycle.

UNI europa affiliate PCS (UK) has adopted the principle of reporting each year to its annual conference on its work around environmental issues. Interestingly, PCS sees three strands to this work. One of these, *green workplaces,* is closely focused on the union's direct work, in conjunction with its branches and local activists, in negotiating for places of work which are more environmentally friendly. A second is what PCS describes as *green campaigns,* working with environmental groups and NGOs such as Greenpeace to advance the agenda on climate change and environmental protection. ("The mutual mistrust that has existed in the past between the green movement and the unions cannot continue, given the urgency of the need to tackle climate change," PCS told its members in 2008)[41].

The third focus is on *PCS itself*, and the role that unions such as PCS can play as exemplars. As PCS says, "We need to practise what we preach. Taking

measures to make PCS HQ and our regional centres greener, more sustainable workplaces is an important

indicator of our commitment to these issues… We believe that we cannot expect others – whether employers, the government, other organisations or our members – to take us seriously on these issues otherwise."[42]

PCS's latest (2009) report to members includes comprehensive details of steps taken, including the phasing out of Styrofoam cups and disposable cutlery, revisions to the existing fair trade/ethical trade purchasing policy to include environmental factors, the purchase of 'green' electricity from renewable sources, union policy on printing and paper supplies, and a survey on staff travel. PCS is currently considering how it can accurately measure its organisational carbon footprint.[43]

There is every indication that steps like this chime very closely with union members' own concerns and desires. In fact, there is evidence that unions themselves can become stronger by taking up the issues of energy sustainability and climate change. An appropriate last word can be given to UNITE here, who point to the latent organising opportunities:

"Environmental campaigns have the ability to engage and involve people who may be turned off by traditional union business, in much the same way that work on equalities, learning and health and safety have encouraged new and different forms of workplace activism and can build a critical mass of support to channel back into core demands for better pay and conditions".[44]

Appendix

This table is reproduced from a European Commission publication, 12 March 2009[45]

Voluntary ICT Sector commitments to targets and deadlines for CO_2 and Greenhouse Gas emissions (GHG), and energy efficiency/consumption

Companies	Target reduction %	Baseline *	Target date	Comment
Alcatel–Lucent	10	2007	2010	CO_2 emissions of facilities
Bell Canada	15	Not given	2012	GHG emissions
British Tele-Communications Plc	80	1996	2020	CO_2 emissions
Cisco Systems	25	2007	2012	GHG emissions
Dell	Additional 15	Not given	2012	Operational carbon intensity
Deutsche Telekom AG	20	2006	2020	CO_2 emissions
Ericsson	15 - 20	2006	2008	Energy efficiency
France Telecom	20	2006	2020	CO_2 emissions
Hewlett-Packard	16 - 40	2005	2010-2011	Energy consumption and GHG emissions for operations and products
Intel	20 30	2007 2004	2012 2010	Carbon footprint GHG emissions
Motorola	6	2000	2010	CO_2 emissions
Nokia	6	2006	2012	Energy consumption of offices and sites
Nokia Siemens Networks	20 - 49	2007	2009-2010	Energy consumption of products
Sun Microsystems Inc.	20	2007	2015	GHG emissions
Telecom Italia	30 % increase	2007	2008	Eco-efficiency indicator
Vodafone Plc	50	2006/2007	2020	CO_2 emissions
European Union (all sectors)	**20** **20**	**1990** **Projected energy use in 2020**	**2020** **2020**	CO_2 emissions Energy savings/ efficiency

* The baseline is the year in relation to which the reduction/improvement target is set.

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[2] UNITE the Union, How Green is my Workplace?, p3
[3] Forrester Research (a), The Dawn of Green IT Services
[4] Intellect, op cit, p4
[5] Intellect; High Tech: Low Carbon, p6. This report has been reissued in a slightly amended form by Digital Europe (EICTA)
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[7] Intellect, op cit, p41
[8] GeSI and the Climate Group; Smart 2020: Enabling the low carbon economy in the information age, p6, p17
[9] Intellect, op cit, p14
[10] TCO Development, Your Computer and the Climate, p3
[11] GeSI and the Climate Group, op cit, p19
[12] Forrester Research (b); TechRadar for I&P Professionals: Green IT 1.0 Technologies, Q2 2009, p6
[13] Gesi and the Climate Group, op cit, p21
[14] Intellect, op cit, p15-16
[15] RCO Development, op cit, p7, quoting EU Energy-using Products study
[16] Intellect, op cit, p17
[17] OECD, Towards Green ICT Strategies, p21
[18] Greenpeace, Searching… for Green Electronics, p7
[19] Forrester Research (b), op cit, p26
[20] OECD, op cit, p21
[21] 'High Tech' for Europe's Low Carbon Future, report of conference 12 February 2009, http://85.255.198.139/eusew/uploads/Report%20from%20%C2%B4High%20Tech%C2%B4%20for%20Europe%C2%B4s%20Low%20Carbon%20Future.pdf
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[23] European Commission (2008) Addressing the Challenge of energy efficiency through Information and Communication Technologies, COM (2008) 241.
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[24] WWF (a) Outline for the first Global IT strategy for CO2 reductions: The first billion tonnes of CO2 reductions to achieve transformation; WWF (b) The potential global CO2 reductions from ICT use
[25] Intellect, op cit, p20
[26] GeSI and the Climate Group, op cit, p29
[27] GeSI and the Climate Group, op cit, p7
[28] GeSI and the Climate Group, op cit, p50
[29] WWF (a) op cit, p6
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[31] OECD, op cit, p4
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[41] PCS, Becoming a Greener Union report, 2008
[42] ibid
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[44] UNITE, op cit, p17
[45] European Commission, Commission Pushes ICT use for a Greener Europe