JISC Final Report

Green ICT in London HEIs, GrILH, Final Report

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Acknowledgements

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Contact

Dr Paresh Shah
London Higher
Senate House
Malet Street
London
WC1E 7HU

E paresh.shah@londonhigher.ac.uk
T 020 7664 4841

Executive Summary

The project was a 10 month baseline study of Green ICT publicly funded Higher Education Institutions (HEIs) in London. The key aims were to establish broad estimates of energy use and carbon emissions due to ICT services from HEIs in London, classify progress towards the Greening of ICT, obtain case studies of best practices, determine if relevant work outside the higher education sector could be adopted by London HEIs, and identify priority areas requiring funding support for Green ICT in London.

There was interest in the project from 19 of 42 HEIs in London and an informal network was established with Directors, managers and other staff working in Estates, Facilities, Energy Management or Sustainability. Semi-structured interviews were carried out at 18 HEIs to establish current practices in ICT and views on implementing different Green ICT options.

As part of carbon management strategies within HEIs, energy savings in ICT are being examined with high adoption of software to turn off computers when not in use (PC power down), improved printing and imaging services and rationalisation of data centres. Several HEIs have also established cloud-based email services for students and staff with major vendors.

Formal surveys, such as self-assessment maturity models, were not carried out to categorise progress by HEIs on Green ICT, but from interviews and discussions most HEIs appear to be in the second and third stages of the classification scheme on institutional change proposed by James and Hopkinson (2009), which covers a continuum from “first steps, making connections, joined up actions, radical change”.

Requests were made for HEI contacts to complete the carbon footprinting toolkit, previously produced by the Suste-IT (URL) project in 2009, and HEIs were able to provide data after about three to five months from when initial requests were made.

Total energy use in ICT was estimated to vary between 330,000 to 5,000,000 kWh per year for a range of small (creative and/or specialist) and medium-sized HEIs.

Values for energy use, electricity costs and CO_2 emissions from 11 London HEIs

Type of HEI	energy use, kWh per year
Teaching1	3,900,000
Teaching2	3,700,000
Teaching3	3,000,000
Teaching4	4,500,000
Teaching5	5,300,000
Teaching6	2,100,000
Creative1	331,000
Creative2	1,580,000
Specialist1	823,000
Specialist2	853,000
Specialist3	1,809,000

Extrapolating from all energy returns, it was estimated that the 42 publicly funded HEIs in London annually use 170 million kWh, costing £20.4 million and contributing 91 kilotonnes[1] of CO_2, based on conversion factors in the carbon footprinting toolkit.

Total energy use and CO_2 emissions from London HEIs

	energy use kWh per year	electricity costs £	$C0_2$ emissions kg per year
Total	170,020,000	20,400,000	91,300,000
Notes		assumming flat rate 12 pence per kWh	0.537 as conversion factor from energy use

Desk-based studies of Green ICT adoption in the areas outside of the higher education sector indicated very little information from further education colleges or schools. There are several regional sustainability initiatives with which some London HEIs are involved in, but greater awareness and participation could benefit more HEIs in executing their environmental management strategies.

Large commercial organisations appear to have well-developed strategies linking ICT as part of wider sustainability policies, providing both financial and social responsibility benefits. As part of the Greening Government agenda, Departments are supplying real time energy reporting online to monitor use, influence behaviour change and demonstrate progress towards targets for reductions in carbon emissions under CRC legislation. Some aspects could be modified and employed by London HEIs for internal reviews, competitions and facilitating changes in working practices.

Background

It is estimated the ICT industry globally consumes about 6-10% of the world's energy resources and is responsible for 2-3% of greenhouse gas emissions, similar to the aviation industry (Gartner, Inc., 2007; St. Arnaud, 2009a, b).

As part of the regulatory environment in the UK (Climate Change Act 2008; UK Low Carbon Transition Plan, 2009) a key performance target for the Higher Education Funding Council for England (HEFCE) is to comply with the requirement to reduce carbon emissions in the HE sector by 34% by 2020 and 80% by 2050 (against 1990 levels).

Sustainable, or Green, ICT is an area where short- to medium-term interventions can produce savings in energy use, decreased costs and reductions in carbon emissions. Current estimates of energy use and carbon emissions in the UK HE sector are based on an innovative pilot study at one university but these estimates would benefit from regional inputs.

[1] conversion of kg to kt from web resources, e.g. www.metric-conversion.net/convert_kilograms_tonnes%20%28metric%29.htm or www.unitconversion.org/weight/kilograms-to-kilotons-metric-conversion.html.

Aims and Objectives

The project had two main aims:

1. Assess the current state of Green ICT issues in London HEIs, possibly with a formal classification system. A key emphasis will include obtaining baseline data on energy use and carbon emissions using the SusteIT Energy and Carbon Footprinting tool.

2. Raise awareness of Green ICT issues and assist member institutions in developing or accelerating sustainable ICT policies to comply with HE sector guidelines and national legislation. This will be achieved through facilitating discussions, workshops and networking, as well as publication of data and case studies.

Specific objectives were:

1. Landscape study of Green ICT in London drawing on London Higher's membership of over 40 HEFCE-funded universities and higher education colleges within the Government Region.

2. Compile a comprehensive register of Green ICT processes in relevant categories, such as procurement procedures; deployment and operations (including sub-categories for alternative computing [thin clients, cloud computing, outsourcing, virtualisation]); data centres; printing/imagery, etc.

3. Use estimates of individual HEI data to compile overall figures for regional energy use and carbon emissions from the carbon footprinting toolkit.

4. Generate case studies to illustrate best practice in specific topics

5. Parallel work will aim to explore other sectors in London for examples of best practice which would benefit London HEIs, such as Green ICT in schools and further education colleges, regional sustainability initiatives and commercial or private organisations.

Methodology

Network of HEI contacts

Email invitations were sent by London Higher to Vice-Chancellors and Heads of Institutions providing background information on the aims of the project and requesting participation from relevant staff. A meeting was held on 13 July 2010 with 19 HEI representatives from 17 HEIs. Presentations on the project, Green ICT and carbon footprinting were provided by London Higher, JISC, BT Global Sustainability, Canon plc and SusteIT.

A network of contacts covering 19 HEIs was established from this meeting and from subsequent email enquiries. HEI representatives covered Directors, Managers and other staff working in Estates, Facilities, Sustainability, and Energy or Environmental Management.

Completion of carbon footprinting returns required the engagement and active participation of ICT staff working with Environmental and Sustainability managers in the HEIs concerned.

Information on current Green ICT developments and other notices were relayed through an email distribution list, blog postings (http://grilh.blogspot.com/) and via Twitter (@Paresh_GreenICT).

Formal Advisory Groups were not considered necessary as HEI staff did not express any desire for such structures and had little time to attend possible meetings. Instead, project direction was managed by London Higher and JISC.

Meetings with HEIs

Discussions and semi-structured interviews were held with HEI contacts to obtain background information and opinions on Green ICT within their institutions.

Carbon Toolkit Data
Summaries of carbon toolkit returns were compiled and regional estimates on energy use, costs and carbon emissions were sent to the 12 HEIs which had provided data and to the HEEPI at the University of Bradford, which is collating summaries from comparable projects in the UK.

Classification of Progress to Green ICT
Classification schemes on Green ICT implementation, such as the Sustainable ICT Maturity Model (SIMM), were examined but were considered to be time consuming and not appropriate in this initial baseline study. As an alternative the simpler classification of institutional change proposed by James and Hopkinson (2009) was used for overall assessments of discussions with HEI contacts.

Case Studies
Case studies were requested by email and at various meetings held in early 2011.

Green ICT in non-HE Sectors
Desk-based studies were conducted to find information on Green ICT practices outside of the HE sector involving internet and database searches and contacting regional, commercial and HE professional organisations.

Implementation

Meetings with HEIs
Appointments were made to visit representatives at 18 HEIs between late Summer and Autumn 2010. Semi-structured interviews were held covering Green ICT topics and related issues. During meetings the benefits of completing the carbon toolkit were emphasised (complete ICT asset register, estimate of ICT energy use in institutional total, identifying areas for cost savings).

Although there had been enthusiasm to complete the toolkit, only 11 HEIs provided data returns. This may appear to be satisfactory but one reason for the low level of response was the uncertainty generated by the Browne Review and Comprehensive Spending Review in late 2010. Another factor was insufficient staff resources to collect data and concomitant pressures on ICT departments to prioritise registration of first year undergraduates and resolve routine technical problems during this period.

Because of time constraints on HEI staff, the classification of progress towards Green ICT was based on interviews and discussions.

Carbon Toolkit Data
A workshop was held on 25 January 2011, attended by 14 people from 11 HEIs to present initial findings from the carbon toolkit returns, discuss areas for “quick wins” in energy savings as well as opportunities and barriers for Green ICT. Presentations were made by London Higher, JISC and the Suste-Tech project coordinated by the Environmental Association of Universities and Colleges (EAUC).

An overview of the GrILH project and preliminary findings were also discussed at a workshop on Green ICT held by the London Universities Environmental Group (LUEG) on 11 January 2011.

A “best practices” seminar on Green ICT, jointly organised by the GrILH and Suste-Tech, was held on 10 February 2011 with speakers from EAUC, London South Bank University, University of Hertfordshire, University of London and Eduserv. This was attended by 14 HEI contacts from eight institutions and UCISA.

Outputs and Results

Carbon Toolkit Data

Summary results from 10 London HEIs are presented in this section.

Table 1: Energy use estimates from carbon toolkit returns

Estimates	energy use, kWh per year	Number students	No. staff (academic staff)	No. desktop PCs
Teaching1	3,900,000	9,000-26,000	1,000-3,000 (700-1,000)	2,500-8,000
Teaching2	3,700,000			
Teaching3	3,000,000			
Teaching4	4,500,000			
Teaching5	5,300,000			
Teaching6	2,100,000			
Creative1	331,000	400-7,700	1,000-1,700 (60-600)	300-2,400
Creative2	1,580,000			
Specialist1	823,000			
Specialist2	853,000			
Specialist3	1,809,000			

Table 2: Comparison of % energy use between London and non-London HEIs

	London HEIs (n=11)			Non-London HEIs (n=4)*		
	median	min	max	median	min	max
HPC	1%	0%	20%	15%	1%	23%
Servers	27%	1%	63%	26%	18%	40%
PCs	32%	19%	55%	38%	26%	48%
Networks	11%	0.1%	30%	10%	8%	11%
Telephony	3%	1%	5%	2%	0%	7%
Imaging	10%	4%	29%	7%	4%	14%
AV	5%	1%	22%	1%	0%	5%

* source: http://www.susteit.org.uk/files/files/27-ICT_Energy_Footprint_Tool_Results_Master_27.xls

Chart 1

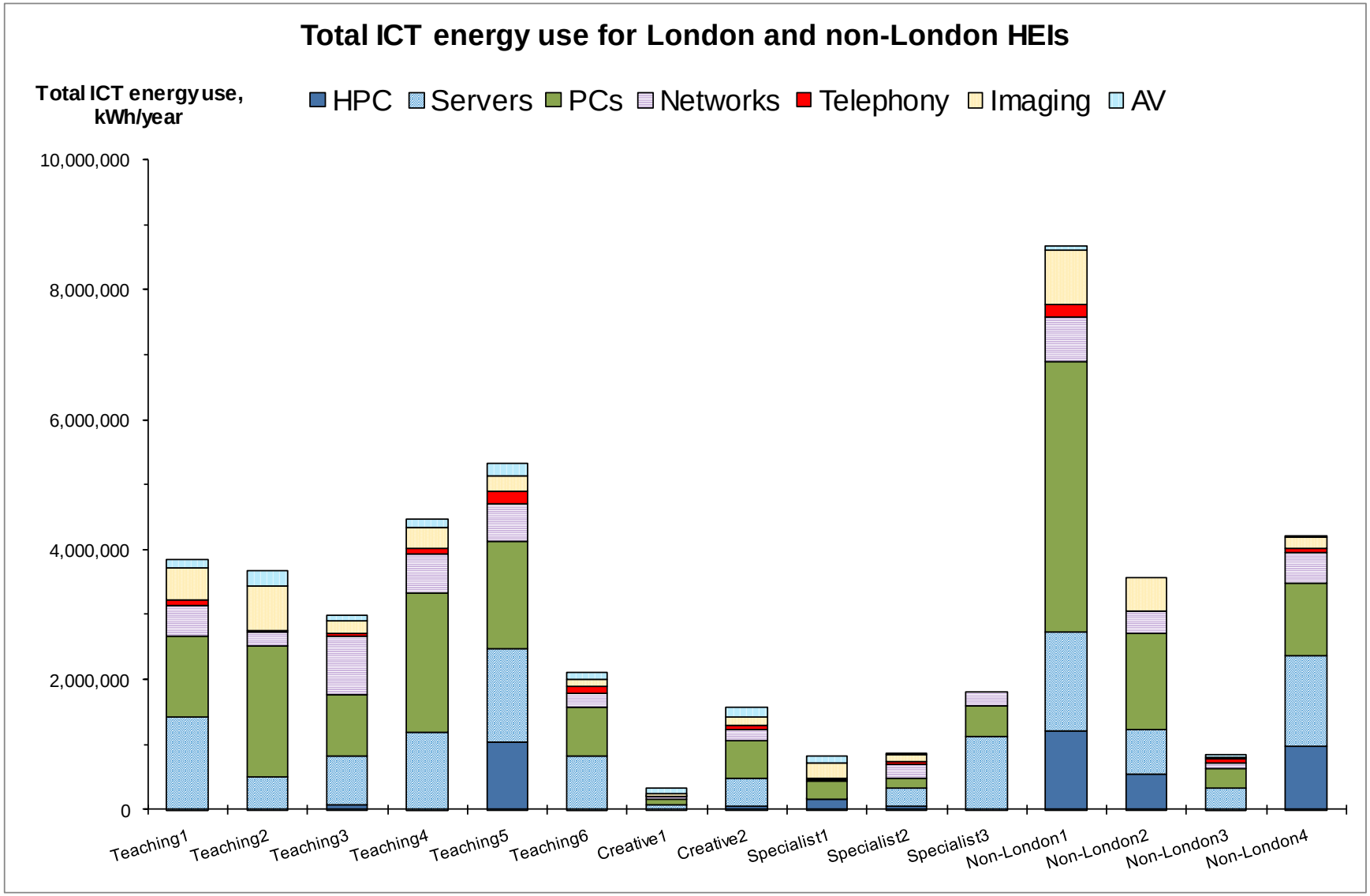

Total ICT energy use for London and non-London HEIs
Total ICT energy use, kWh/year
HPC
Servers
PCs
Networks
Telephony
Imaging
AV
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
Teaching1
Teaching2
Teaching3
Teaching4
Teaching5
Teaching6
Creative1
Creative2
Specialist1
Specialist2
Specialist3
Non-London1
Non-London2
Non-London3
Non-London4

Chart 2

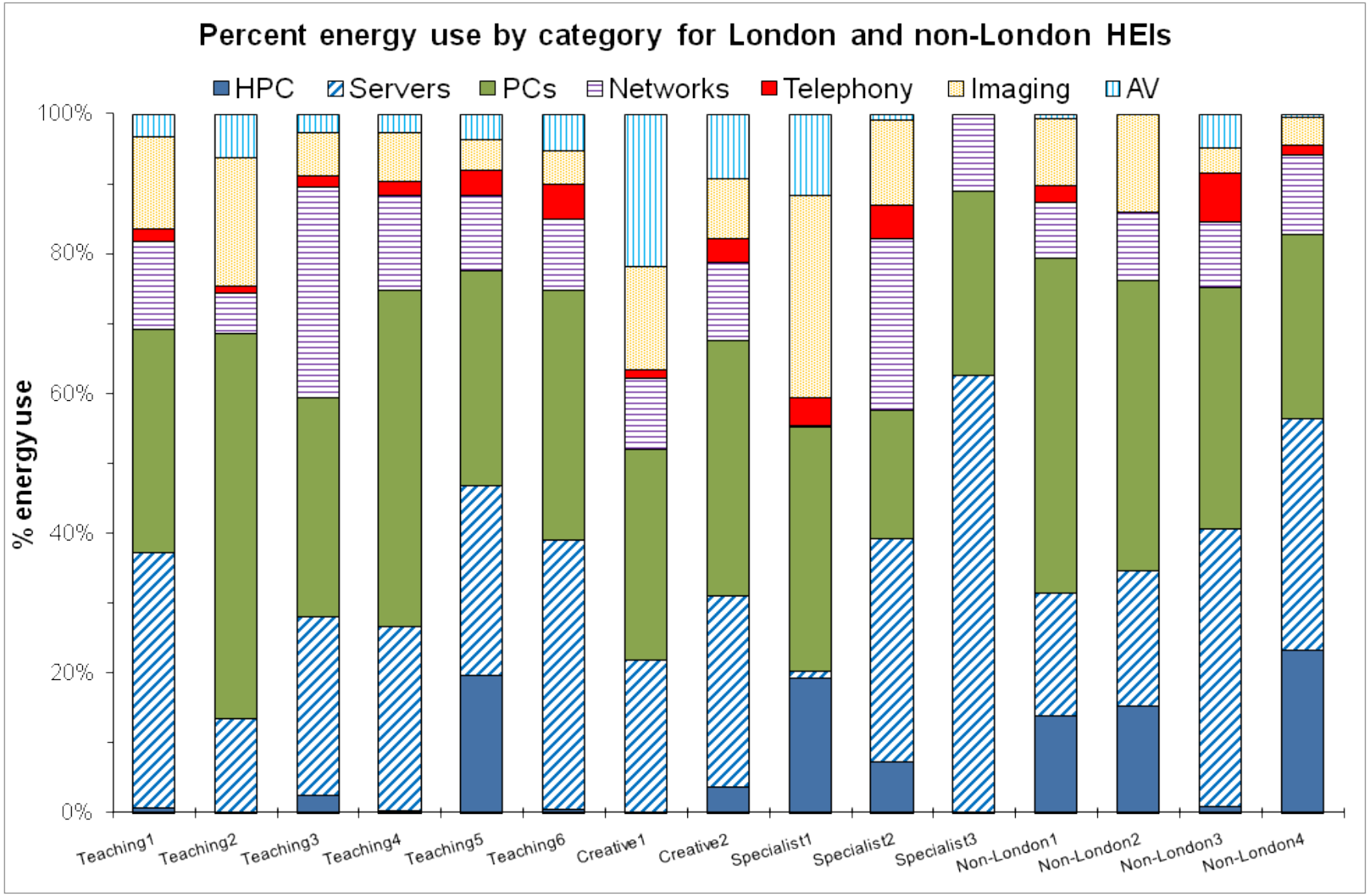
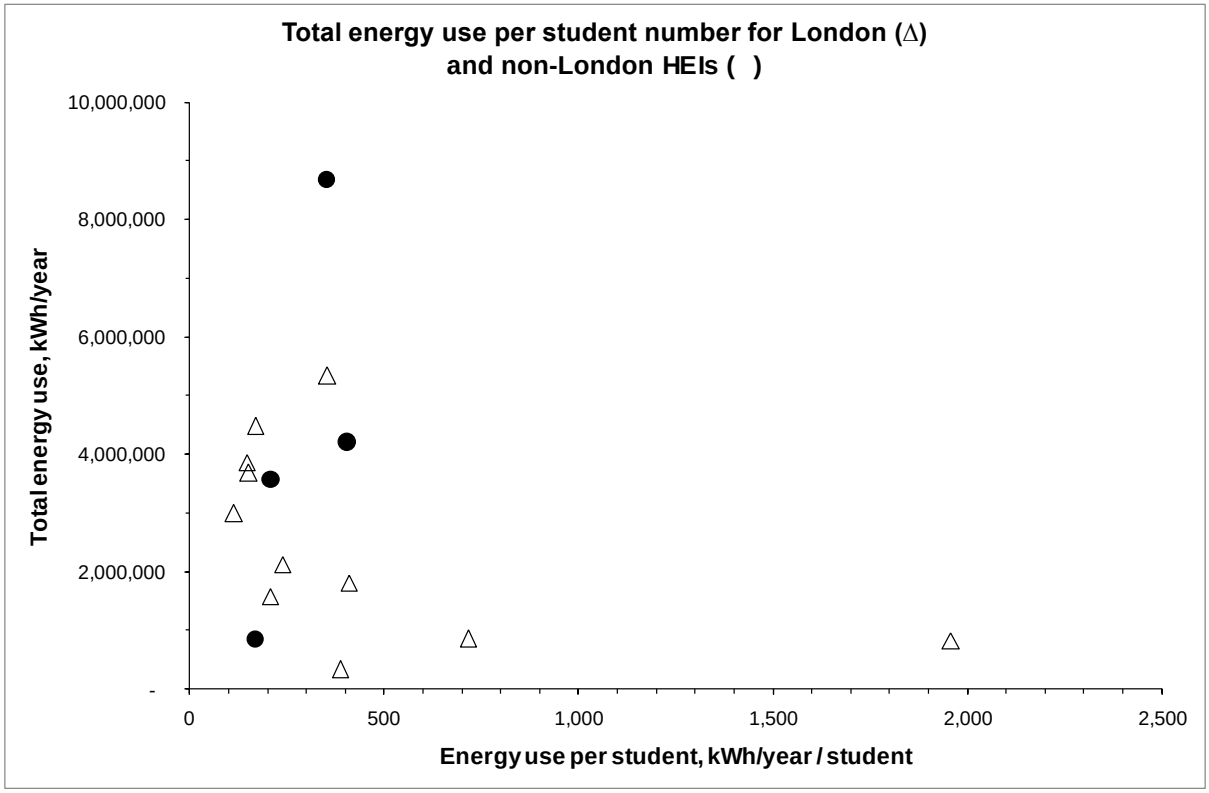

Percent energy use by category for London and non-London HEIs
HPC
Servers
PCs
Networks
Telephony
Imaging
AV
% energy use
100%
80%
60%
40%
20%
0%
Teaching1
Teaching2
Teaching3
Teaching4
Teaching5
Teaching6
Creative1
Creative2
Specialist1
Specialist2
Specialist3
Non-London1
Non-London2
Non-London3
Non-London4

Chart 3



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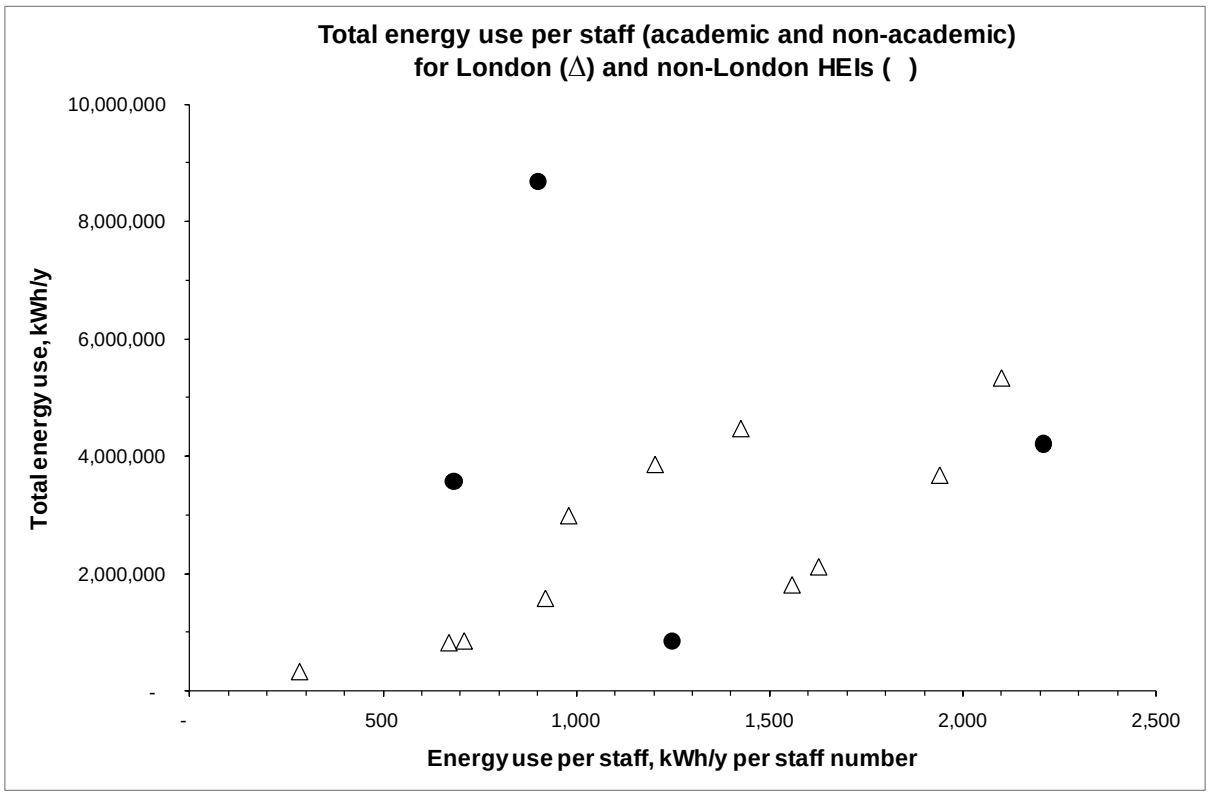

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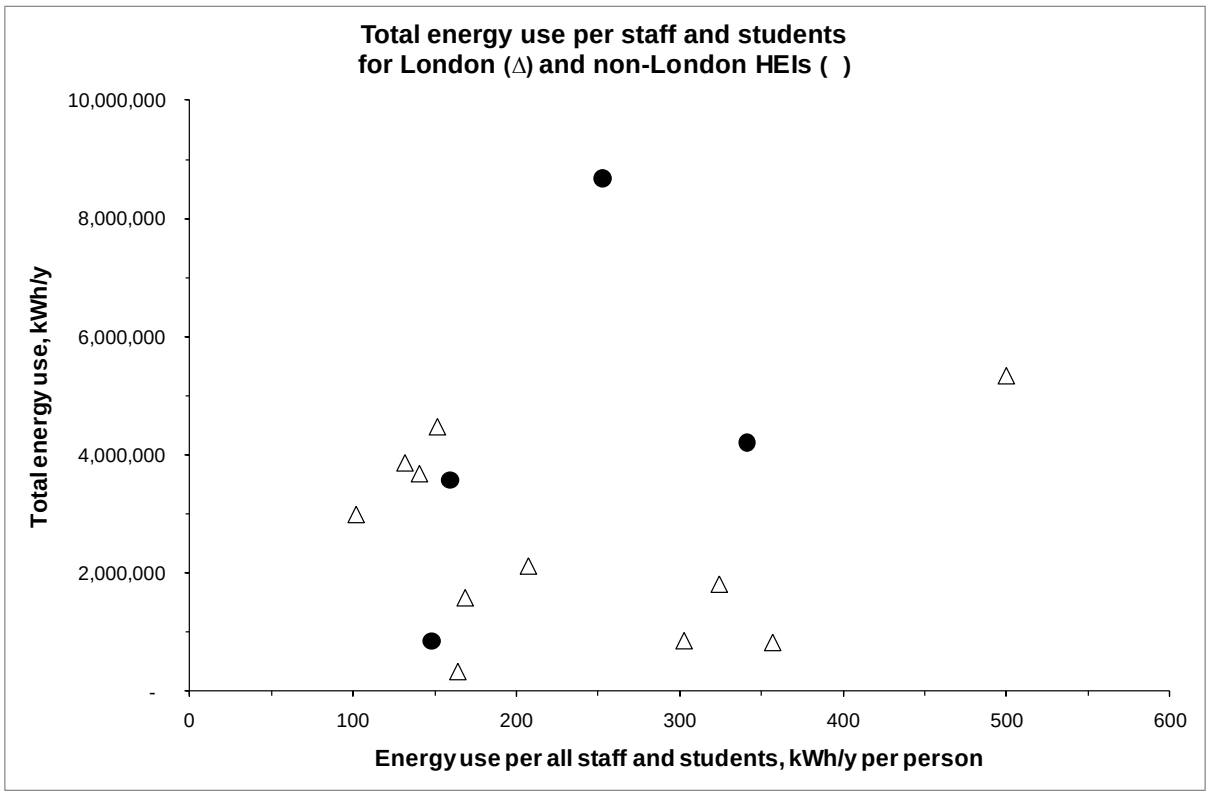

Chart 6

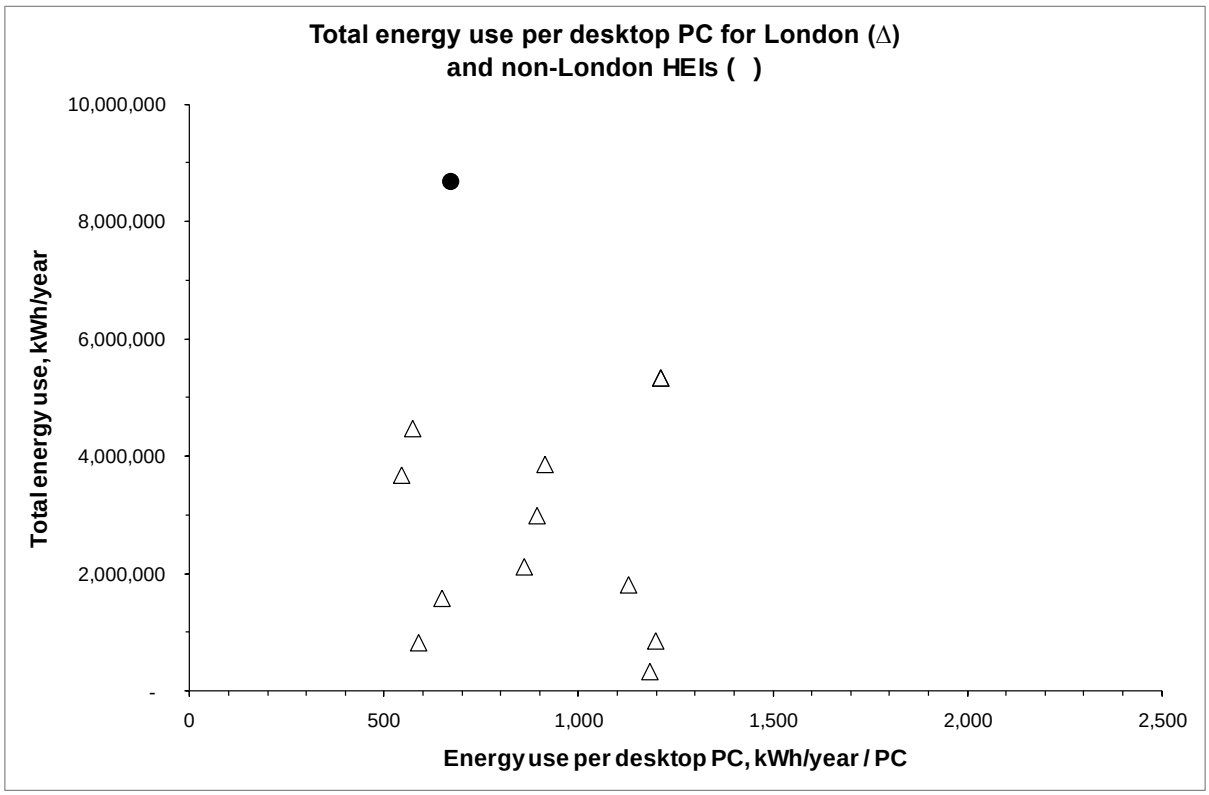

Table 3: Estimation of total energy use, electricity costs and CO_2 emissions for London HEIs.

	Type of publicly funded HEI			
Category	Teaching-led	Research-led	Creative or Specialist	TOTAL
No. public HEIs	15	4	23	42
energy use*, kWh per year	56,550,000	93,850,000	19,600,000	170,000,000
electricity costs**, £	6,790,000	11,300,000	2,350,000	20,400,000
C02 emissions***, kg per year	30,400,000	50,400,000	10,500,000	91,300,000
% energy use	33%	55%	12%	100%

* median values of 3.8 million, 23.5 million and 0.8 million kWh per year used for teaching-led, research-led and creative/specialist HEIs, respectively.

**0.12 pence per kWh

***0.537 conversion factor

Summary of carbon toolkit returns

Data presented for toolkit returns contain approximations and should not be regarded as providing definitive totals for energy use, electricity costs or CO_2 emissions.

At an HEI level, total energy use in ICT was found to vary between 330,000 to 5,000,000 kWh per year for the teaching-led and creative and specialist institutions.

Within HEIs, highest energy use was estimated to be in the operation of PCs and servers followed by imaging and networks, similar to previously published data involving four non-London HEIs. Interestingly, energy used by networks exceeded energy consumption in printing and imaging services at five teaching or creative/specialist London HEIs. Other estimates of energy use by networks vary between 30 and 40% of ICT energy use (Anderson et al., 2009).

Scatter plots of untransformed data showed few obvious relationships between total energy use by HEIs and staff, student or PC resources but more data is required.

At a regional level, the calculation of 170 million kWh/y, costing about £20.4 million annually, for all London HEIs is likely to overestimate the actual amounts involved but these are starting points for assessing the relative importance of carbon emissions by publicly funded HEIs in London Region.

ICT operations in London HEIs appear to contribute 91 kilotonnes annually in CO_2 emissions, equivalent to about:

- 32% of the UK HE sector (Appendix 1; James and Hopkinson, 2009);
- 10% of emissions from the London Borough of Hackney (2008 figures; AEA, 2010);
- 0.2% of current emissions by the Greater London Authority (e.g. http://www.lsbu.ac.uk/news-php/news.php?newsid=554).

Classification of Progress to Green ICT

Semi-structured interviews with HEIs indicated most had implemented or were implementing areas highlighted in the Low Carbon ICT Roadmap for 2009 and 2010, such as improving data centres, energy efficient PCs and rationalising printing services (Table 4; Anderson et al., 2009).

Several HEIs were also experimenting with increased settings for temperature and humidity in data centres (~ 25^{o}C and 50% RH) which is a recommended goal for 2011 in the Roadmap. A number of HEIs have started or are considering using cloud-based email services, mostly for students rather than staff. However, very few HEIs appeared to be applying changes in procurement or using videoconferencing, both of which can help with Green ICT.

Table 4: Topics covered in discussions with 17 HEIs during Autumn/Winter 2010

	Number of HEIs where:	
ICT operation	being done or implemented	being considered
Data centres - rationalisation, upgrading, server virtualisation	10	1
PCs - powerdown, increased refresh cycles, "greener" PCs	8	0
Printing/imaging - multifunction devices (MFDs), duplex, greyscale, digital prospectuses	9	1
Thin clients, virtual desktops*	1	4
Cloud services** - e.g. email for students, staff and alumni (email for life)	3	1
Procurement strategies - TCO, energy efficient equipment	1	4
Disposal - re-use/re-sell, donate to charities, WEEE directives	4	1
Videoconferencing - VOIP (Skype), JISC	0	3
Telephony upgrades	3	0

Note: this is a semi-qualitative summary and is not based on a formal survey

* one HEI evaluated possibility but did not consider it to be of benefit

** two HEIs considered services but decided against signing up with providers

Issues raised in discussions

Approximately 15 topics on ICT energy efficiency were mentioned by HEI contacts (Table 5) and some of the key points include:

1. *Thin clients:* newer models are thought to overcome current drawbacks regarding efficiencies, poor video streaming and overspecified configurations;

2. *Behaviour change:* communications and feedback are vitally important in changing work practices, most of which are targeted at students and support staff but rarely cover academic and research staff. Resources from EAUC could be helpful in campaigns (http://www.eauc.org.uk/bcmp_resources);

3. *Data pool:* need for centralised web resources to share equipment energy readings, types of sensors/meters used, hopefully preventing duplication and assisting HEIs in TCO and energy use evaluations;

4. *Energy crunch:* Uncertainty in energy supplies is a global issue not just confined to the UK (Forum for the Future, 2010). However, two nuclear power plants are due to close in the UK in 2011 followed by nine oil- and coal-fired power stations in 2016, which is equivalent to 16 per cent of the country's total generating capacity (http://www.ifandp.com/article/005556.html).

   The planned reduction in the UK's electricity supply will lead to a "supply gap" that, according to some analysts, could lead to temporary blackouts as early as 2012. Pressure is most likely to be felt around London, which also has around 80% of the UK's data centre capacity (http://www.dmwgroup.com/green-it-0).

   A lack of energy supply is hindering data centre expansion and ICT operations by financial services in the City of London (SAMI Consulting, 2009). For business continuity, some HEIs based in central London are planning back up data centres outside of the capital.

Many HEIs have recently been developing cross-Departmental coordinated actions on sustainability and energy reduction because of carbon management plans required by funding councils and CRC legislation from Government.

Overall, London HEIs participating in this study are thought to be in the second and third stages of the continuum of institutional change in ICT proposed by James and Hopkinson (2009) which are:

i. First steps: limited capacity and fragmented support mechanisms
ii. Making connections: lack any truly coordinated approach to sustainability
iii. Joined up actions: sustainability commitments in place and mechanisms to implement them
iv. Radical change: pioneers who combine a strong commitment to sustainability with internal capacity in sustainable ICT

Table 5: Full list of issues raised in discussions with HEI contacts

Area	Topics
PCs	• "wake on LAN" remote access requires desktop PCs at work to be switched on • Use of personal laptops lower for arts students than those studying STEM subjects • Most energy savings from efficient monitors not desktop PCs
Thin clients/ virtualisation	• True costs of virtualisation • Unsure about using thin clients • Thin client poor for video streaming
Cloud services	• Previously free email services could be subject to charging in the medium- to long-term
Energy metering/ measurements	• Energy metering required for rooms not buildings • No standards for different types of sensors – advice/resources recommended • Website data pool on energy readings for ICT equipment so comparisons can be made or results used by other HEIs, preventing duplication
Other	• For science-based subjects, energy use for ICT is lower than running lab equipment e.g. freezers, cold rooms, fridges, insect and plant rearing facilities. Equipment can be more than 10-20 years old but expensive to replace • CRC changes mean savings are taken away as a levy or tax and are not being reinvested, causing uncertainties • Behaviour change is a challenge and internal communications and feedback are important • Most energy saving measures such as PC powerdown and use of multi-function devices (MFDs) is implemented for students and non-academic staff but adoption by academic staff is a barrier • Energy "crunch" – concerns about insufficient supply in three to four years time

Involvement in national and regional initiatives

National initiatives

The 42 HEIs in London comprise 25% of all 168 publicly funded HEIs in the UK. Hence, participation by London HEIs in national energy reduction schemes and sustainability initiatives should reasonably expected to be around 25% of all HEIs. However, London HEIs seem to be under-represented in HE sector awards (Table 6).

In addition, about 200 HEIs signed the 10:10 commitment including 11 from London.

Table 6: Participation of London HEIs in main HE sector sustainability awards.

Award	Description	No. London HEIs (%)	URL
EAUC Degrees Cooler	Four strands: Going Greener; Green Impact ; People and Planets Going Greener; Student Switch Off.	4 of 20 involved (20%)	http://www.degreescooler.org.uk/degrees-cooler-universities/
Universities That Count	performance improvement in social and environmental responsibility	4 of 45 (9%)	http://www.eauc.org.uk/utc
EAUC Green Gown Awards	awards in recognition of exceptional sustainability inititiatives	Three London HEIs were highly commended from 29 prize winners in 2010	http://www.eauc.org.uk/green_gown_awards
Ecocampus	environmental management system and award scheme with four levels.	3 of 33 (9%)	http://www.ecocampus.co.uk/

Regional initiatives.

In London, 95 public sector organisations have been involved in Carbon Management Programmes with The Carbon Trust including 31 HEIs (Carbon Trust, 2010).

Green 500 is the Mayor of London's carbon management scheme, aiming to mentor London's top 500 organisations through their carbon reduction commitments, and includes seven London HEIs, six university affiliated hospitals and one specialist dental institute (http://www.green500.co.uk/).

Case Studies

Three case studies have been provided for this on powerdown, printing services and institutional change (Boxes 1 to 3).

Case Study 1: PC Power Management
London School of Hygiene and Tropical Medicine

Background and challenge
While ICT accounts for around 2% of global carbon emissions, within HEIs it can account for between 20-30% through use by staff and students. In order to help minimise the consumption across departments within LSHTM, in July 2010 an energy saving solution to monitor PC activity and implement remote shutdown when PCs were not in use was installed.

The powerdown software creates detailed reports and graphs showing when individual machines or groups of computers are in active use, logged in but idle, on but not logged in, or powered off. Additionally, it provides the ability to implement actual power-saving measures such as shutting down PCs, putting machines into standby and turning off monitors when a computer is idle or not in use.

The Green ICT change
The implementation was conducted in two stages, for both staff and public workstations. For the first phase the software was left simply report on workstation use, monitoring the levels of inactivity and PCs left switched on when no users were logged in.

In phase 2, a modest set of measures was introduced to power off PCs not logged into after 15 minutes, and put monitors into standby after 15 minutes of inactivity. The effect of even this modest activity was dramatic, particularly on public workstations which were commonly left on for the entire day irrespective of use.

In addition to the standard service offered by the software, IT services then introduced a further initiative that would give users a pop-up message if they'd been logged in overnight, and provide them with an opportunity to respond about their working patterns. This also served to raise awareness about both the project and the need for users to switch off.

The reporting allowed IT services to drill down on activity, highlighting the worst offenders so that these users could be targeted for improvement. The potential to introduce automatic shutdown without losing work is currently being investigated for future rollout, as well as giving users a range of power management options to choose from.

One of the biggest problems identified was that many people are forgetting to log out when they leave a workstation.

Key points and benefits
The reporting data is available for anyone in the school to view online and there is a link for users to check the performance of their own computer.

Although there have been huge improvements in performance, IT services still feel that there is a long way to go. In 2011, IT services and the LSHTM Sustainability Group will expand on this work and the communications to staff and students by making the reporting data visible within key areas such as computer rooms and combining this with the message for users to switch off when they are finished.

The real time data gives the school a great way to monitor if these initiatives are having the desired effect.

A complete version of this case study is available at www.londonhigher/grilh.html.

Case Study 2: Managing printing and imaging – Departmental case study
London South Bank University (LSBU)

Summary
Consolidating nine printer, scanner and fax machines by replacing them with two multifunctional devices (MFD) in one Department is expected to produce annual savings of £100 in energy use and a reduction by 0.5 tonnes for CO_2 emissions. Other benefits will include more accurate invoicing and less printer downtime using print management software; increased office floor space and better use of academic staff time through on-line printing.

Background and challenge
As part of the LSBU strategy to reduce the number of single function devices and move to fewer, greener, more efficient, multifunctional devices (MFDs), The university is undertaking reviews of departmental devices and work areas with M2Digital. A full analysis was undertaken by M2digital to produce a comprehensive print management strategy with predictions of efficiency benefits, cost savings and reductions in carbon emissions. A Department with seven support staff and nine different devices that were not monitored for printing and imaging was identified as a suitable candidate to test for a more efficient printing and imaging solution.

Previous practice
In the past, Departments could specify and order any printer or imaging device, either directly or from recommended suppliers. In recent years such ordering has to be done with scrutiny by staff in ICT or Document and Copyright Services.

The Green ICT change
There should be quantifiable reductions in carbon emissions and increased staff awareness of environmental issues and cost during this change process. Two MFDs were installed (one as back-up) and the Department staff can print locally or send the print request on-line to the LSBU Print Room from any internet enabled device. We encourage the on-line option as this saves carbon in travel to and from LSBU and while at the university, so the carbon reduction is much larger for London.

Having printing done remotely makes better use of academic staff time. However, some staff find it more convenient to keep on using older, expensive, inefficient devices and remain unaware or unwilling to use alternative solutions. As a result, multimedia resources, such as video clips and "how-to" guides have been developed to communicate the advantages of switching to MFDs and on-line printing. Examples can be viewed at http://tiny.cc/sendonline and http://www.lsbu.ac.uk/sdu/5min/olprint/.

Key points and benefits
Removing six printers and a fax machine freed up office floor and desk space, and reduced the numbers of devices to maintain, support and purchase consumables for. SmartDevice Monitor software is on-line at LSBU and is used to proactively ensure good uptime for the MFDs, control powerdowns, ensure timely ordering of supplies and increased print service efficiency. End users can print locally or on-line from any internet or networked enabled device.

Conclusions and recommendations
This is an ongoing business process. The aim is to reduce carbon emission and tighten up procurement and management of mixed, unregulated devices. The new MFDs will improve technology, save carbon and drive change in blended teaching and learning by improving the quality of teaching and learning materials and by allowing digitised copy being added to our Electronic Document & Records Management System.

The next phase will be to identify individual user volumes, review the need to print and photocopy, and encourage original digital content for our local Electronic Document and Records Management System (EDRMS). This will develop our content in LSBU's virtual learning environment, increase assets and address several copyright issues and concerns.

Additional information.
The Department staff all welcome the additional features and functions of the central multifunctional device (2- & 4-hole paper punching, stapling, with double sided printing in black as a default). The manager is pleased because costs are known and the budget for printing and imaging is transparent. The next step (in 2012) is to link the use of the MFD with indivivual users and make them more accountable for their own use and carbon footprint.

Contact details
Alan Lee, Document & Copyright Services Manager, ICT; leear@lsbu.ac.uk.

Case Study 3: IT Transformation Programme
London Metropolitan University

Background and challenge

London Metropolitan University has set an aspirational target of reducing it's carbon footprint by a third over the next five years from a 2009 level of 13,500 tonnes CO_2 to 9,045 t CO_2 by 2014. This has to be achieved at the same time as becoming cost efficient and radically transforming the IT services provided within the university.

Previous practice

- Hundreds of individual servers;
- Staff and Student PCs never switched off;
- Printed UG and PG prospectus which were then posted to students;
- Individual photocopiers and desktop printers.

The Green ICT change

- Virtualisation of servers – 137 servers removed from active service;
- Auto shutdown of student PCs with anticipated savings of around £250k annually. To be formally measured over the coming year. Auto shut down of staff PCs being planned for 2010/11;
- Procuring eco-friendly PCs where possible;
- Replacing print prospectus with online prospectus, which is anticipated to save around £200 k annually;
- Replacing individual photocopiers and desktop printers with Multi-Functional Devices and 'follow me' printing. It is anticipated that this will reduce paper usage/wastage by 20% and power wastage by 80% once this initiative is fully implemented**.** Student facilities have been replaced in 09/10 while staff roll-out has just started.

Reductions in carbon emissions and power usage from various initiatives are difficult to quantify since power usage is measured building by building.

Contact details

Raghu Vydyanath, Director Information Systems & Services; R.Vydyanath@londonmet.ac.uk.

Other case studies on Green ICT

- ***JISC:*** http://www.jisc.ac.uk/whatwedo/programmes/greeningict.aspx.
- ***Carbon Trust:*** http://www.carbontrust.co.uk/cut-carbon-reduce-costs/reduce/public-sector/public-sector-case-studies/pages/publicsectorcasestudies.aspx#HE
- ***Commercial / private sector:*** www.intellectuk.org/intellect-reports/3788.
- ***Central Government:*** *HM Government (2009). Greening Government ICT, One Year On: A progress report on the Government's Greening Government ICT Strategy.* Cabinet Office 2009.

Green ICT in non-HE Sectors

Desk-based studies of Green ICT practices in areas outside of the higher education sector provided very little information from further education or schools.

Many large commercial organisations have well-developed strategies linking ICT as part of wider sustainability policies to provide both financial and social responsibility benefits. Guidance on carbon management strategies outline the main challenges, processes for reductions and efficiency drivers (e.g. Shann, 2010; IBM Corporation, 2007, 2008).

About 77% of FTSE100 companies report having a reduction target for greenhouse gases emissions and many of these are likely to meet their targets by 2020 (Carbon Disclosure Project (2009).

SMEs in London are able to obtain free advice on Green ICT by a joint project involving the Environmental IT Leadership Team (EILT) and the Global Action Plan charity (http://greenict.org.uk/).

A short-term energy competition organised in late 2010 resulted in a league table of 18 central Government Departments based in London (http://data.gov.uk/energy-competition-league-table).

This has led to the development of regular on-line reporting by Departments for energy use, carbon emissions and plans for reductions (e.g. http://www.stark.co.uk/government/dwp.aspx; http://www.bis.gov.uk/transparency/energy).

In parallel to central Government reporting, a number of HEIs are also starting to provide on-line monitoring of energy use, including work supported by JISC under Greening ICT and from HEFCE's Leadership Governance and Management fund:

- www.jisc.ac.uk/whatwedo/programmes/greeningict/customer.aspx
- www.hefce.ac.uk/lgm/build/lgmfund/projects/show.asp?id=195&cat=15.

Outcomes

	Key Aims	Outcomes
1	Assess current state of Green ICT issues in London HEIs and obtain baseline data on energy use and carbon emissions	Network of contacts at 19 HEIs and carbon footprint returns from 11 HEIs (25% of London HEIs)
2	Raise awareness of Green ICT issues through discussions, workshops and networking, as well as publication of data and case studies	Meetings at 18 HEIs; organised one workshop and one best practices seminar (with EAUC); presentations at two other meetings; email distribution list; Twitter account; blog postings.
	Specific objectives	
1	Landscape study of Green ICT with London Higher's membership of over 40 HEFCE-funded HEIs	Baseline information and data collated.
2	Comprehensive register of Green ICT processes in relevant categories, such as procurement procedures; data centres; printing/imagery, etc.	Not completed due to insufficient time.
3	Collection of statistics for HEI and total regional energy use and carbon emissions using the SusteIT Energy and Carbon Footprinting toolkit	Returns from 11 HEIs presented at three events.
4	Generation of case studies to illustrate best practice in specific topics	Three case studies covering PC powerdown, printing and institution-wide measures for Green ICT.
5	Parallel work to explore other sectors such as: - schools and further education colleges - regional sustainability initiatives - commercial/private organisations	Little information from schools, FE and 2012 Games. London HEI participation in HE sector awards, and national and regional programmes was explored. Activities by commercial and central Government departments are worth considering by HEIs.

There appear to be no obvious areas requiring grant support by JISC or other HE funders, as the portfolio of JISC projects are covering most aspects of Green ICT. However, HEI contacts felt there was a need for networking and better targeted dissemination of information, for example on cloud services or data centre design. This would entail not just email lists or newsletters but local meetings and events to encourage networking and a "community" of personal contacts, which this project has initiated.

Implications

General position of Green ICT
Green ICT was ranked as a top emerging issue in a survey of IT managers conducted by UCISA in 2008, but did not feature as a specific item in the most recent survey taken in 2010 (http://www.ucisa.ac.uk/groups/exec/Events/2010/greenit.aspx). This may be because the need for energy reductions in ICT is now well recognised and measures are being taken under carbon reduction and sustainability plans

During meetings with HEI contacts and events in early 2010, several topics were raised which may be of wider interest.

1. Cloud-based services
Providers such as Google, Microsoft, Amazon and most recently Eduserv (HEFCE, 2011), can supply email and other services, often of higher quality than the ICT departments within HEIs. Some advantages of outsourcing include allowing alumni to have "email for life", as the institutional domain address can help with professional development.

A recent review by McDonald et al. (2010) detailed the benefits, concerns and issues in adopting cloud services in HE and FE. Possible "models" by which cloud sevices could be used include:
Cloud Workspace - contract with commercial cloud providers for communication, collaboration and productivity tools for students and staff;

Large-Scale Cloud Storage - institutions move their educational and institutional repositories, institutional, archives, corporate datasets, data backup, archiving and disaster recovery and research datasets into the cloud;

Cloud-Enabled Learning Environments – for virtual and personal learning environments;

Academic Clouds - counteract concerns regarding privacy, security and understanding of the academic sector needs through *public academic, private academic* and *private institutional clouds*.

2. Future functions of ICT departments
Given integration with cloud services, advances in technology (e.g. dockable smart phones for laptops and desktops), greater use of social media and changed expectations for IT services from students and staff, it remains to be seen whether ICT departments will have fewer responsibilities in the next five to ten years.

Data centre capacity may not be reduced because of public, private and/or hybrid cloud services but could instead be used for operating and securely storing data on-site in the following areas:

Enterprise Architecutre – institutional strategy and implementation through coordinated ICT; http://www.jisc.ac.uk/publications/briefingpapers/2010/bpenterprisearchitecturev2.aspx;

Energy metering – smart meters and smart grids for optimum energy use in decentralised power networks (Forum for the Future, 2010);

Data management – requiring professional data mangers for academic and non-academic (Estates, ICT) operations.

3. Data management
This is likely to be an increasingly important issue in academic research, driven both by grant funders and by pressures for "open data".

Free academic software allows more labs to conduct their own analyses rather than feeding into centralised processes, for example in genomics (e.g. Nature, 2011), but demands for transparency, data mining and sharing mean more academic data need to be stored by research groups in HEIs, either expanding the central data storage function in ICT or requiring cloud-based storage.

Research funders in the UK and USA now require data management and data sharing plans in project proposals (Wellcome Trust; 2011; NSF, 2011). The Technology Strategy Board recently announced a project with three Research Councils aimed at harnessing diverse data sets and speeding up analysis and visualisation techniques (BBSRC, 2011).

There are two UK pilot projects on sharing research data at the UK Research Data Service (UKRDS) (http://www.ukrds.ac.uk/) and JISC Managing Research Data (MRD) (http://www.jisc.ac.uk/whatwedo/programmes/mrd.aspx).

Funding ICT projects

Salix funding is used by many HEIs for energy efficiency projects (SusteIT, 2010) and a recently announced partnership between the Carbon Trust and Siemens could also be applicable to HEIs (Carbon Trust, 2011).

The London Development Agency RE:FIT programme aimed at public sector building refurbishment can include ICT upgrades (http://www.lda.gov.uk/projects/refit/).

Recommendations

1. Better dissemination of JISC projects and findings: a difficult area as there will always be "information overload" and a new email newsletter has recently been started. Perhaps regional briefings, networking events and/or small meetings with ICT staff in HEIs. This will be especially important as projects aimed at more difficult areas in Green ICT (e.g. procurement, energy monitoring, greening events) begin to report their findings;

2. Improving energy efficiency in networks: there appear to be few studies by HEIs in this area and collaborative projects with industry could follow proposals and targets in the Low Carbon ICT roadmap (Anderson et al., 2009).

3. With the network of HEIs established through this project, coordinated work on reducing ICT energy use by London HEIs would help ascertain areas for quick gains, as well as barriers, which could be disseminated to other HEIs in London and adjoining regions. The project could also include several other aims highlighted from this study:

    - Improving energy efficiency in networks: there appear to be few studies by HEIs in this area and collaborative projects with industry could follow proposals and targets in the Low Carbon ICT roadmap (Anderson et al., 2009).

    - Web-based resource pooling energy measurement findings for ICT equipment

    - Advice and support to HEIs which are afffected by electricity supply issues (energy crunch), especially in central London.

In addition, the experience of the Scottish Funding Council's Sustainable ICT in Scottish Further & Higher Education project has shown that the combination of carbon footprinting, development of action plans to tackle ICT-generated carbon, and involvement in workshops and mutual support activities can help institutions make significant impacts on their ICT related energy use.

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