JISC

Green ICT – Practical Steps

Rob Bristow - Joint Information Systems Committee

Top Tips to reduce your carbon footprint

1. Assess your carbon footprint
2. Enable PC Powerdown for devices not in use. Move to Thin-Client Devices or more efficient thick-client devices as appropriate
3. Extend life of equipment and procure to Energy Star 5
4. Consolidate and virtualise servers. Get servers out of departments and offices into properly designed data centres. Rum them warmer
5. Implement Hot/Cold aisle separation and containment in your data centre. Look at the possibility of direct cooling of racks
6. Install more efficient power supply units (PSU) and uninterruptible power supply systems (UPS)
7. Consolidate printers and enable duplex and monochrome printing by default
8. Reduce travel by maximising the opportunities for remote conferencing and flexible and home working
9. De-duplicate and rationalise data storage
10. Rationalise and simplify IT systems and architecture

Why Green ICT – Why JISC?

- Picked up by JOS Committee 2007
- Carbon Reduction
- CSR
- Links to other aspects of JOS work
  - Business Efficiency
  - Toolkits and self-assessment approaches
  - Sustainable futures

Drivers

- ICT Energy and carbon emissions
- CRC
- Funding council drivers
- Reduce costs
- Improve efficiency
- Enhance reputation
- New ways of working and new paradigms for teaching, learning, research and administration

The Problem

- Many devices
  - 760,000 PCs
  - 215,000 servers
  - 147,000 networked printers
  - 512,000 Mwh of electricity
  - 275,000 tonnes of CO2
- High costs
  - £116 million + in 2009 (HE & FE in UK)

Source: Suste-IT Report

The Problem

- Data centres
- The desktop
- Printing
- Embedded carbon
- Disposal
- Demand!

Picture: Josie Fraser

The opportunity

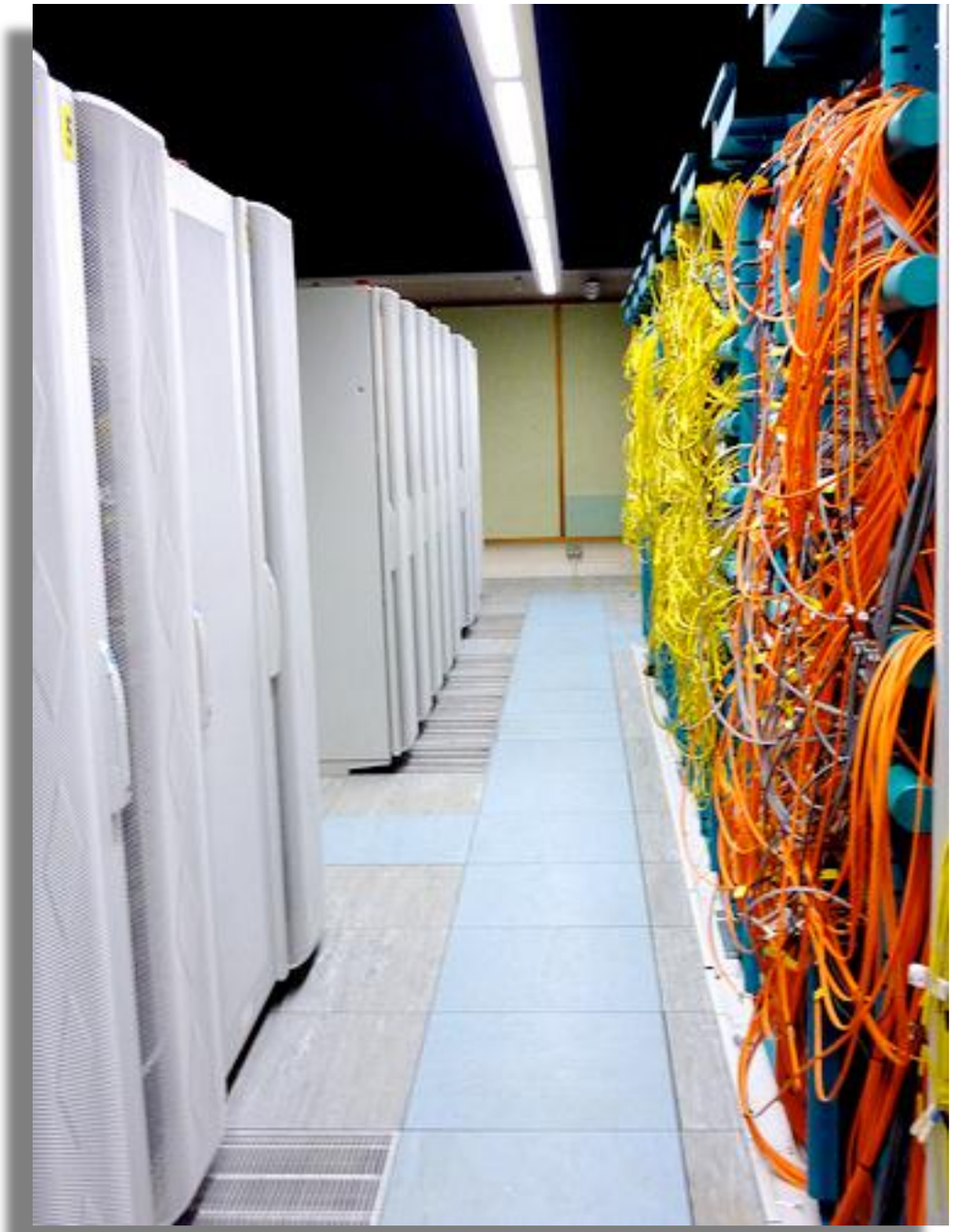
- Smarter systems, buildings and processes
- De-materialisation, dis-aggregation and dis-intermediation
- HE as exemplar for low-carbon IT
- Green as driver for other efficiency gains
- The sustainable future university enabled by technology

The Desktop

- Powerdown - This should have been done by now
- Extend it out to staff PCs
- Wake-on-LAN solutions available
- Extend life
- Procure to Energy Star 5 and EPEAT Gold if possible
- Examine case for Thin-Client

Data Centres

- “the physical reality of modern campus CyberInfrastructure (CI) is a complex network of ad hoc and sub-optimal energy environments in departmental facilities”
  - Green Light project - UC - San Diego http://greenlight.calit2.net/
- But demand is growing
  - Processing
  - Storage



Picture: Josie Fraser

The Data Centre - Steps

- Virtualise
- Hot-Cold Aisle Separation
- Blanking plates
- Raise operating temperature in line with ASHRAE recommendations
- Free cooling

Printing

- (Staff) printing is out of control
- HE Sector consumes over 21,000 tonnes of paper per year
- Accounts for 10-16% of ICT-related electricity use
- Most of the energy associated with printing comes from making the paper

- Form a cross functional team and get buy-in from users
- Consolidate printing to MFDs
- Enable “Pull” printing
- Enable duplex and monochrome printing by default
- Enable quick switch to low power mode

Procurement

- UK Government's Quick Wins
- Centre of Excellence
- Standards
  - Energy Star
  - ECMA Eco-Declaration
  - EPEAT
- Sustainability not yet embedded in procurement practices
- Need for strategic view of procurement and estates involvement

The Green ICT Programme - Overview

Key objectives for the programme

- Greening the sector - attitudinal and behaviour change embedded across the sector
- New sustainable procurement paradigms
- Sustainability seen as key driver and yardstick for sector activities
- Harnessing of sector research activities

Intended outputs from this programme

•Substantive body of knowledge illuminating areas of uncertainty in respect to Green ICT

•Exemplar projects providing leadership and best practice example

Outcomes

•Reduction of sector carbon footprint and associated energy costs

•Increased capacity and expertise across the sector in sustainable ICT

•Improved reputation of sector and UK as leaders in this area

•Reduction in waste generated by ICT use

The story so far

- Suste-IT Project
  - Year long look at Green ICT in HE and FE
  - Report, briefing papers, case studies
  - Carbon Footprinting Tool
  - Thin/Thick Client tool
  - http://www.susteit.org.uk/

Green Projects

- Low Carbon ICT – Oxford
  - Wake-on-LAN and Powerdown solutions
- Location Independent Working – Coventry
  - Flexible working process and practices
- RARE-IDC – Hertfordshire
  - Re-engineering real-life server rooms
- ECCICLES – Bolton
  - Step by step change to reduce energy use

Current Projects

- Deliberative User Approach in a Living Lab: connecting users to energy use through ICT [DUALL] (De Montfort)
  - “a socio-technical, deliberative approach enabling users of a large-scale, public-sector building to understand the potential for ICT to reduce energy consumption
- How Green Was my video-conference (Swansea)
  - Real life understanding of how people use V-C and the environmental impacts of using it
- Green in Silico (Bradford – HEEPI)
  - Focus on STEM (Science, Technology, Engineering and Mathematics) related ICT activities
- Greening Events (Bristol)
  - An exploratory investigation into how to minimise the sustainability impacts of academic events while gaining the maximum benefit from them

Projects (cont)

- Energy Recovery for Server Rooms (ER4SeR) (UHI Millennium Inst
  - Outline Project Description: Development of a Management Decision Support toolkit for the potential for use of Energy Recovery from computer server rooms, based on complete walk- through of at least three real-life scenarios
- E-Reader Demonstrator Project (Edgehill)
  - Investigating and trialing the potential for print substitution by using e-Readers in institutional committee meetings
- Planet Filestore (Cardiff)
  - Investigating the environmental savings from dynamically moving data between fast, resilient tier 1 storage and reduced energy lower tier storage

Projects (cont)

- Energy Reporting with Green Outcomes - ERGO Project (Pembroke College)
  - To reduce the environmental impact of institutional ICT through raising awareness of the effects that small behavioural change can make to reduce energy usage
- PEG – Printing Efficiently and Greener (UEL)
  - Printing rationalisation without tears
- ThinC Efficiency: Does “Thin Client” Mean “Energy Efficiency”? (Leeds Met)
  - An experimental analysis providing real data relating to the comparative costs of running thin and thick client systems in a typical university environment.

Projects (cont)

- Virtually Sustainable (Bradford – HEEPI)
  - Further work on Video-conferencing and remote collaboration tools
- Responsibility for Energy Costs (Gloucestshire and Forum for the Future)
  - Exploring the relationship between the users of energy and those who pay for it
- Cloud Study (Strathclyde)
  - Review of environmental and institutional implications of Cloud Computing
- ICT Energy and Carbon Management (EAUC) & London Higher project

The Cloud

- “Not everything will move into the cloud, but the cloud will move into everything” - Nicholas Carr
- JISC - three studies – technical, research, and enterprise (inc environmental implications)
- Cloud and Grid – Convergence?
- Hybrid clouds and Shared Services
- Questions about “Greeness” of the Cloud

Cloud Realities

Comparison of significant cloud data centres		Sq Footage	Estimated number of servers	Estimated power usage effectiveness	% of Dirty Energy Generation of local grid	% of Renewable Electricity of local grid
Google	Lenoir, NC	476,000	-	1.21	50.5% Coal 38.7% Nuclear	3.8%
	Dalles, OR	206,000	-	1.2 -	34.4% Coal 3.3% Nuclear	50.9%
	Apple, NC	500,000	-		50.5% Coal 38.7% Nuclear	3.8%
Microsoft	Chicago, IL	700,000	473,000	1.22	72.8% Coal 22.3% Nuclear	1.1%
	San Antonio, TX	470,000	-	1.2	37.1% Coal	11%
YAHOO!	Lockport, NY	190,000	-	1.16	21.0% Coal 27.0% Nuclear	27.7%
	La Vista, NE	360,000	100,000	-	73.5% Coal 14.6% Nuclear	7%

Source – Greenpeace

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Cost and Carbon Comparison Tool:
Thick vs Thin Clients - Thin Clients Vendors' Data

	Sun	Wyse	Chip PC	Own data	Clever thing
Replacement Cycle					
Replacement cycle (years)	8	12	10	1	1
Replacement cycle for thin client server	4	4	4	1	1
Numbers of Devices (#)					
Integrated monitor?	Yes	Yes	No	No	No
No. thin clients per Thin Client server	240	240	240	3	1
Capital Costs (£)					
Client purchase price per client (incl. VAT)	265	227	105	3	1
Thin client server purchase price	3,600		5,800	3	1
Operational Costs (£)					
Licence costs					
Annual client and server licence costs (per client)	19.00		15.00	3.00	1.00
Energy Costs					
Power of client in active/idle mode (Watts)	28	6	3	3	1

EU Code of Conduct for Data Centres

aims to: "inform and stimulate data centre managers to reduce energy consumption in a cost-effective manner without hampering the mission critical function of data centres"

- From comms cabinets to bespoke facilities
- Vendors & Participants (Data centre operators & end-users)
- Released November 2008
- Best practices and guidelines (not mandatory)
- Agreement to adopt recommended measures
- Commitment to report performance data

Exercise – Agenda Setting

- What should we address *tomorrow?*
- What should we address over the *next 6 months?*
- What should we address over the *next 2-3 years?*

Exercise – The 5 “R”s

- Rules & Regulations
- Roles & Responsibilities
- Rewards
- Relationships
- Routines

Exercise – Rules, Roles and Rewards

- Are the policies clear and widely followed with regard to Green ICT? Do all staff know what existing policies apply to different aspects of Green ICT?
- What existing or policies need to change? Are new rules called for? Can certain rules be scrapped or relaxed?
- How would those wishing to adopt Green ICT go about changing the institutional policies?
- How would services, structures and individuals be affected and how would they be likely to respond?
- What sanctions could be applied where policies are not followed?
- Who, within and beyond the institution, has responsibilities in relation to these policies?
- What does the increasing move to Green ICT mean for our institutional structure of incentives, and in particular, how are we going to reward desired behaviour towards these goals?
- Is the current structure of incentives generating the desired behaviours or does it need to be revised? What new kind of rewards would be appropriate to encourage people to engage with this agenda?

Links

- http://www.jisc.ac.uk/whatwedo/programmes/greeningict.aspx - JISC's Greening ICT Programme
- http://re.jrc.ec.europa.eu/energyefficiency/html/standby_initiative_data_centers.htm - EU C of C
- http://www.susteit.org.uk/publications/index.php - for:
  - Suste-IT main report and summaries
  - Best practice reviews for Data Centres, Personal Computing, Printing, Procurement
  - A number of papers written by Grid Computing Now! for the Suste-IT project. Subjects covered include the EU Code of Conduct for Data Centres, Data Centre Cooling and Virtualisation
- http://www.susteit.org.uk/cases/index.php - for 20 case studies drawn from UK HE and FE highlighting good practice and innovative solutions
- http://greenict.jiscinvolve.org/ - JISC's Green ICT Blog
- #greenict - Tag in use on Twitter et al
- http://www.eauc.org.uk/home - The Environmental Association of Universities and Colleges (EAUC)
- http://www.defra.gov.uk/sustainable/government/what/priority/consumption-production/quickWins/index.htm - Buy Sustainable - Quick Wins

Contact

- Rob Bristow
  - Programme Manager (Green ICT)
  - r.bristow@jisc.ac.uk
  - 07825 823 282
  - Twitter: robbristow
  - Blog: http://greenict.jiscinvolve.org/
  - Mailing list: SUSTAINABLE-ICT@JISCMAIL.AC.UK