Green Fields for ICT

Bob Crooks
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Green ICT Lead, Dept Env Food & Rural Affairs
Chair BCS Green IT Specialist Group
CO2 emissions jump!

Global CO₂ emissions from fossil fuel use and cement production per region

In London – London Internet Exchange reports handling 1.5 terabytes per second and doubling in next 6 months!

In Japan

Diagram B: Energy consumption of IT equipment 1993-2010

Source: Ministry of Internal Affairs and Communications (MIC), Japan
Whether or not caused by us ...

- Energy is in short supply
- Materials are in short supply
- Manufacture of ICT and development of ICT services consume both &
  - ICT is growing 2% +, typically 10-15% of a business CO2 footprint
  - Moving to an economy based on value of information...accelerating growth!
  - And Martini expectations!
Some perspectives on IT...

Globally

- Man-made CO2 emissions add up to around 49 billion tonnes pa
  - 1 billion + tonnes from ICT.
- Data storage capacity growing by ~ 40% annually
  - In 2010 we passed the zettabyte mark for stored data
- Worldwide data centres + comms predicted to consume ~ 2zbytes kW-h by 2020

In UK

- 10 million office PCs, nearly 50% of adult population use PCs at work
  - expected to grow to 70% by 2020
- IT consumes 15% of office power rising to 30% by 2020
  - Expect 45% of Domestic Power to be used for home IT and CE products by 2020
  - In total ICT power consumption already represents 10% of total UK energy consumption
    - or 4 Nuclear Power stations!

References: (Berkeley National Labs + Global Action Plan + IPCC + Energy Saving trust + Carbon Trust)
Context – CO2=>Energy=>Cost

• Rising costs
  • UK forecast 15-20% rise in energy prices for 2012
• Carbon getting a value
  • CRC, ETS etc

=> Save CO2, Save energy, Save £/$...
What is Green ICT ...?

*Reducing the environmental impacts of ICT products and services across their lifecycle...*

- Manufacturing
- Delivery/Installation
- Operations
- Disposal /decommissioning at end of life
Green ICT Efficiency Principles

**PRODUCTION & DESIGN**
- Raw Materials
- Manufacture & Assembly
- Transport
- Supply chain Procurement

**OPERATION**
- Power Management
- ICT Usage
- Cooling of ICT
- User Behaviour

**REUSE**
- Re-cycle, Reclaim
- Donate
- Refurbish
- Resell

**DISPOSAL**
- Removal of hazardous parts

Green ICT Efficiency Principles:
- Energy efficient Design Componentisation
- Interoperability
- Build for reuse, not landfill
- Fit capacity to spec
- GBS standards compliant
- Power management
- Consolidate/Virtualise/Share
- Energy efficiency
- Extend Life of ICT
- Cradle to cradle
- Reuse, resell, redeploy
- Asset management
- Removal of hazardous material
- WEEE Directive
But also Green ICT is about ... 

Exploiting ICT to reduce wider environmental impacts ... (the other 98%!)

- Working practices and processes
  - Meetings/travel
  - Resource utilisation
    - space, paper, heating/cooling
  - Ways of working for staff

- Products and services

New Opportunities and Green Fields...
But the storm clouds are gathering!!
Green Fields for ICT
Part 2

Bob Crooks
Green ICT Lead, Dept Env Food & Rural Affairs
Chair BCS Green IT Specialist Group
Greening Government Commitments

- **Cut carbon emissions by 10% in central government**
- **Cut paper use by 10%**
- **Ensure that redundant ICT equipment is reused or recycled**
- **Closed loop paper waste collection and recycling**

**Long term policy goals**

- **Climate change:** cutting UK greenhouse gas emissions by 80% by 2050
- **Waste:** Planning for a zero waste economy
- **Water:** Using water resources sustainably and efficiently
- **Green economy**

**2011**
- Cut carbon emissions by 10% in central government

**2012**
- Cut paper use by 10%
- Ensure that redundant ICT equipment is reused or recycled

**2013**
- Closed loop paper waste collection and recycling

**2014**
- Get Supply chain data

**2015**
- Cut greenhouse gas emissions by 25%
- Cut domestic flights by 20%
- Cut waste by 25%
- Cut water consumption
- Embed Government Buying Standards
- 2015: Cut water by 25%
PLUS...

the Olympics ....

– 50% reduction in Public Sector travel in/out of London including commuting

and cost saving...

– 25% CSR target for the Public Sector by 2013/14
HMG Greening Government ICT Strategy

- Vision
- Actions and Commitments
- Roadmap
- Maturity Model
- Case studies
Structure

UK HMG Green ICT Strategy

- Strategy Statement
- Actions & Commitments

Maturity Model

Roadmap of improving practices

Workbook

Case studies
HMG Strategy for Green ICT

• Vision:

A cost effective and energy efficient ICT estate, which is fully exploited to enable new, more sustainable and efficient ways of working for staff, organisation & customers

See: http://www.cabinetoffice.gov.uk/resource-library/uk-government-ict-strategy-resources
<table>
<thead>
<tr>
<th>Key target outcome</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ICT equipment and services procured using <strong>Government Buying or International Standards</strong> where appropriate</td>
<td>At initial procurement or next refresh point for purchase/lease, GBS applied where available. Where not available international standards for greener electronics applied, with use of accreditation schemes such as (eg EPEAT, or ECMA) to confirm compliance</td>
</tr>
<tr>
<td>2. Decisions to <strong>replace equipment</strong> based on business utility rather than set refresh points</td>
<td>At refresh points, process in place to review whether to refresh equipment, balancing the footprint from continuing to use and support, against the footprint from procuring, installing and running more efficient kit and disposing of the existing devices</td>
</tr>
<tr>
<td>3. <strong>Power consumption</strong> minimised for end user access devices</td>
<td>Energy management strategies in place across ICT Estate encompassing as appropriate - behaviour change - operating system settings - networked automated energy saving tools</td>
</tr>
<tr>
<td>4. <strong>Number of end user access</strong> devices reduced to minimum necessary for business needs</td>
<td>Device intensity reduced through sharing and device reduction initiatives, adopting for example: - device pools - virtual desktop technologies - thin clients - PC hives - VOIP - Soft Phones</td>
</tr>
<tr>
<td>5. <strong>Number of printers and volume of print reduced</strong> to minimum necessary for business needs</td>
<td>Print reduction strategy developed and adopted incorporating - behaviour changes - print settings e.g. duplex - consolidation of print functions e.g. MFDs - technologies for efficiencies e.g. proximity printing, print volume reporting by organisation and individual - settings to reduce use of toner - measures to minimise colour printing</td>
</tr>
</tbody>
</table>
**Roadmap – 14 key areas for improving practice**

<table>
<thead>
<tr>
<th>Area</th>
<th>Description</th>
</tr>
</thead>
</table>
| 6. **Networks audited**, reduced and shared with due regard to resilience needs. | Network infrastructure rationalised and shared  
- Audit existing provisions and resilience arrangements  
- Align networks and remove duplication  
- Match provisions to requirement  
- Power management efficiencies  
- Use shared/cloud based services and migrate to PSN provisions where appropriate |
| 7. Suppliers engaged in monitoring and improving environmental performance of the **ICT supply chain**. | Improved environmental performance of the ICT supply chain through  
- incentivised contracts to deliver greener products, services and innovative behaviours  
- adoption of GBS for product types covered  
- reporting of energy/carbon footprints for products and services |
| 8. Business needs met through **shared applications** hosted in-house, or as services on the web | Existing applications and services and business reqs, are audited and rationalised, those apps and services not required being decommissioning, and new development avoided by sharing those available within organisation and beyond |
| 9. **Applications are virtualised and consolidated** onto fewer servers. | Applications virtualised where appropriate, removing/reducing hardware dependencies, and consolidated onto fewer servers that are loaded to maximum levels of utilisation with due regard to resilience needs |
| 10. **EU Data Centre Code of Conduct** endorser status adopted. | Programme of energy efficiency improvements drawn up and implemented and Endorser status gained under EU CoC for energy efficient data centres and server rooms |
| 11. **Server rooms** are run energy efficiently | The impact of data centres and server rooms on the environment is understood and managed with active supplier engagement continuously seeking efficiencies and reduced impacts. |
12. **Storage capacity** minimised with due regard to resilience and availability needs.

Data storage capacity, deployment and growth is controlled and managed with:
- policies and guidance in place for managing emails and documents,
- use of tiering and compression technologies
- availability of collaboration spaces

13. Minimal levels of land-fill from **disposal of ICT** kit at end of life.

Disposals reduced through policies and practices for re-using and re-cycling ICT kit at end of useful life

14. **Business travel** reductions through adoption of audio, web and video conference facilities, social media and collaboration tools

Engaged with staff and the organisation's Greening Government programme, ICT is being exploited to change individual and organisational ways of working and reduce environmental impacts
& the Service wrap ...

A Maturity Model
1. **Foundation**
   - evidence and intelligence gathering to inform actions, agreed plans
2. **Embedded**
   - committed, initial developments, basic processes in place
3. **Practised**
   - moving forward, repeatable actions to improve
4. **Enhancing**
   - pushing new opportunities, adopting best practice, improving capability
5. **Leadership**
   - taking control, having own vision, optimising performance

Maturity Model structure (1)

- **Managing ICT services**
  - Governance
  - Architectures
  - Capacity
  - Support
  - Information/data
  - Supply chain
  - Disposal
  - Metrics/reporting

- **Managing ICT technology**
  - Utilisation
  - Consolidation
Maturity Model structure (2)

- **Managing ICT change**
  - Investment decisions
  - Running Projects
  - Solution design
  - Procurement

- **Exploiting ICT**
  - Front-line services
  - Travel
  - Resource use
  - Energy reduction
  - Space reduction
  - Reporting
  - Joining up
**Organisation Name:** A N OTHER DEPT

<table>
<thead>
<tr>
<th></th>
<th>Previous</th>
<th>Level attained</th>
<th>Desired</th>
<th>Change on Previous</th>
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<tbody>
<tr>
<td>Managing Services</td>
<td>1.00</td>
<td>1.80</td>
<td>3.80</td>
<td>0.80</td>
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<tr>
<td>Managing Technology</td>
<td>1.00</td>
<td>2.00</td>
<td>5.00</td>
<td>1.00</td>
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<tr>
<td>Changing Services</td>
<td>1.25</td>
<td>2.00</td>
<td>3.75</td>
<td>0.75</td>
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<tr>
<td>Exploiting technology</td>
<td>1.00</td>
<td>2.71</td>
<td>5.00</td>
<td>1.71</td>
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<tr>
<td><strong>Overall FfGIM Score:</strong></td>
<td>1.06</td>
<td>2.13</td>
<td>4.39</td>
<td>1.07</td>
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<tr>
<td>Measurement and Progress reporting</td>
<td>Green ICT Actions</td>
<td>Green ICT Commitments</td>
<td></td>
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<td>-----------------------------------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1st assessment Plans in place to achieve level 3</td>
<td>2nd assessment Initiatives taken to achieve level 3</td>
<td>1. Maturity Model Assessment Level 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Roadmap Identification and achievement of 10 areas for improving practice</td>
<td>3rd Roadmap</td>
<td>2. Achieved 10 areas of improved practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programme to measure ICT energy use</td>
<td>1st ICT footprint &amp; trajectory to 2015</td>
<td>3. Green ICT Energy use standards and reporting against trajectory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2nd ICT footprint</td>
<td></td>
<td>4. Encourage supplier green practices</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3rd ICT footprint Develop &amp; adopt standards for ICT footprints</td>
<td></td>
<td>5. Green ICT Lifecycle</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>6. Energy efficient data centres</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>7. Reuse or donate all surplus ICT</td>
<td></td>
</tr>
<tr>
<td>Greening the ICT Infrastructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GBS embedded in all new contracts</td>
<td>Identify and switch off redundant equipment</td>
<td>8. Green processes &amp; ways of working</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Share and reuse infrastructure and services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EU CoC Endorser status EU CoC Participant status for all new DC services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set up tracking for ICT reuse</td>
<td>Reuse report</td>
<td>9. Green business outcomes &amp; economy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reuse report</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Initiatives taken to increase reuse and donations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exploiting ICT to Green Gov Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implement &amp; exploit collaboration &amp; mobile working technologies</td>
<td>Deploy collaboration &amp; mobile working tools across government</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Best practice sharing across government</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exploiting ICT to Green Public Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilise social media &amp; mobile comms to drive move to online &amp; greener services</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Hampshire Branch
Southampton Solent University
17 January 2012

Green Fields for ICT
Part 3

Bob Crooks
Green ICT Lead, Dept Env Food & Rural Affairs
Chair BCS Green IT Specialist Group
So what are we doing in the Defra?

Making our ICT more efficient..

Started with

• Footprinting...
Defra Network ICT Emissions

- IBM Data Centres: 38%
- Defra Work Spaces: 35%
- Defra Server Rooms/Closets: 27%

18% of total Estates, Bus travel, ICT

(IBM, 2009)
Defra moving forward

• From switching off...
• Printer optimisation (2,200 => 900)
• Apps rationalisation (1,000=>300)
• Server reductions through
  – Virtualisation,
Virtualisation

Advantages of virtualisation include:
- Faster time to deploy new “servers” or to increase resource (CPU and memory) to existing “servers”
- Reduction of data centre space occupied and thus power and cooling resources consumed. Refer to the IBM House of Carbon initiative and the joint Defra and IBM study Cutting the carbon footprint of IT.

Server Virtualization: Where Is It Taking Us?

Before Virtualization …

- Server Sprawl
- Low Utilization
- Synchronous Deployment
- Capacity Planning by Server
- Resource Management by Server
- Disaster Recovery by Duplication
- Management Downtime

… After Virtualization

- Asynchronous Deployment
- Holistic Capacity Planning
- High Availability
- Live Migration
- Centralized Resource Management and Automation
- Disaster Recovery Without Duplication

Gartner

Virtualisation is not a “golden bullet” which can solve every problem!
Making our ICT more efficient, consuming less..

- Virtualisation, reduced servers from 1800 => 1100
- Server rooms cooling
  - Sampson House
  - On site server rooms...
Visibility

Ergon - 6th Floor

- Air conditioning problem after roof works on 10 Jan
- Floor grilles moved by Interserve on 12/13 Feb
- 1st storage device turned off by IBM22 on 2 Feb
- 2nd storage device turned off by IBM25 on 2 Mar

Daily Electricity Use (kWh)

Linear (Daily Electricity Use (kWh))
Track progress...

ICT Carbon Footprint (Daily)

- Rural Payments Agency
- Natural England
- Animal Health
- Core
Not forgetting…

Disposal
**Summaries**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Weight (kg)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of items collected</td>
<td>718</td>
<td>7,249.00</td>
<td>100.00%</td>
</tr>
<tr>
<td>Items reserved for refurbishment &amp; return to client</td>
<td>32</td>
<td>72.00</td>
<td>0.99%</td>
</tr>
<tr>
<td>Items supplied schools /charities under MAR</td>
<td>265</td>
<td>2802.5</td>
<td>38.66%</td>
</tr>
<tr>
<td>Items for commercial sale</td>
<td>380</td>
<td>3667.5</td>
<td>50.59%</td>
</tr>
<tr>
<td>Items of non hazardous waste for material reclamation</td>
<td>27</td>
<td>437.5</td>
<td>6.04%</td>
</tr>
<tr>
<td>Items containing hazardous waste</td>
<td>14</td>
<td>269.5</td>
<td>3.72%</td>
</tr>
<tr>
<td>Totals</td>
<td>718.00</td>
<td>7,249.00</td>
<td>100.00%</td>
</tr>
<tr>
<td>Total weight of items reutilised</td>
<td>677</td>
<td>6,542.00</td>
<td>90.25%</td>
</tr>
<tr>
<td>Total weight of items channelled into waste disposal/material reclamation</td>
<td>41</td>
<td>707</td>
<td>9.75%</td>
</tr>
<tr>
<td>Reclaimed materials from waste items</td>
<td>601</td>
<td>8.29%</td>
<td></td>
</tr>
<tr>
<td>residue of unrecyclable materials - treated by filtered incineration or chemical rendition</td>
<td>106.00</td>
<td>1.46%</td>
<td></td>
</tr>
<tr>
<td>total percentage by weight of materials reused or reclaimed</td>
<td></td>
<td></td>
<td>98.54%</td>
</tr>
</tbody>
</table>

(Your recycling figure) 98.54%
- E-conferencing
  - Audio
  - Video
  - Webinars
- cut business mileage by 33% (19 million miles) since 2005
- over £5 million travel cost saving since 2009/10.
**Natural England**: 2008/10
saving of £1.5m on direct travel
-saving £600k on non-working travel time (less car travel more public transport)

*New ways of working*
Natural England experience – quantify savings...

New ways of working

![Bar chart showing VC, Webinar, and Telecon data from Sep-08 to Sep-10]
In Summary....

ICT for Business efficiency in Defra

• E-conferencing
  • Audio
  • Video
  • Webinars
• Engagement with Defra’s GGC programme
  • Estate reduction
    • Scrunching
    • Consolidation of server rooms
  • Paper reduction
    • E- procurement
    • Web services and publication
• Getting ready for the Olympics, a step change?
• Defra’s Green ICT Network
Hampshire Branch
Southampton Solent University
17 January 2012

Green Fields for ICT
Part 4

Bob Crooks
Green ICT Lead, Dept Env Food & Rural Affairs
Chair BCS Green IT Specialist Group
But what about the individual?
Sustainability just another movie show until it suddenly becomes real
Underpinning need for behaviour changes...

• Need behaviour changes throughout
  – How we use ICT more efficiently
    • Less power
    • Less support overheads
    • Less consumables
  – Using ICT to do things more efficiently
    • Less travel
    • Less paper
    • Less space
    • Quicker, more embracing decision making
=> EXERCISE MORE!

=> Reduce paper

- Shared virtual space => Huddle, Sharepoint
- Collaboration tools => Google docs, Doodle ...
- Take a laptop not a note pad!

=> Reduce travel

- E-conferencing => audio, webinar, video
- Mobile comms => 3G/4G, WIFI

=> Reduce office space

- Work away from the office, on the move, hotel rooms, home
Scheduling – try doodling....!

http://doodle.com/ztudpcmuanux29cg
Some explorations so far...

– Meeting people

• Face to face
• Audio conference
• Web conference
  – Adobe
  – GoToMeeting
  – Webex
  …
• Video conference
• Presence
Web conferencing...

Cisco Webex Meeting Center

For training information, please go to http://university.webex.com.

- Show past meetings
- Show only meetings that require registration

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Host</th>
<th>Duration</th>
<th>Join</th>
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</thead>
<tbody>
<tr>
<td>9:00 am</td>
<td>Abstimmung zum aktuellen Stan...</td>
<td>Robert Zippel</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>10:00 am</td>
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<tr>
<td>10:30 am</td>
<td>KSA BCM</td>
<td>Ioai Khairy</td>
<td>3 hours</td>
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<tr>
<td>10:42 am</td>
<td>jean-paul_lauer74</td>
<td>Jean-Paul Lauer</td>
<td>1 hour</td>
<td></td>
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<tr>
<td>11:00 am</td>
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<tr>
<td>11:01 am</td>
<td>OFMS Review Meeting</td>
<td>Ben Tomblin</td>
<td>7 hours</td>
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<tr>
<td>12:00 pm</td>
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<tr>
<td>12:25 pm</td>
<td>Meeting</td>
<td>Kevin Peronard</td>
<td>1 hour</td>
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<tr>
<td>12:30 pm</td>
<td>Second SIT session</td>
<td>Arshay Silverman</td>
<td>1 hour</td>
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<tr>
<td>1:00 pm</td>
<td>Germany and Maciagnet</td>
<td>Marco Misitano</td>
<td>30 mins</td>
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</tr>
<tr>
<td>1:00 pm</td>
<td>Member Group convention</td>
<td>Jarek Warchol</td>
<td>2 hours</td>
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<tr>
<td>1:00 pm</td>
<td>Riunione preliminare Pre-ias</td>
<td>Ian Nebuloni</td>
<td>2 hours</td>
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<tr>
<td>2:00 pm</td>
<td>Creditsafe Prospect Training</td>
<td>Rachael Marking</td>
<td>30 mins</td>
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https://uk-eval.webex.com/mw0306lc/mywebex/default.do?siteturl=uk-eval
Web conferencing...

Jarek Warchofs meeting

Topic: Trial run for BCS Green SG

Audio Conference

Invite & Remind

Share My Desktop

End Meeting

Presentation to insert name here
Collaboration

• Reaching people
  - SMS
  - Email
    – Committee members simple sharing addresses
    – BCS lists for members, but what a sender address!!
      - qw76@pop3.bcs.org.uk
    – And so set up our own shared webmail box for receiving mails from members
      - greenitsg@bcs.org.uk
  - Twitter
  - SurveyMonkey
Collaboration

– Sharing with people

• Sharepoint
• Google docs
• Huddle
• BCS Member Network
Planning document for joint UEL/BCS Green IT seminar

DRAFT MEETING ANNOUNCEMENT to transplant to Eventbrite

22 March 2011 — an evening seminar at the University of East London in UK Climate Week

A blueprint for ‘green print’ – and paperless reading

Paper publications and documents have long played a key role in business and education – and to be quite realistic, paper and printing are going to be with us for the foreseeable future. But how can we reduce the environmental impact of printing?

In Create, Choose, Waste. The School of Computing IT and Engineering at UEL is coming...
https://my.huddle.net/?ReturnUrl=%2fmyhuddle%2fdefault.aspx
Green Fields for ICT
Part 5

Bob Crooks
Green ICT Lead, Dept Env Food & Rural Affairs
Chair BCS Green IT Specialist Group
And what the UK BCS/CITP is doing...

- Green Specialist Group
  - 1300 members and growing
  - Bulletins/NewShoots
  - Wikispace
  - Events
  - Working groups
  - Education
    - Foundation Certificate, on-line exams
    - A Green IT book ....
Green IT for Sustainable Business Practice: An ISEB Foundation Guide

Mark O’Neill

£24.95 Standard
And more...

- Data Centre SG
  - 2,000 members
  - Leading players for CoC
  - Data centre modelling tool
  - Data Centre Foundation Certificate

- To join a Specialist Group check - [http://www.bcs.org/server.php?show=nav.5815](http://www.bcs.org/server.php?show=nav.5815)
Some web sites...

**Buying Standards**

- The OGC Buying Solutions website: [http://online.ogcbuyingsolutions.gov.uk/bcm/sustainablesolutions/quickwins](http://online.ogcbuyingsolutions.gov.uk/bcm/sustainablesolutions/quickwins)

**Gov strategy**


**General green stuff**

- Carbon Trust, [http://www.carbontrust.co.uk](http://www.carbontrust.co.uk)
- Computing, [Www.Computing.co.uk/greencomputing](http://Www.Computing.co.uk/greencomputing)
- Energy Saving Trust, [www.energysavingtrust.org.uk](http://www.energysavingtrust.org.uk)
- NetRegs, [www.netregs.gov.uk#](http://www.netregs.gov.uk#)

**BCS Green IT Specialist Group**

[http://www.bcs.org/](http://www.bcs.org/)

**PAS standard**


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The Chartered Institute for IT
Switch on and use IT!

=> Eat less,

=> Exercise more

  => Become an Olympic athlete!

And it all helps...
Clear the clouds!