

Can we address the Environmental Impact of ICT?

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John Booth

- MD Carbon3IT Ltd
- Technical Director National Data Centre Academy
- Vice Chair BCS Green IT SG
- BSI TCT7/3 Committee EN 50600 Data Centre Standards
- EU Code of Conduct for Data Centres (Energy Efficiency)
- Data Centre Alliance Chair SIG Data Centre Energy Efficiency & Committee Member Sustainability
- DCD CEEDA (Certified Energy Efficient Data Centre Award) Global Lead Assessor
- ISO 50001 Energy Management Systems Lead Auditor
- ISO 22301 Business Continuity Management Systems Lead Auditor
- Energy Saving Opportunities Scheme (ESOS) Lead Assessor Energy Management Association
- Certified Data Centre Audit Professional (CDCAP[™])
- EU H2020 Projects
 - PEDCA Pan European Data Centre Academy
 - EURECA Green Procurement for Public Sector Data Centre
 - CATALYST Data Centres as Flexible Energy Hubs (Renewables, Grid & Heat Services)
 - ECO-Qube AI AC Close Control in "Edge" Data Centres



Agenda

- The 3 Parts of ICT \checkmark
- Elements \checkmark
- eWaste \checkmark
- \bullet Impact of Rising Sea Levels and why this is important! \checkmark
- Data Centres \checkmark
- Impact of Lockdown 1 (March July 2020) \checkmark
- Addressing ICT Environmental Impact \checkmark
- Mitigation Actions ✓
- COP26 ✓
- Summary & Close



Doggerland!





Conclusion, is IoTr truly sustainable?

hydrogen 1

With thanks to materials innovation!

Elements Employed in Silicon Tech'







key: atomic number symbol atomic weight (mean relative mass)





With thanks to: Prof R Lanyon-Hogg & the National Geological Society



Rare Earths









South African Gold/Diamond Mining 1900s



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ICT Materials

- •For PC's
- •240kgs of fossil fuels
- •21lbs of chemicals
- •1500 Litres of Water
- •1000 Different materials
- •FOR ONE PC.
- •In 2009, 367.8 million PC's were manufactured.
- •And that in 2008, the number of PC's on the planet exceeded...
- •1 billion units.
- Totals
- •Fossil Fuel 240 Billion Kgs
- •Chemicals 22 Billion Kgs
- •Water 1500 Billion Litres



ICT Materials

- •For Servers (x3)
- •27,282,000 in use 2009
- •Fossil Fuels 625.5 x 27,282,000 =
- •Chemicals 64.53 x 27,282,000 =
- •Water 3,150 x 27,282,000 =

17,064,891,000 Kgs 1,760,507,460 Kgs 85,938,300,000 Kgs/Litres

•Total Fossil Fuels used in Computing to date = 241,323,304,572.50Kgs or
•24.1 Billion Tonnes (estimated)

•Total amount of fossil fuels to produce the 1Billion Desktops and 27 Million Servers to date would run Drax for...

• 2400 Years.

•NB Drax provides 7% of UK Generation Capacity











•Studies conducted at Chinese, Indian, Nigerian and Ghanaian e-waste sites found large concentrations of heavy metals and organic contaminants such as PBDEs, PCBs and polycyclic aromatic hydrocarbons (PAHs)in the air, in dust, soil, vegetation and in the blood of workers and residents on and in the vicinity of the sites

https://www.sciencedirect.com/science/article/pii/S0160412019340012





1. Temperature exchange equipment:

more commonly referred to as cooling and freezing equipment. Typical equipment includes refrigerators, freezers, air conditioners, and heat pumps.



4. Large equipment:

typical equipment includes washing machines, clothes dryers, dishwashing machines, electric stoves, large printing machines, copying equipment, and photovoltaic panels.



2. Screens and monitors:

typical equipment includes televisions, monitors, laptops, notebooks, and tablets.



5. Small equipment:

typical equipment includes vacuum cleaners, microwaves, ventilation equipment, toasters, electric kettles, electric shavers, scales, calculators, radio sets, video cameras, electrical and electronic toys, small electrical and electronic tools, small medical devices, small monitoring, and control instruments.



3. Lamps:

typical equipment includes fluorescent lamps, high intensity discharge lamps, and LED lamps.



6. Small IT and Telecommunication equipment: typical equipment includes mobile phones, Global Positioning System (GPS) devices, pocket calculators, routers, personal computers, printers, and telephones.



•The Global E-Waste Monitor 2020 reports a record 59 tons MTonnes of ewaste, and predicts a rise to 81 tons Mtonnes by 2030.

•<u>https://www.techrepublic.com/article/global-e-waste-is-up-21-in-5-years-causing-serious-environmental-harm/</u>



eWaste





Doggerland!





30/09/2020



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Firstly, what is a "Data Centre"?

- A home for "digital infrastructure"
- Servers, Networking & Storage
- An electrical system to provide "electrical energy"
- A cooling system?
- An Uninterruptible Power Supply (UPS) & Generators
- Telecommunications/Network Cabling Systems
- Building Integrity Systems
 - Fire/VESDA/Suppression Systems
 - Security
 - Access Control
- Policies, Procedures & Processes







To Deliver...

• "Digital Services" to....

Internal &External Customers

•At the "lowest possible cost"

•Based on "Risk Profile"



•Logo http://ictanddigitalstrategy.org.uk/2014/08/delivering-digital-services/



Definition "Data Centre"

•For the purposes of the Code of Conduct, the term "data centres" includes all buildings, facilities and rooms which contain enterprise servers, server communication equipment, cooling equipment and power equipment, and provide some form of data service.

• (e.g. large scale mission critical facilities all the way down to small server rooms located in office buildings).





Climate Change Agreement "Data Centres" Definition



•A facility belongs to the standalone data centres sector if the business activity is the leasing or licensing of a data facility which is being used as a data centre.

• "data facility" means a room, or rooms sharing the same electricity supply circuit, occupied mainly or exclusively by computer equipment which is enabled to transfer data electronically, and where in respect of the room or rooms:

•(a) the temperature and humidity is regulated in connection with the operation of the computer equipment;

•(b) the electricity supply is at least 200kW; and

•(c) electricity is supplied by a back-up electricity supply when the mains supply is interrupted. (e.g. large scale mission critical facilities all the way down to small server rooms located in office buildings).



The "Edge"



Carbon³17

Data Centre Energy & Environmental Impact

•Energy

- •UK Commercial Energy Use 0.8%
- •UK "Hidden" Energy Use 12%
- •UK Energy Gap
- •UK 14GW (Nuclear/Coal) Decommissioned by 2032
- •UK "Net Zero" Ambitions
- •UK Energy Imports 10%
- •Brexit

- Environment
- Land Use
- ICT Embodied Energy
- Transport Energy
- Rare Earths Mining Impacts
- eWaste Human Health
- eWaste Soil Contamination

Carbon¹Did lockdown affect Energy Use?

• Traditional TV pickups made a comeback

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- "During 'peak lockdown' from late March to mid-May, it's safe to say that more of us were sitting at home than ever in UK history; and many of us watched specific programmes in 'real time', when they were actually broadcast. Boris Johnson's speech to the nation on 10 May drew in a staggering 27.5 million viewers, while on 5 April the Queen's address attracted 24 million people.
- Our colleagues at National Grid ESO saw how these big viewing figures impacted electricity usage, for example with a 500-600MW pickup at the end of the Queen's address. This is equivalent to 300,000 people heading into the kitchen afterwards to make a cuppa.



Did lockdown affect Energy Use?

• Clap for Carers caused spike in demand





• Lockdown Lie-ins: morning peak moved later



Carbon¹Did lockdown affect Energy Use?

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• Drastic drop in demand is now returning to new normal



Carbon¹Did lockdown affect Energy Use?

- Traditional TV pickups made a comeback
- Clap for Carers caused spike in demand
- Lockdown Lie-ins: morning peak moved later
- Energy Gap

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- Brexit WILL affect European Interconnectors (ESM)
- 10% UK Total Capacity
- 14GW Nuclear/Coal will be Decommissioned by 2032



Net Zero!

 The UK's 2050 net zero target — <u>one of the most ambitious</u> in the world — was recommended by the Committee on Climate Change, the UK's independent climate advisory body. Net zero means any emissions would be balanced by schemes to offset an equivalent amount of greenhouse gases from the atmosphere, such as planting trees or using technology like carbon capture and storage



CCC Progress Report July 2019

Climate change adaptation is a <u>defining challenge</u> for every <u>government</u>, yet there is only <u>*limited evidence*</u> of the *present UK Government*# taking it <u>*sufficiently seriously.*</u>

• # Previous "hung" parliament

• Ref: <u>https://www.theccc.org.uk/wp-content/uploads/2019/07/2019-Progress-Report-Summary.pdf</u>



CCC Progress Report July 2019

- It is time to act. Next year may see the UK host the most important global climate summit since Paris in 2015. Our credibility in the COP26 Presidency rests on real action at home.
- The Adaptation and Mitigation Committees have reviewed the UK Government's approach to climate change adaptation and emissions reduction. Our reports are published in parallel, as required under the Climate Change Act.

 We find a substantial gap between current plans and future requirements and an even greater shortfall in action.





- Do YOU need the latest mobile phone?
- Do YOU need the latest gadget?
- Digital Detox
- Implement "Green IT" concepts into Workplaces
- Use "Refurbished IT" & "Recycle"
- Ask Questions!



- The EUCOC covers...
- Data Centre Utilisation, Management & Planning
- IT Equipment & Services
- Cooling
- Data Centre Power Equipment
- Other Data Centre Equipment
- Data Centre Building
- Monitoring
- Practices to become minimum expected
- Items under consideration





Mitigation Actions BS EN 50600 Series



EUROPEAN STANDARDS ORGANIZATIONS

Data Centre, Design, Build & Operate Standards



Design & Build



BS EN 50600 Series (ISO22237) as Technical Specifications

BS EN50600 -1 General concepts BS EN50600 -2-1 Building Construction BS EN50600 2-2 Power Distribution BS EN50600 2-3 Environmental Control BS EN50600 2-4 Telecommunications Cabling Systems BS EN50600 2-5 Security Systems

CLC EN 50600 TR-99-1 – EUCOC CLC EN 50600 TR-99-2 – Sustainability Guidance



Operations



- ISO 9001 Quality Management Systems
- ISO 14001 Environmental Management Systems
- ISO 50001 Energy Management Systems
- ISO 27001 Information Security Management Systems
- ISO 22301 Business Continuity Management Systems

EN50600 Series (ISO22237 Technical Specification)

EN50600 3-1 Operational & Maintenance



Catalyst





CATALYST aspires to turn data centres into flexible multi-energy hubs, which can sustain investments in renewable energy sources and energy efficiency. Leveraging on results of past projects, CATALYST will adapt, scale up, deploy and validate an innovative technological and business framework that enables data centres to offer a range of mutualized energy flexibility services to both electricity and heat grids, while simultaneously increasing their own resiliency to energy supply.





WWW.PROJECT-CATALYST.EU





HTTPS://ROADMAP.PROJECT-CATALYST.EU



COP 26

1st – 12th November 2021

Glasgow, Scotland

BCS Green IT/HQ Call 3rd February

https://ukcop26.org/



Summary

Pandora's Box is OPEN

Organisations RESPOND to consumer pressure

Extend that phone contract without upgrade

Do a "Digital Detox"

Think about your digital storage (photos etc)



Thank You



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