



# ICT and climate change: shifting the emphasis

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Stephen Young

[www.ICTandclimatechange.com](http://www.ICTandclimatechange.com)



# Agenda

1. The size of the challenge, and the policy response
2. ICT players: victims, villains or heroes?
3. De-coupling, de-materializing, de-carbonizing
4. ICT & energy: a carbon cost benefit analysis
5. Conclusions
6. Discussion

# Stephen Young: biography

- [www.ICTandclimatechange.com](http://www.ICTandclimatechange.com), 2007: Founder
- Ovum, Principal Analyst, 1996 to date
  - Author of Ovum reports on international telecoms, data centres, bandwidth explosion; devised Wholesale@Ovum; column in Capacity magazine, media and conferences; Ovum Thought Leader on ICT and climate change
- Mercury Communications Ltd: Manager, Public Policy: 1990-1996
  - Main contact with DG XIII and UK stakeholders
- Electricity Consumers' Council: Communications and Research
  - Influencing the debate on UK electricity privatisation and regulation
- Economics lecturer 1983-1987; 2007-
  - Focus: the state and the economy, regulation, public policy



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# EU goals and policies

- EU 2020 goals:
  - 20% reduction in EU greenhouse gas emissions, cf 1990 levels, or 30% if other developed nations agree to take similar action
  - renewables to rise to 20% of all energy consumed, with flexibility in how each country contributes to the overall EU target
  - 20% increase in energy efficiency
  - biofuels: 10% of all fuel used in transport
  - energy policy for EU aimed at capping change at 2°C
- Action plan for 2007-9:
  - Energy efficiency and renewable energy: making transport, electrical appliances & buildings more energy efficient; national action plans with targets for renewables in power generation and heating, and biofuels in transport; improvements to EU emissions trading system.
  - Energy technology: funding for research to bring down price of renewable energy and low-carbon technology; new ways to increase energy efficiency; plans to stimulate construction of 12 plants to demonstrate sustainable fossil fuel technologies, e.g. carbon capture

# Stern Review et al: a partial take on technology

- Stern says greenhouse-gas emissions can be cut in four ways. Costs will differ depending on which combination of methods & which sector:
  - 1) Reducing demand for emissions-intensive goods and services
  - 2) Increased efficiency, which can save both money and emissions
  - 3) Action on non-energy emissions, such as avoiding deforestation
  - 4) Switching to lower-carbon technologies for power, heat and transport
- Policy to cut emissions needs three essential elements:
  - 1) Carbon pricing
  - 2) Technology policy
  - 3) Removal of barriers to behavioural change

But, what about ICT?



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# Victims, villains or heroes?

- Victims
  - ICT company activities affected by increasing number of severe weather events, especially telcos
- Villains
  - producing GHG emissions which add to global warming
- Heroes
  - ICT to reduce climate change in other industrial and domestic sectors: de-materialising and de-carbonising the economy

# ICT players as victims of climate change

- Climate change means an increased risk of service disruption to network infrastructures: energy, transport and telecommunications. Many telcos already suffering effects of global warming, due to frequent severe weather effects.
- Examples:
  - Cable & Wireless - Hurricane Ivan, hit the Caribbean in 2004 and resulted in exceptional operating costs of £18m relating to business and network restoration, plus a £3m fixed asset write-down.
  - BT - said that severe weather systems resulting from climate change had already caused substantial damage to BT's UK operations and cost the company money, with the situation only set to get worse.
  - 'The gales last winter followed Scotland's wettest summer on record. This meant we experienced numerous cable faults, overhead cables down and a whole car park full of vehicles ruined by floods'.
- Climate change means that there will be a lot more of this, even in temperate zones

BT chief executive Ben Verwaayen, June 2005

# ICT players as villains of climate change

- Energy is used by ICT players:
    - to power telecom networks, servers, routers
    - to heat and cool buildings
    - to protect equipment
    - as petrol and diesel for transport.
  - NB: telecoms is less energy-intensive than many other industries
    - Telecoms: 0.82% of total costs are energy; 2.29% of total UK output
    - Electricity production & dist: 16.07% of total costs are energy; 1.08% of UK output
    - Banking and finance: 0.27% of total costs are energy; 4.05% of UK output
- Source: Stern Review
- Many telcos are implementing specific actions to reduce their carbon emissions – and save money

# ICT is evolving

- Moore's Law => more and more computing power crammed into ever smaller spaces. Heat load increases.
- A PC uses 280 watts; there are 5 million PCs in the UK public sector alone
- More home PCs are being left on 24x7 with broadband connections
- Moving to thin client architectures cuts processor power requirements overall, and reduces the obsolescence of desktop equipment creating a virtuous circle. But: will users accept the loss of "personal computing"?
- Data centres use as much power as a small town and back up power supplies often run in standby mode

# ICT is converging, e.g. infotainment

- In Japan & Denmark, energy consumption from appliances in stand-by mode = c10% of total residential energy consumption, ie phone chargers, DVD players, set-top boxes, TVs...
- In 2005, UK consumer electronics products used the energy equivalent of 5 power stations
- “Leaving devices like TVs and DVD players on standby at home puts up to 1m tonnes of carbon into the atmosphere, and costs households £25 each year”  
John Healey, Financial Secretary to HM Treasury
- Set top box = c1.5% of home electricity use
- June 2006, Treasury and UK DEFRA officials met electrical retailers to press for energy efficiency standards for consumer electronics “brown goods”, similar to white goods like fridges

# More Internet => more data centres => more power

## US data centres:

- 2000 - 5.6m servers; 2005 - 10.3m servers
- Electricity consumption = approx 5x1000 MW power stations (cost \$2.7m)
- Or 0.6% of US electricity consumption, rising to 1.2% including data centre auxiliary infrastructure equipment, network and cooling gear; equivalent to all colour TVs in the United States.

## Worldwide data centres:

- 2000 – 14.1m servers; 2005 - 27.3m servers
- Electricity consumption = approx 14 x 1000 MW power stations (cost \$7.2m)

## Drivers:

- Volume of servers: increasing numbers of cheap, low end servers
- Volume growth = approx 90% of increased power, cf energy per unit up by only 5-8%

Source: Data centre power use doubles 2000-2005, J Koomey, Lawrence Berkeley National Labs/AMD, Feb 2007

# ETNO: environmental benchmarks

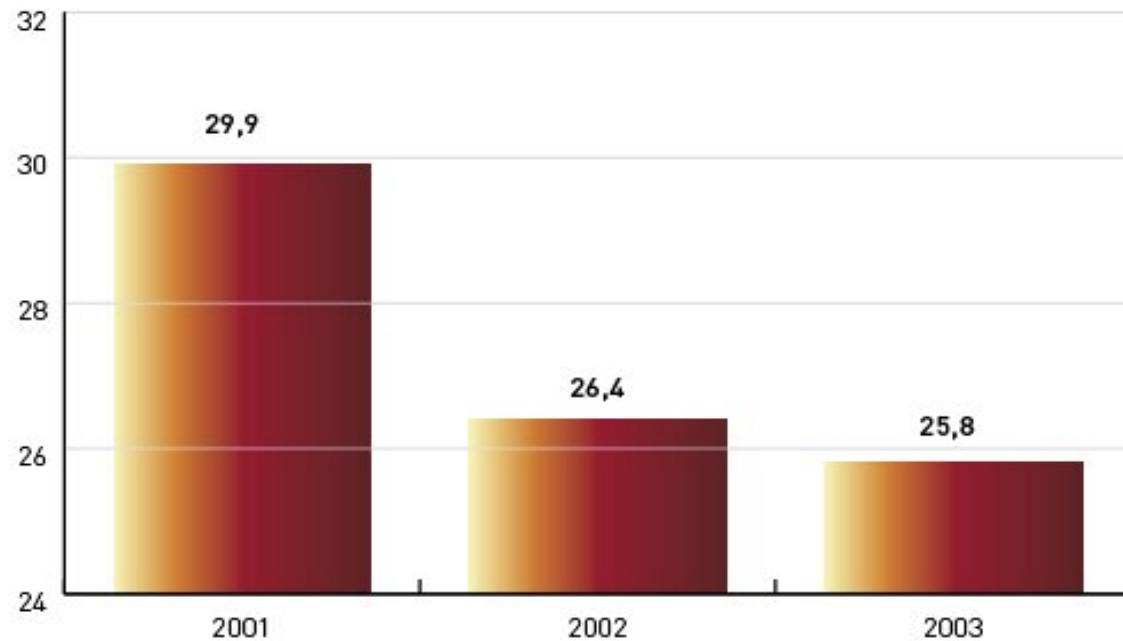
- The European Telecommunications Network Operators (ETNO), the trade association, for Europe's telcos, and its voice in Brussels. Membership: 41 of Europe's largest telcos in 34 countries. Main policy link between EU and European telcos
- ETNO launched its Environmental Charter in 1996, signed by 25 telcos. Share best practice to achieve continuous environmental improvement in daily business operations and relations with suppliers.
- September 2004 ETNO Sustainability Charter calls on signatories to review overall company policy to implement sustainable growth with commitment to sustainable development via:
  - sustainable provision of products and services
  - integrating business activities with environmental, social, and economic responsibilities - minimising, where practicable, any negative impact these activities may generate.
- At launch date, 16 European telcos committed to the new charter: BT, Cesky Telecom, CYTA, Deutsche Telekom, France Telecom, KPN, Maltacom, MATAV, Portugal Telecom, Slovak Telecom, Swisscom, Telecom Italia, Telefonica, Telekom Austria, Telenor and TeliaSonera; more expected to join.
- ETNO has now set up a project 'Climate Change - challenge for the telecom sector', under its Environment Charter to establish best-practice guidelines to help participating companies measure, reduce and report on their greenhouse gas emissions  
Joint ETNO/WWF Report, Saving the Climate @ the Speed of Light

# How are telcos doing?

Grams of CO<sub>2</sub> per unit of turnover (25 ETNO members)

CO<sub>2</sub> Emission Indicator

Europe's telecoms operators reduced their overall CO<sub>2</sub> emissions by 7% and emissions per unit turnover by 14% from 2002-2004



Source: ETNO *Accountability in Connectivity*, 2005

# Example: BT

- Reducing its own footprint
- Influencing customers and suppliers to reduce their footprints (e.g. carbon calculator)
- Engaging with employees to help reduce their personal footprints
- Supports Kyoto with target to reduce its 1996 footprint by 25% by 2010 (achieved a 60% reduction)
  - BT has now pledged to reduce its footprint by 80% from the 1996 figure by 2016.
  - BT needs to:
    - reduce emissions in its data centres
    - use 100% renewable energy,
    - reduce emissions from its fleet and reduce travel emissions through smarter travel/greater use of technology.
- BT pledges on procurement principles for all new contracts with suppliers:
  - to harness the capability, diversity and innovation of the supply base to add value to the business and encourage suppliers to offer solutions which have a reduced environmental impact
  - energy consumption and environmental impact of a product or service (from manufacture, through usage, to disposal) will be a mandatory criterion in tender adjudication
  - energy consumption and environmental impact of any replacement product or service (from manufacture, through usage, to disposal) is required to be less than its predecessor

# Example: BT

- BT consumes 0.7% of the UK's electricity consumption
- BT has extended its Green Energy contract until 2010. Saves BT equivalent carbon as 300,000+ households a year
- BT pledges:
  - continue cutting carbon emissions. Already reduced emissions by 60% between 1996 and 2006. Now aims to extend that to 80% by 2016
  - review energy supply, including exploring potential of wind power
  - audit energy consumption of its data centres
  - influence its supply chain to produce lower carbon-emitting products
  - influence customers by proposing lower carbon solutions
  - engage with workforce (104,000) to reduce personal carbon footprints and empower them to influence their local communities
  - recognizes the potential of networked IT services in reducing CO2 by cutting down on unnecessary travel: more than 80% of BT staff already work some or all of the time from home thanks to broadband
- BT's teleconferencing business is fast growing

# Example: Deutsche Telekom

- Energy consumption: 2,973 GWh (2004)
- One of Germany's largest energy users, => c1.6m tons of CO2
- Buys energy from CHP stations, gas power plants and renewable energy sources to avoid CO2 emissions and cuts link between energy consumption and CO2
- DT's goal: halving CO2 emissions by 2010 (cf 1995), by purchasing electricity from renewable sources: financed by some of the savings from measures to reduce the level of energy consumption

# Example: Sky

- First carbon-neutral media company
- Lowered site-related CO2 emissions by 47%
- Reduced power consumption of set top boxes
- Purchases the majority of energy from renewable sources.
- Offsets emissions that are at present 'unavoidable'.
- Cutting emissions, via energy efficiency & reduced travel = sound financial sense  
"no conflict between addressing climate change and good business practice."
- Now seeking opportunities to increase energy efficiency in creative ways
- Ensuring that new products use energy intelligently
- Encouraging employees to be energy efficient in the workplace, and at home
- Working with suppliers to influence their energy performance
- Inspiring and supporting customers: commitment to engage Sky's customer base of 8m+ with practical/inspiring ways to get informed about energy use

# ICT players as heroes of climate change

- ICT is helping dematerialize and potentially de-carbonise the economy
- Reducing travel, through providing services such as:
  - tele-and video-conferences
  - teleworking/telecommuting
  - Internet services such as e-commerce, e-government and distance learning
  - coming up with new ways, as yet undreamed of, to help other sectors minimise climate change emissions
- The move from narrowband to mass market broadband gives the Internet levels of diffusion, acceptance and functionality that will enable it to be potentially disruptive.
- Two developments, both still ongoing, have accelerated this tendency:
  - for corporate users, IP in the enterprise
  - for domestic users, broadband becomes a mass market service

# ICT players as heroes: case studies

- Video conferencing - if 20% of business travel in Germany alone was replaced by non travel solutions , e.g. video conference: SAVING 5.2 m tonnes CO2
- Audio-conference calls If we replaced travel with 100 million audio conference calls: SAVING 2.2 m tonnes CO2
- Flexi-work If we got 100 million flexi workers: SAVING 2.87 m tonnes CO2
- Online billing 100 million customers received online phone bills: SAVING 109,100 tonnes CO2
- Web-based tax-return If 100 million web based tax returns were sent out: SAVING 101,400 tonnes CO2

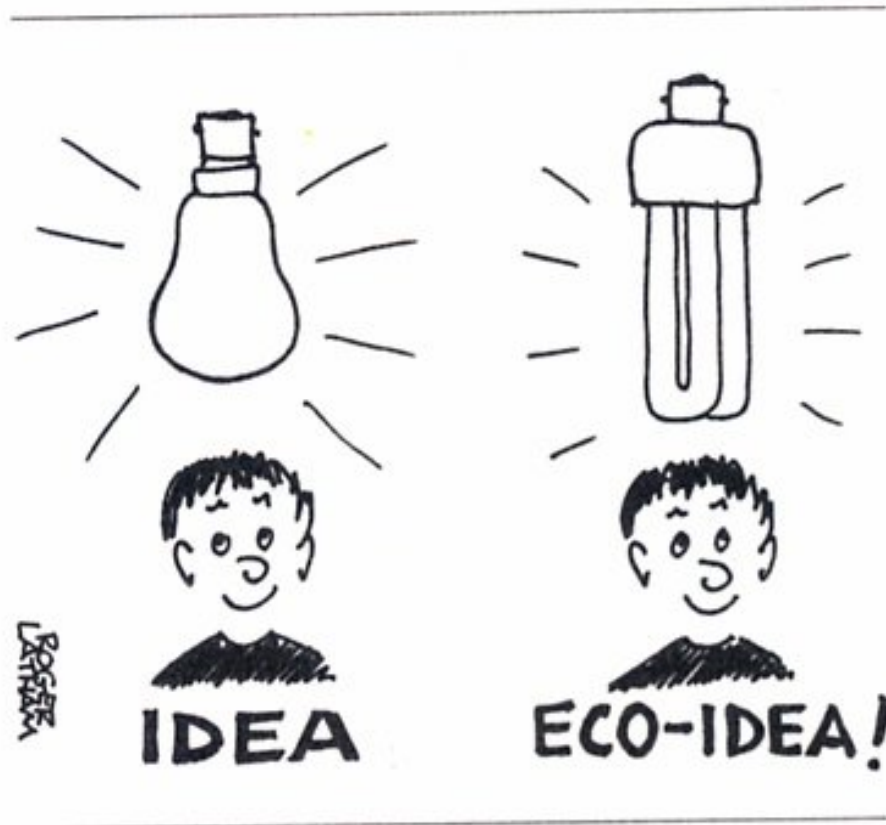
Based on third party verified project results that have been implemented on a small scale by ETNO members



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# Dematerialization: ICT to cut material & energy use



Private Eye, March 2007

# Digitalization and de-materialization

“All that is solid melts into air”

Karl Marx & Frederick Engels, Manifesto of the Communist Party, 1848

“We are moving from atoms to bits...we are not waiting on any invention. It is here. It is now. It is almost genetic in its nature, in that each generation will become more digital than the preceding one.”

Nicholas Negroponte, Being Digital, 1995

“...the weight of current economic output is probably only modestly higher than it was a half century ago, value added, adjusted for price change, has risen well over threefold....Radical transformations in what we produce in the way of goods and services and how we produce them occur perhaps once or twice in a century, at most.”

Alan Greenspan, Federal Reserve Board Chairman, 1996

# Digitalization and de-materialization

- Concepts and ideas substitute for physical resources and human brawn in the production of goods and services:
  - How many standard economic activities can be made weightless and/or frictionless?
  - Of those that can, what fraction will?
  - How will business and consumer behavior change when they do?
  - How will those changes affect energy consumption?
- Examples
  - transistors replace vacuum tubes
  - fibre optics replace copper wire
  - buildings: more floor space, less physical material
  - word processors: less effort to produce a manuscript
  - steel mills run by computers
  - answer phones replaced by voicemails
  - CDs (and DVDs) replaced by downloads, etc



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# Decoupling energy and GDP, USA

- 1950s-1970s: energy and GDP grow together
- 1973/4: Arab oil embargo breaks the link
- 1973-1986: GDP up 35%, energy use static
- 1992-1996: GDP up 3.2%pa, energy use up 4.2% pa
- 1996-2000: GDP up 4.2%pa, energy use up 1.5% pa
- 1997 & 1998: GDP up 9%, energy intensity down 7.6%
- 1999 & 2000: energy intensity down c4% in total
- 2001: energy intensity drops c2.5% (est)

# Internet + new economy $\neq$ more energy

- In making business more efficient, information technology is reducing the energy and materials needed for each \$ of output - often dramatically - and increasing overall productivity
- The Internet stands to revolutionize the relation between economic growth and the environment. Increasingly, the Net itself is being used to manage energy use directly
- US energy demand growth has slowed substantially since the start of the Internet boom
- “The Internet is the cause for rising energy demand in the US” is a myth: demand would be much higher without Internet savings

Source: Joseph Romm, *The Internet and the New Energy Economy*, 2002

# The internet = a new energy economy

“the internet economy could fundamentally and permanently alter the historic relationship (between economic growth and energy intensity) allowing faster growth and with less energy use than seen in the past...generating both structural and efficiency gains”

- Reasons for reducing energy intensity (in USA):
  - 33-50% due to structural economic changes (ie shift out of energy intensive industries)
  - 50-66% due to increased energy efficiency in other sectors

Source: Joseph Romm, The Internet and the New Energy Economy, 2002

# Carbon cost-benefit of ICT: it's positive

- ICT => in the US, a transition toward a "digital society" that may profoundly affect electricity supply, demand and delivery.
- Rand Corporation: four 20-year scenarios of ICT evolution (2001-2021) for the US Department of Energy covering implications for future US electricity requirements:
- increased power consumption by ICT equipment is the most direct and visible effect, but not necessarily the most important.
- the effects that ICTs have on energy management, e-commerce, telework, and related trends likely to be much more consequential
- even large growth in the deployment and use of digital technologies only modestly increases US electricity use in next two decades
- biggest energy concern for a digital society: how to provide higher-quality and more-reliable power demanded by ICTs

Source: Walter S. Baer, Scott Hassell, Ben A. Vollaard, Electricity Requirements for A Digital Society, RAND Corporation, 2002



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# The role of ICT: shifting the emphasis

ICT =

- 40% of Europe's productivity growth
- 25% of GDP growth

“National ICT helps drive economic development”

Source: GeSI Progress Report, 2005

Now it's time to use ICT to

- improve energy efficiency across the EU
- support sustainable development as a technological base for other sectors of the economy
- reduce GHGs within the ICT sector and the rest of the economy



# Conclusion

“With regard to climate change, ICT is part of the solution, and not the problem”

Source: GeSI Progress Report, 2005

“The IT, media and telecoms companies have a unique opportunity and responsibility to realise the eco-efficiency and social benefits of their technologies...”

Source: Peter Johnson, How can the IT and telecoms sector contribute to the EU sustainable development strategy, 2006

For ICT market players, helping to reduce the impact of climate change in a world where carbon is priced will be a major business opportunity

Source: [www.ictandclimatechange.com](http://www.ictandclimatechange.com), 2007

[www.ICTandclimatechange.com](http://www.ICTandclimatechange.com)



# Next steps

- Reducing energy intensity across the economy: a process of evolution?
  - leave it to the market
  - services and solutions from ICT players
- Or
  - a role for policymakers: to encourage, facilitate, incentivise...
  - the importance of leadership
  - and, finally: do as I do, not as I say – the personal does matter...



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# Thank you

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[www.ICTandclimatechange.com](http://www.ICTandclimatechange.com)

PO Box 5208, Hove, BN52 9JZ, UK

t: +44 845 094 5581

e: [youngsry@gmail.com](mailto:youngsry@gmail.com)