The Role of ICT for Energy Efficiency

ICT-ensure

TU Graz
Graz University of Technology

Oct. 9, 2009

Klaus Tochtermann

Context

eCanDo EIT KIC Energy Proposal

Supportive Action ICT-ENSURE
www.ict-ensure.eu

Project Number 224017
Call identifier: FP7-ICT-2007-2

Expert Studies on ICT and

- Health
- Biodiversity
- Climate Change
- Natural Resource

Expert Study: The Role of ICT in Energy Consumption and Energy Efficiency

Lorenz M. Hilty, Vlad Coroama, Margarita Ossés de Eicker, Thomas F. Ruddy, Esther Mülle, Technology and Society Lab ; Empa, St.Gallen, Switzerland 2009; www.empa.ch/tsl

© Know-Center 2009

Perspective of the EC

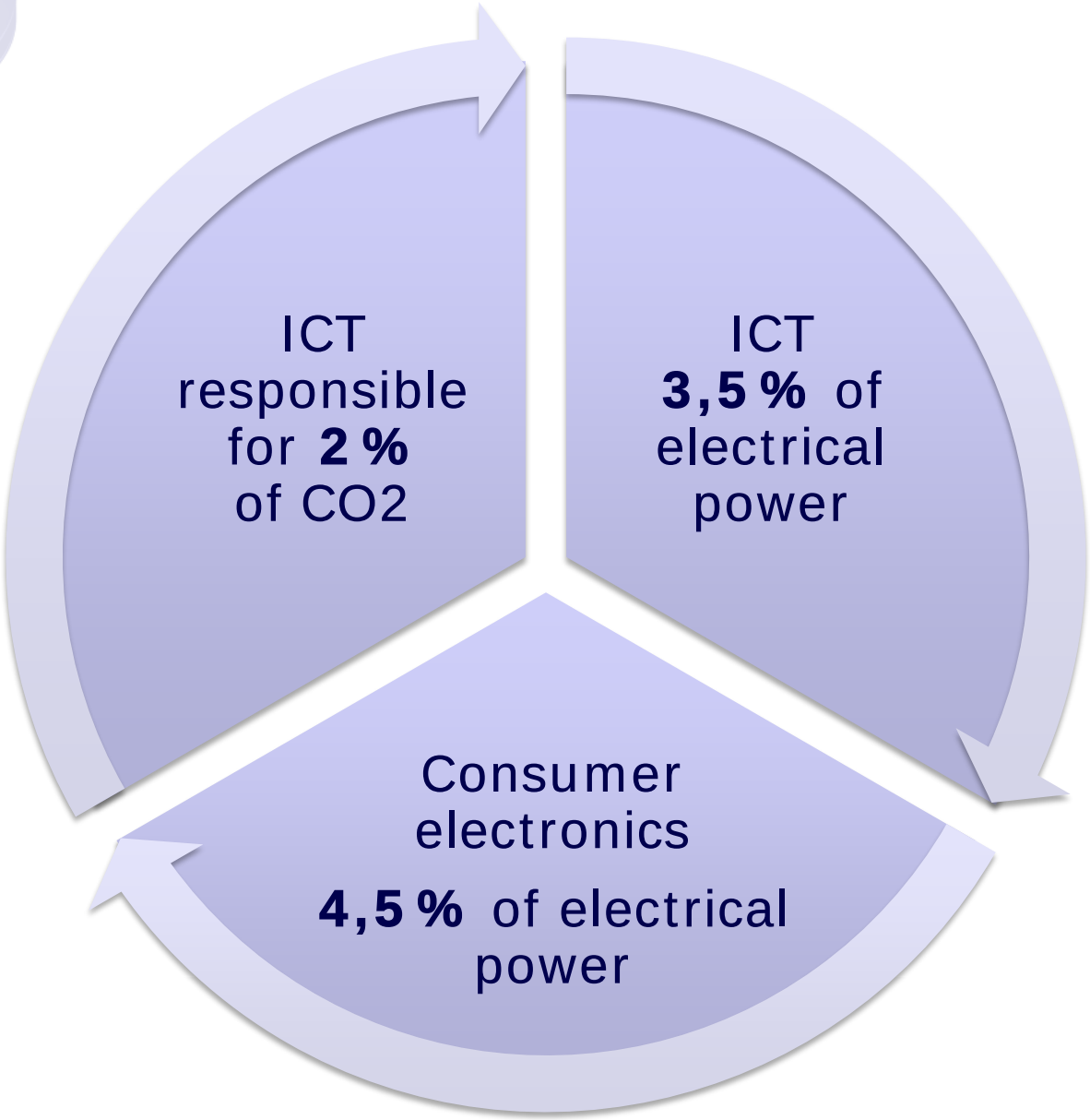
The continued growth of the European economy needs to be **decoupled from energy consumption** ...

Indeed if nothing were to change, final energy consumption in the EU is predicted to **increase up to 25% by 2012**...

ICT have an important role to play in reducing the energy intensity and increasing the energy efficiency of the economy

© Know-Center 2009

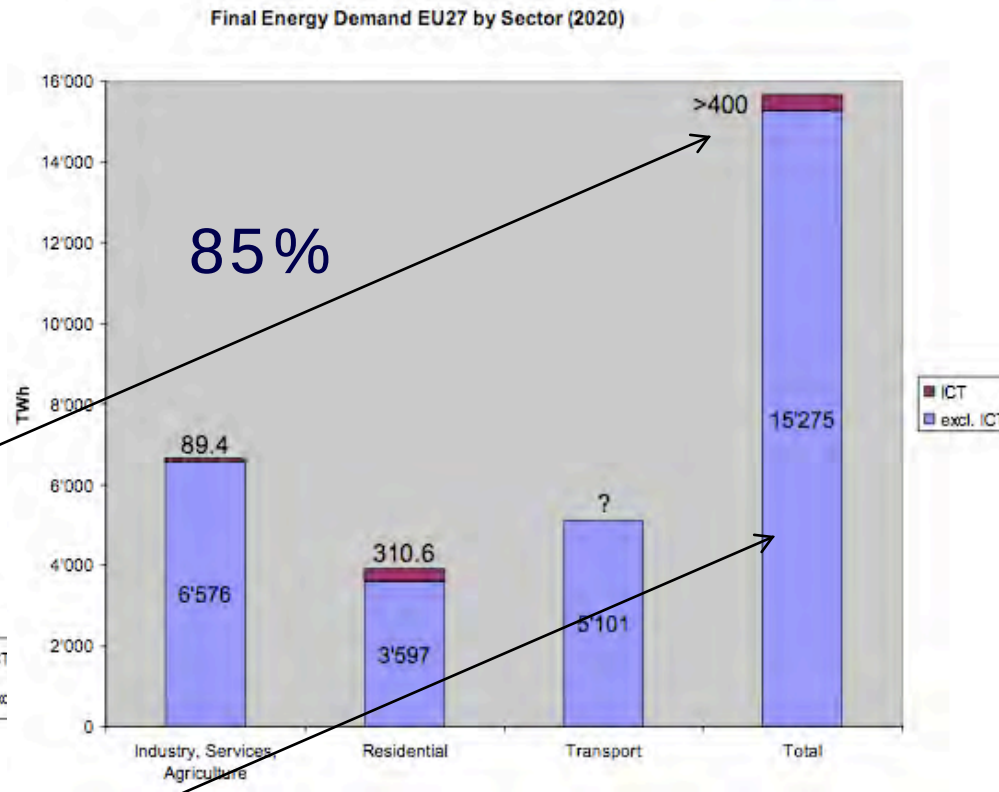
Facts



© Know-Center 2009

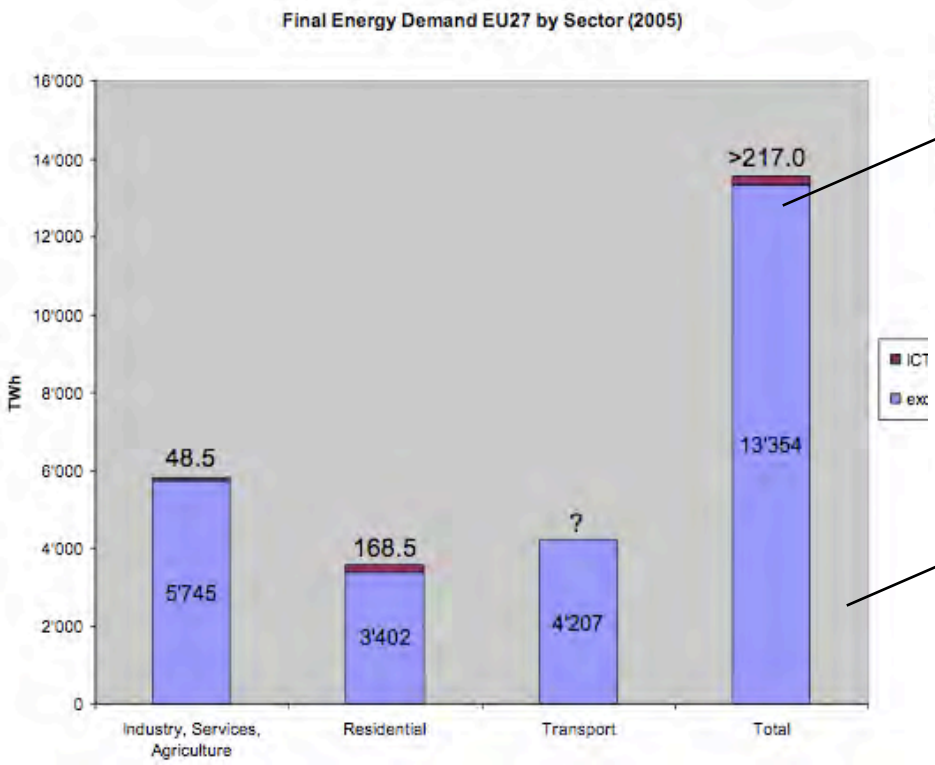
ICT‘s fast growing emissions

2020



85%

2005



15%

© Know-Center 2009

Question...

Google™ Italia

How much is the annual CO2 emission of Blog?

Ricerca avanzata
Preferenze
Strumenti per le lingue

Cerca con Google | Mi sento fortunato

Cerca: nel Web | pagine in Italiano | pagine provenienti da: Italia

3,6kg CO2/year

Consumes 5kg/year

© Know-Center 2009

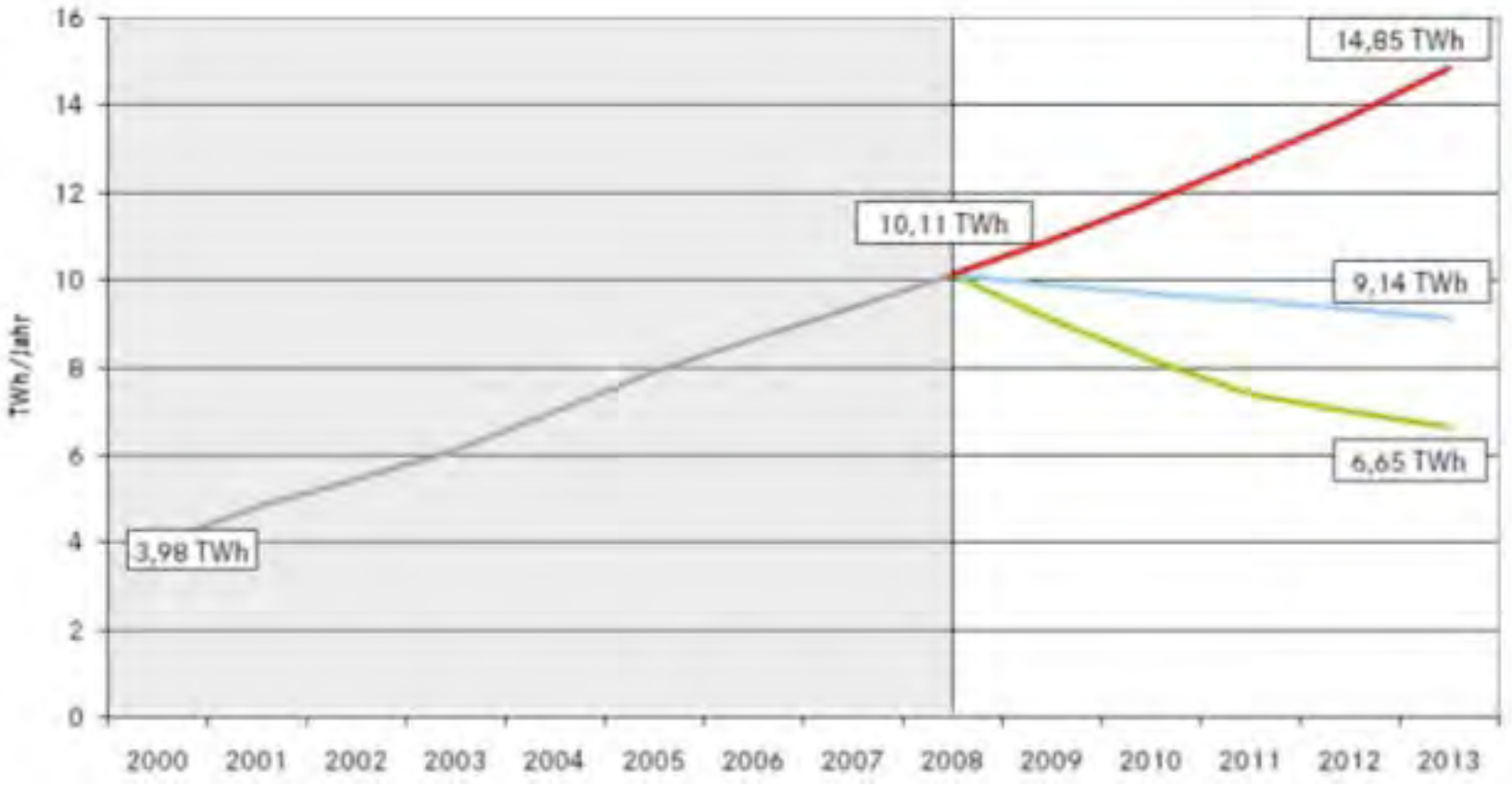
Data Centres – Energy Consumption

2001 to 2006 energy demand per **server** increased by **facor 4**

(Gartner Data Center Power and Cooling Challenge 2007)

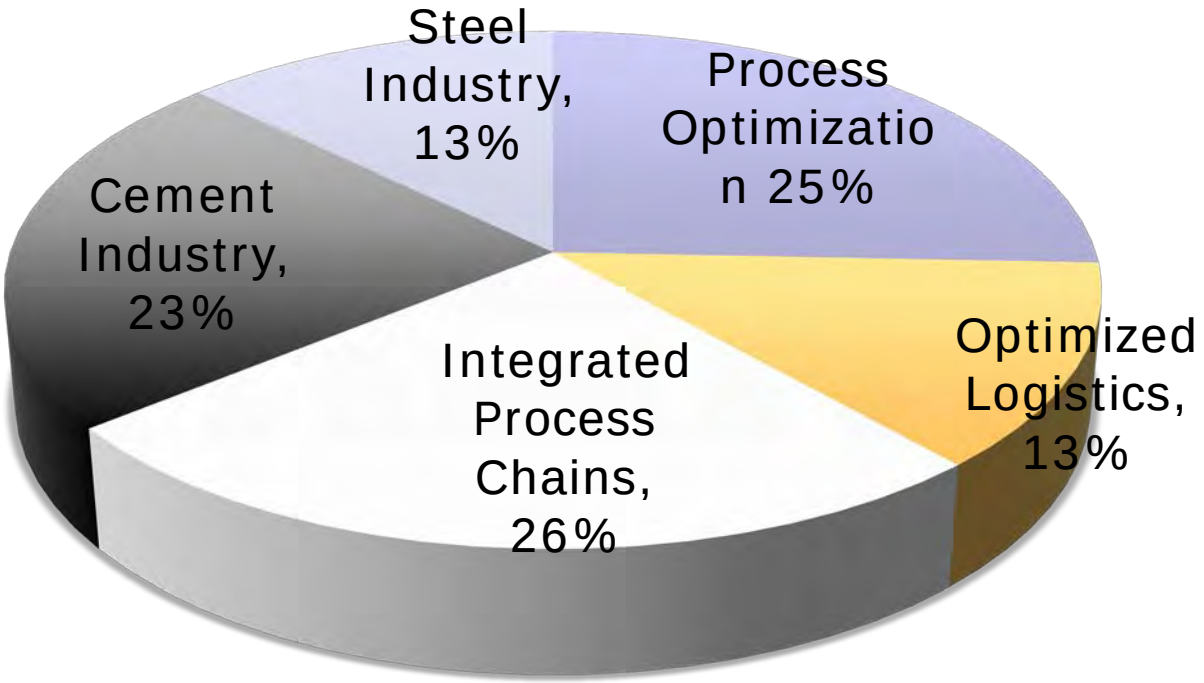
© Know-Center 2009

German Data Centers – Energy Consumption Scenarios



© Know-Center 2009

ICT for Energy Efficiency in other Sectors

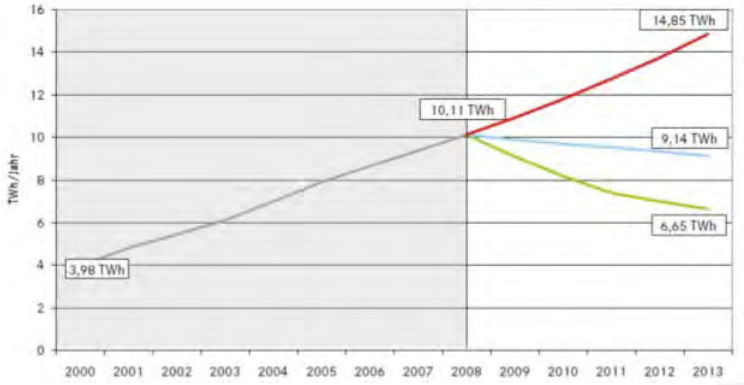


European Commission (2008).
ICT for Energy Efficiency: Ad-Hoc Advisory Group Report, European Commission DG-INFSO.

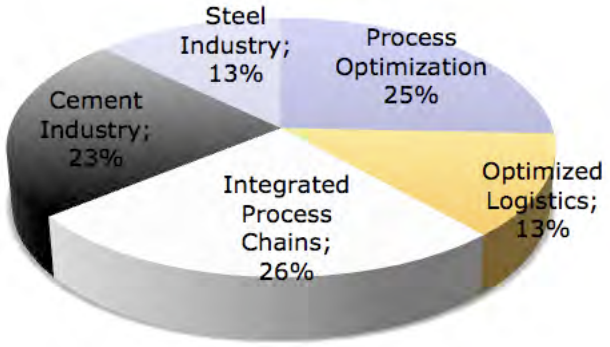
© Know-Center 2009

First Results – ICT and Energy

ICT‘s own energy consumption



ICT-induced energy efficiency



© Know-Center 2009

Question...

293,8 Mio Google Queries/Day

equals to energy of

33447 (!!) light bulbs in one year

© Know-Center 2009

What is ICT energy consumption

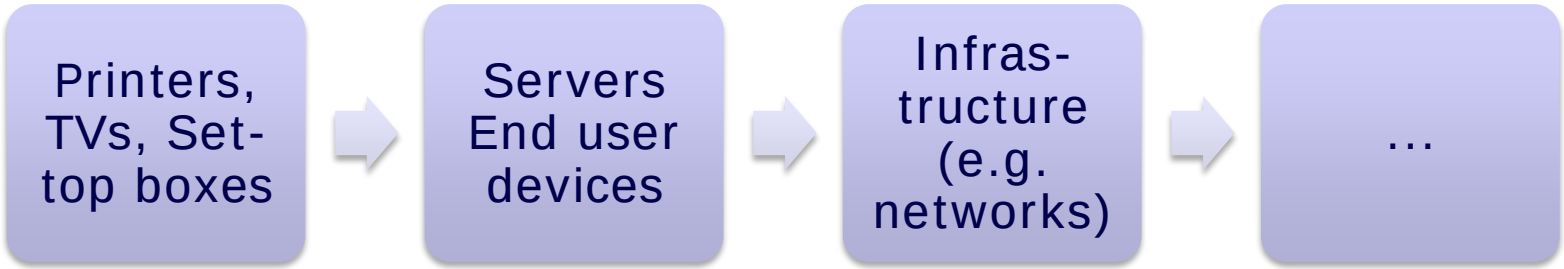
Energy Consumption refers to the transformation of energy transformed at the point of use

ICT-related energy consumption is the amount of energy consumed by a given ICT system in a given period of time

© Know-Center 2009

Challenges in ICT energy consumption

What belongs to ICT?



© Know-Center 2009

What is Energy Efficiency?

Energy efficiency of System A is the ratio of the useful output of services from A to the energy consumption by A (e.g. kByte/Ws)

© Know-Center 2009

What is ICT-related Energy Efficiency?

Given two systems A and B producing a functionally equivalent output of services Sa=Sb

Assume A contains subsystem C which is an ICT system and B does not contain that subsystem (B= A – C)

ICT-related Energy Efficiency is the factor by which the energy consumption of a system decreases if an ICT system is added to it and all other things are kept equal.

© Know-Center 2009

Challenges in ICT for Energy Efficiency

ICT **cannot induce energy efficiency** by its own

© Know-Center 2009

Question...

Google™ Italia

How much energy does a Second Life Avatare need?

Cerca con Google | Mi sento fortunato

Ricerca avanzata
Preferenze
Strumenti per le lingue

alia

1,75 KWh/year
1,17 Tons CO2

© Know-Center 2009

Expert Study
Which Technologies belong to ICT?

Technology (A: servers, B: network, C: end-user devices; D: embedded)	Energy Consumption	Enabling Effect on Energy Efficiency
A1: servers outside data centres	high	medium
A2: corporate data centres for in-house services	high	high
A3: data centres of ICT service providers	high	high
B1: terrestrial and marine communication: optic fibre cables & copper cables	low	medium
B2: wireless communication: GSM, WiFi, 3G antennas	medium	medium
B3: wireless communication: telecom satellites	low	medium
B4: supporting Internet infrastructure: routers, DNS servers	high	medium
C1: personal computing devices: desktops, laptops, netbooks	high	medium
C2: home telecommunication devices: landline phones	medium	low
C3: mobile telecommunication devices: cellular phones	medium	medium
C4: TV sets, set-top boxes	high	low
C5: portable media (music and/or video) players, e-books	medium	low
C6: digital cameras	medium	low
C7: peripherals (scanners, printers, etc)	medium	low
D: embedded ICT	high	high

© Know-Center 2009

ICT-Related Energy Efficiency Potentials

Application area	Highly relevant	Relevant	Somehow relevant	Almost irrelevant	Irrelevant
smart electricity grids	6	2	2		
consumer real-time energy consumption feedback	3	4	2	2	
buildings: intelligent heating/cooling/ventilation	9	2			
buildings and streets: intelligent lighting	5	6			
passenger transport and mobility	7	3	1		
goods transport and logistics	9	1	1		
discrete parts manufacturing	3	4	2	1	
chemical process industries	4	4	2		
virtual meetings and tele-work	4	4	2		
virtual media	2	5	4		

© Know-Center 2009

Quality of Data

Data	Very good	Good	Medium	Poor	Very poor
ICT energy consumption – availability			7	3	1
ICT energy consumption – quality			4	6	1

Data	Very good	Good	Medium	Poor	Very poor
ICT for energy efficiency – availability			3	6	2
ICT for energy efficiency – quality		1	1	7	2

© Know-Center 2009

Conclusions

Research on ICT Energy Consumption and ICT-induced Energy Efficiency **should be integrated**

Increase of ICT-induced energy efficieny will lead to a **faster increase the ICT energy consumption** ...

Decompose ICT into specific technologies and application areas

© Know-Center 2009

Last Question...

Goog

Which is one of Britain's worst polluters?

Cerca con Google | Mi se

Cerca: nel Web | pagine in Italiano | pa

Mail Online

Home | News | Sport | TV&Showbiz | Femail | Health | Science&Tech | Money | Debate | C

Science&Tech Home | Pictures | Gadgets Gifts and Toys Store

Schulfreunde wiederfinden!

Meine Abschlussklasse:

1987

1987
1977

anzeigen

StayFriends

Weather supercomputer used to predict climate change is one of Britain's worst polluters

By DAILY MAIL REPORTER
Last updated at 3:28 PM on 27th August 2009

Comments (74) | Add to My Stories

The Met Office has caused a storm of controversy after it was revealed their £30million supercomputer designed to predict climate change is one of Britain's worst polluters.

The massive machine - the UK's most powerful computer with a whopping 15 million megabytes of memory - was installed in the Met Office's headquarters in Exeter, Devon.

It is capable of 1,000 billion calculations every second to feed data to 400 scientists and uses 1.2 megawatts of energy to run - enough to power more than 1,000 homes.

The computer used 1.2 megawatts to run - enough to power 1,000 homes

Klaus Tochtermann
Know-Center Graz
Graz University of Technology
Inffeldgasse 21a
8020 Graz

+43 316 873 9250
ktochter@know-center.at
www.know-center.at

© Know-Center 2009