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für Verkehr,
Innovation und Technologie

Proceedings and Workshop Results

Electrical Enduse Efficiency
Chances for Green ICT and Electronics in Austria

Berichte aus Energie- und Umweltforschung
8/2010

Friday, 5th March 2010
ARCOTEL, Hotel Wimberger, Vienna

e2050

IEA FORSCHUNGS KOOPERATION

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Electrical Enduse Efficiency Chances for Green ICT and Electronics in Austria

5th March 2010, Vienna

Proceedings and Workshop Results

Ing. Michael Hübner
Federal Ministry for Transport, Innovation and Technology

Ao. Univ. Prof. Dr. Wolfgang Wimmer
Technical University Vienna

DI Marcus Hofmann
Austrian Energy Agency

Vienna, March 2010

Supported by the Austrian Federal Ministry for Transport, Innovation and Technology

Contents

A number of IEA (International Energy Agency) member countries join forces in a new international collaborative programme to promote wider use of more energy-efficient electrical equipment, the **IEA Implementing Agreement "Efficient Electrical End-Use Equipment (4E)"**. The focus of the co-operation is on efficiency of electrical end-use equipment. The Austrian Federal Ministry for Transport, Innovation and Technology as a Member of the 4E Executive Committee is coordinating the Austrian participation.

Energy efficiency is more than ever a top priority on the international agenda. Using energy-efficient equipment is the most cost-effective short-term path to greater energy security and lower greenhouse gas emissions to combat climate change. It reduces pressure on energy resources. The IEA estimates that energy-efficiency improvements could contribute 47% of reductions in energy-related CO_2 emissions potentially achievable by 2030.

"Green ICT" at the moment is seen as one of the major strategic topics in the international discussion. The Keyword opens up a large innovation-field with many specific topics and technologies. The entire workshop gives a framework to discuss related R&D Topics and priorities as well as chances to be seen for Austrian industries and SMEs. The outcomes will be used by the Austrian Federal Ministry for Transport, Innovation and Technology for the further development of Austrian R&D Programmes and Strategies as well as for the work in the IEA Implementing Agreement 4E.

Target of Workshop

> Information on IEA 4E Activities, incl. Annexes (Mapping and Benchmarking, Stand By Power and Motors)
> Exchange of experience on current and planned policy initiatives in Europe, US and Australia
> New developments in Eco-Design and Green IT

Target Group

> Industry dealing with the development and production of appliances
> Policy makers dealing with energy efficiency issues, energy agencies
> Design companies

Venue: ARCOTEL, Hotel Wimberger AG
Neubaugürtel 34-36, 1070 Vienna

www.energytech.at/iea

Agenda

IEA FORSCHUNGS KOOPERATION

Friday, 5th March 2010

09:00 WELCOME AND INTRODUCTION

Strategies for Energy Efficient Technologies
Michael Hübner, ExCo Representative for Austria,
Federal Ministry for Transport, Innovation and Technology, Austria

EMERGING ENERGY EFFICIENCY POLICY CHALLENGES
IEA Implementing Agreement 4E, Net Zero Appliances
Hans-Paul Siderius, IEA 4E Chair, Senter Novem, Netherlands

Policies for Efficient Electronics
Mark Ellis, MEA, IEA 4E Operating Agent, Australia

Consumption Limits on Products, Trends in Energy Star Specifications
Katherine Kaplan, Jim McMahon, EPA, USA

QUESTIONS AND DISCUSSION

10:30 COFFEE-BREAK

11:00 AUSTRIAN PRACTICES AND CHALLENGES

Intelligent Control for Energy Efficiency (Buildings, Traffic, Industry)
Werner Schöfberger, Siemens AG Österreich

Electronics for Efficient Use of Energy
Herbert Pairitsch, Infineon Technologies Austria AG

Green ICT: Consistent Actions to reduce Energy Consumption
Martin Chaloupek, IBM Österreich GmbH

Energy Efficient Lighting Solutions
Wilfried Pohl, Bartenbach LichtLabor GmbH

Innovative Lighting Solutions and Control
Peter Dehoff, Zumtobel Staff GmbH

Ecodesign of Consumer Electronics
Gerhard Podhradsky, Phillips Österreich

Green Telecommunications
Georg Serentschy, Austrian Regulatory Authority for Broadcasting and Telecommunications

e4u – Power Electronics as Enabler for Energy Efficiency
Erich Prem, eutema

14:00 CONCLUSIONS: FUTURE TECHNOLOGIES and R&D CHANCES for OECD Countries / Austria
Discussion-Input and Moderation: Wolfgang Wimmer, ECODESIGN company

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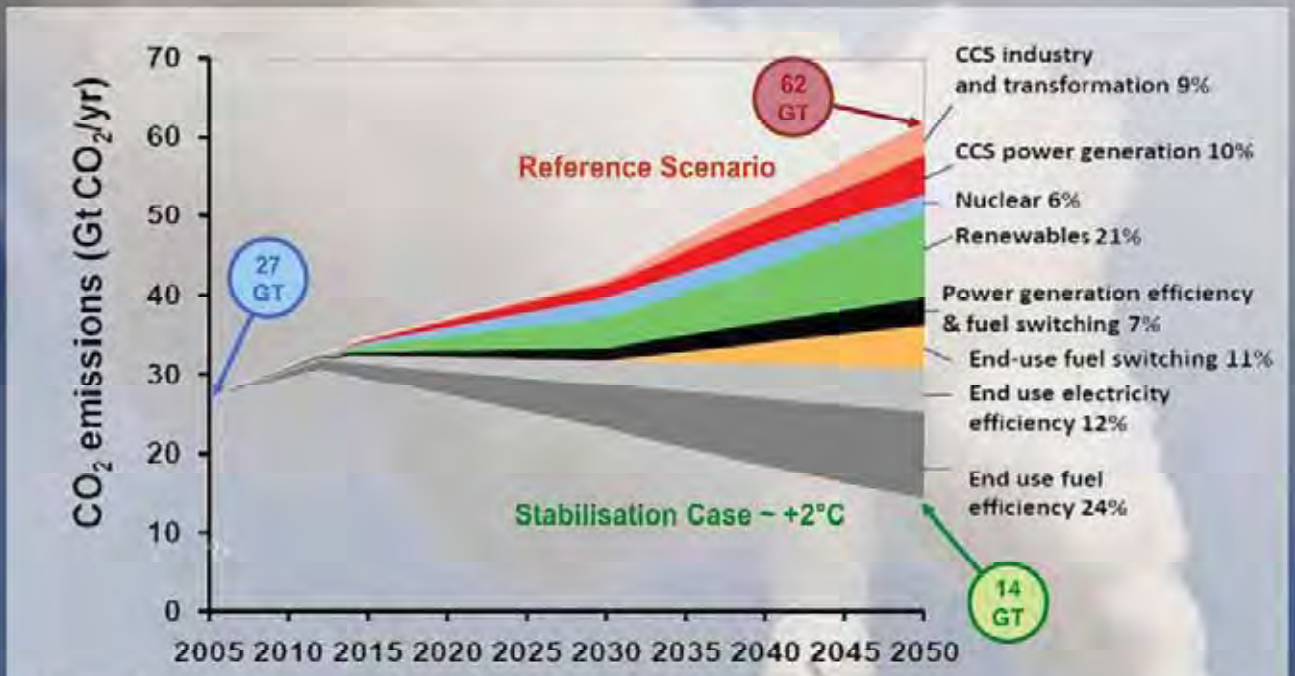
Strategies for Energy Efficient Technologies

4E Wokshop on Green ICT in Austria
Wien, 05. März 2010

Michael Hübner

4E ExCo Representative for Austria
Energy and Environmental Technologies
Federal Ministry for Transport, Inno vation and Technology, Austria

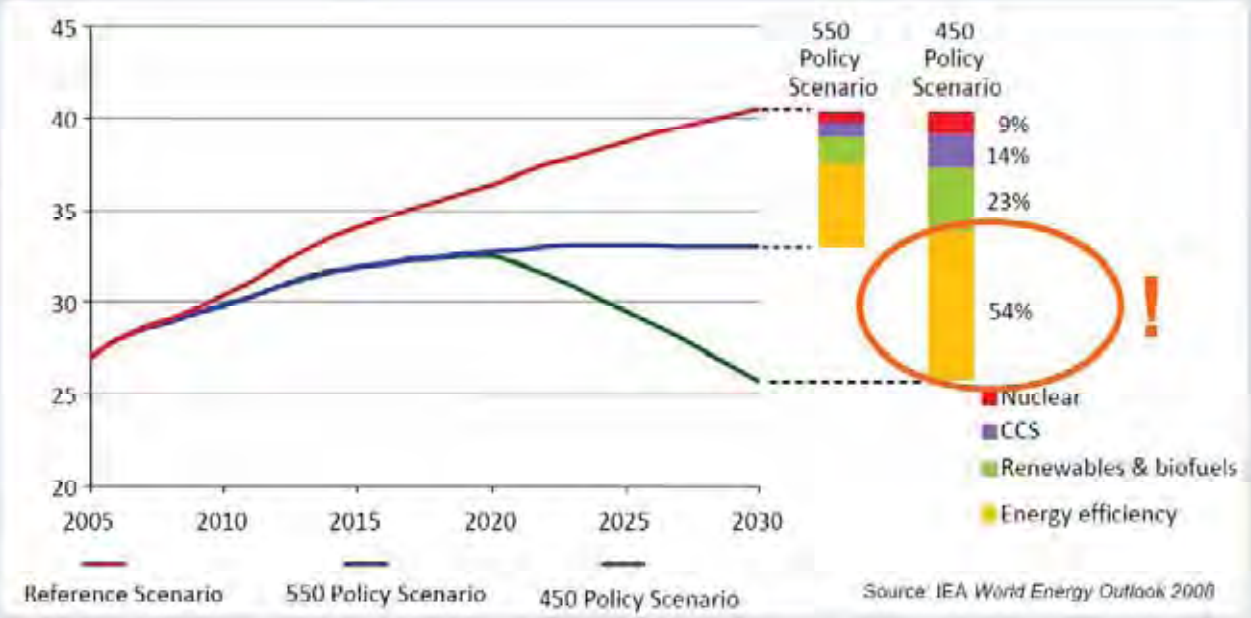
The Global Challange: Low Carbon Economy



Source: Energy Technology Perspectives 2008, OECD IEA

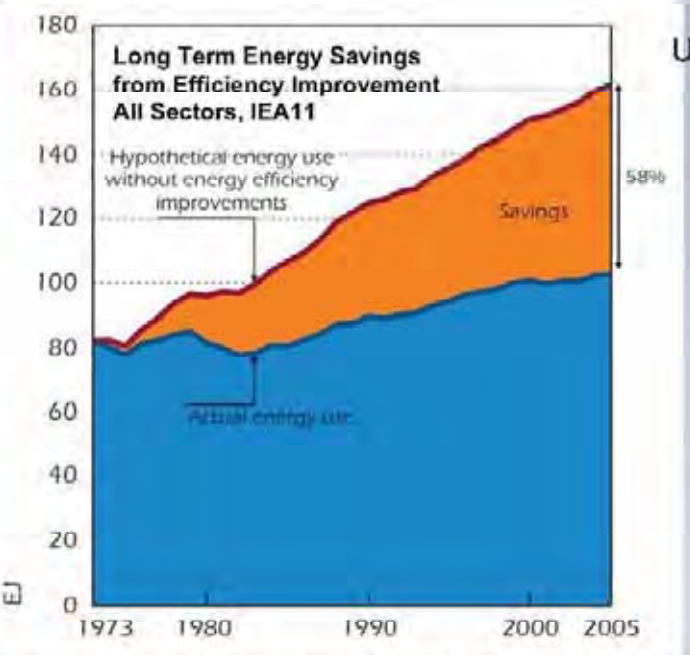
Picture source: Eisinger, Hochschule für Angewandte Kunst Wien

Efficiency is Key



Source: „Ensuring Green Growth in a Time of Economic Crisis: The role of Energy Technology, G8 Environment Ministers Meeting 22 April 2009, Siracusa, Mr. Nobuo Tanaka*Executive Director, International Energy Agency*

Efficiency- What do we mean? (Rebound)



Unsere Visionen:

Source: IEA indecators database, Worldwide Trends in Energy Use and Efficiency, IEA 2008

From Incremental to Transformative

Source: Dennis Pamlin, Senior Associate, Chinese Academy of Social Sciences, Global Advisor

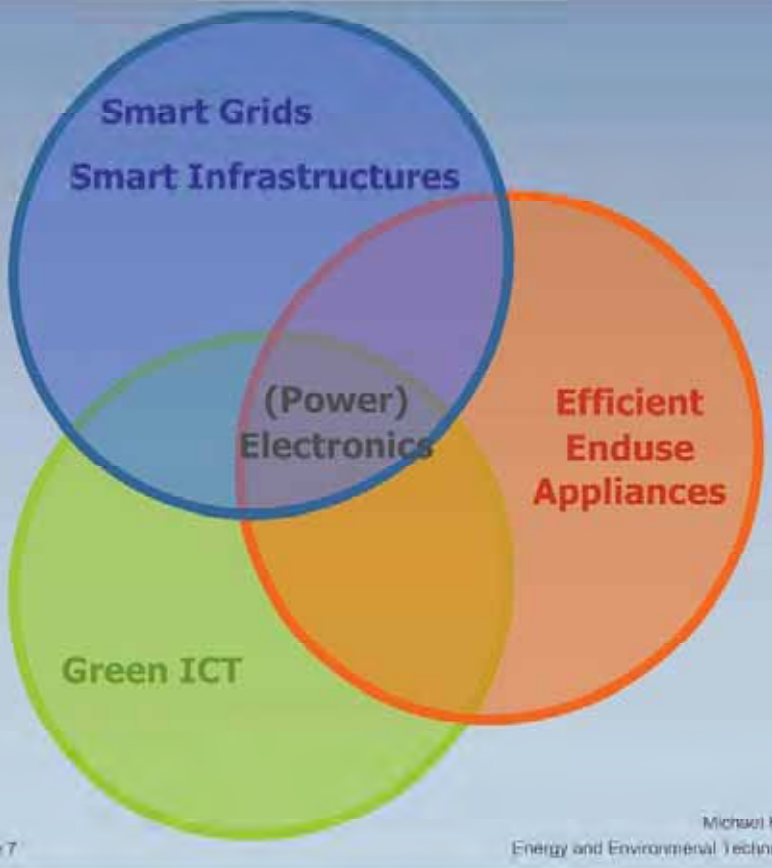
Systemic Approach

ENERGIETECHNOLOGIEN				SCHNITTSTELLE TECHNIK / MENSCH	ENERGIE-NUTZEN
Erzeugung zentral Erzeugung dezentral	Transport	Verteilung	Endverbrauchstechnologien		**Bedürfnisse der Menschen** Kultur, Lifestyle, Lebensstandard, Wertesystem, persönliche Lebensumstände, Klimawandel
> Effiziente Kraftwerke > Technologien für erneuerbare Energie > Raffinerien	> Supergrids > Ultra High Voltage > Pipelines > LNG	**Forschungsthemen:** > Aktive Verteilnetze > Microgrids > Multifunktionale Energiezentralen > Integration erneuerbarer Energiequellen > Dezentrale Speicher > Virtuelle Kraftwerke > Effiziente Verbrauchstechnologien > Smart Infrastructures	**Forschungsthemen:** > Demand Response > Smart Metering > Produkt DL-Systeme > Geschäftsmodelle > Gestaltung > Smart Services > Energiedienstleistungen		> Glücksforschung > Benutzer-Verhalten > Neue Bedürfnisse
>>>>>>>>>>>>>>>>>>	>>>> ENERGIE >>>>>>>>>>>>>>>>>>>>>>>>				>>>>>> NUTZEN >>>>>>

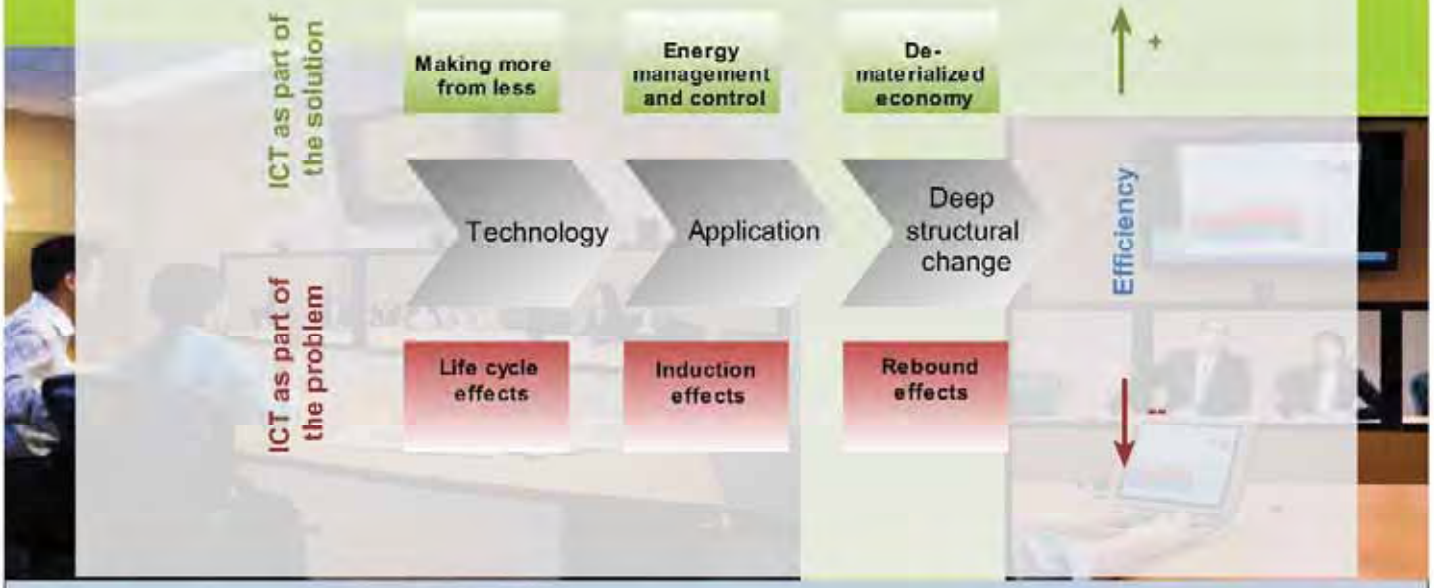
Austrian Strategic Focus „Energysystems, Grids and Enduse"

INFORMATION

Key Topics



"Green ICT" – what are we talking about?



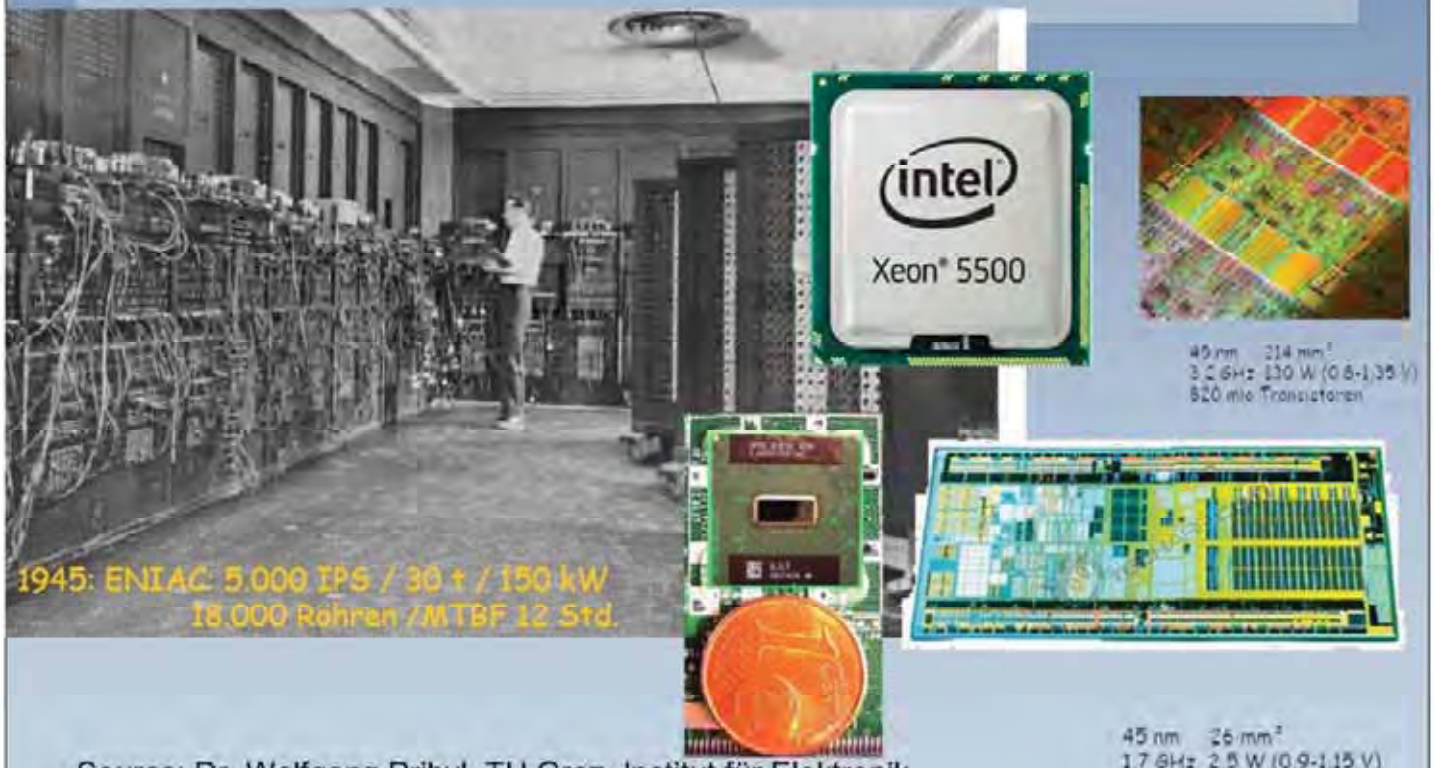
ICT needs Energy

Bsp. Deutschland:

55,2 TWh Stromverbrauch der **IKT in 2007** = **10,5%** des gesamten Stromverbrauchs

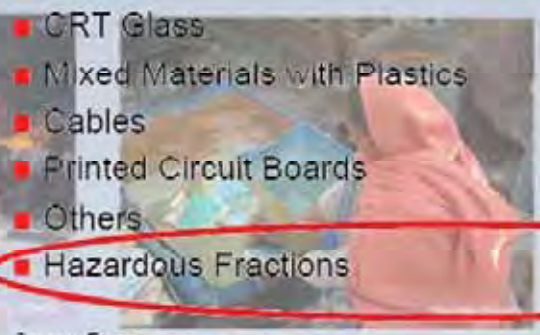
Quelle: www.bmwi.de und Fraunhofer (2009) / Mallek, TU Graz

Making More From Less



Source: Dr. Wolfgang Pribyl, TU Graz, Institut für Elektronik

But: Lifecycle, Materials



Composition of E-Waste (WEEE)

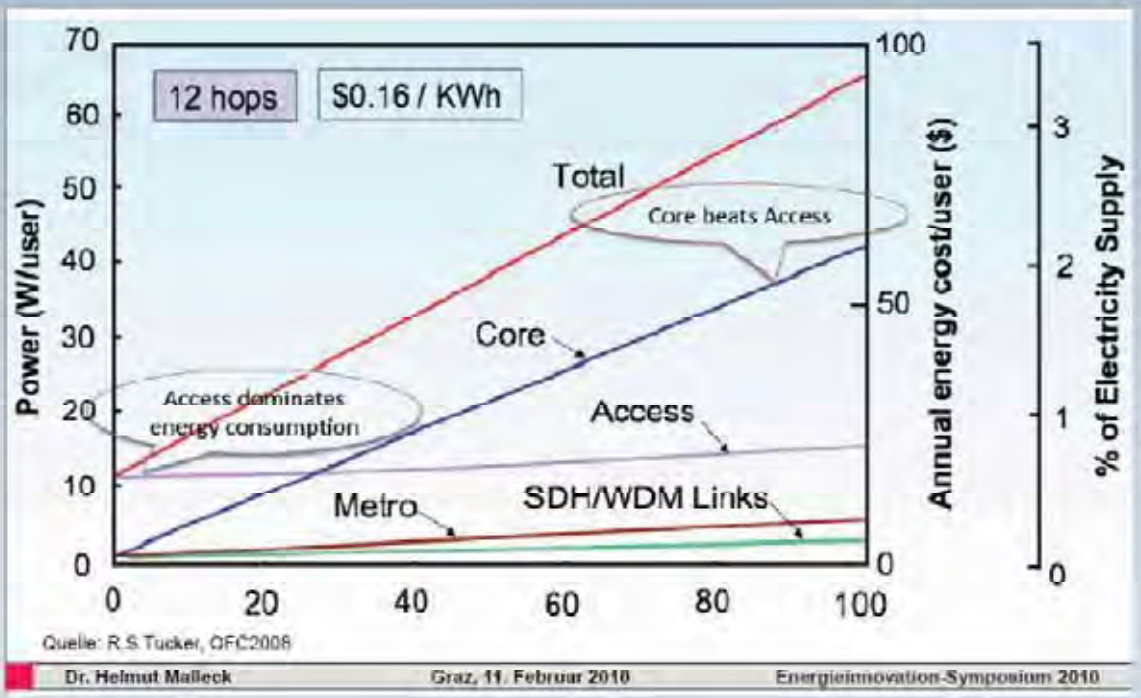
Ferrous Metals	39.1 %
Non-Fe Metals (Aluminium, Copper, Silver, Gold…)	21.0 %
Plastics	14.2 %
CRT Glass	13.4 %
Mixed Materials with Plastics	5.8 %
Cables	2.2 %
Printed Circuit Boards	1.9 %
Others	1.6 %
Hazardous Fractions	0.8 %

Source: Empa

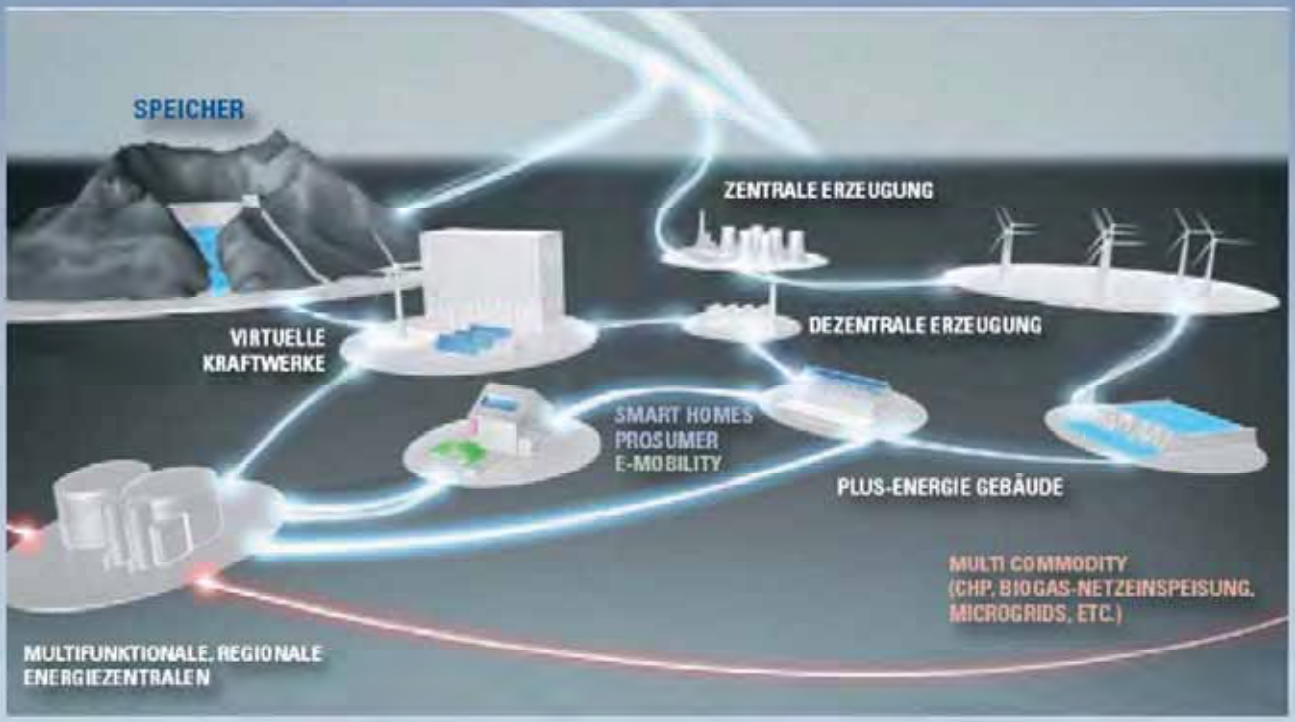
Source: Lorenz Hilty, Empa, Switzerland, OECD Workshop, Copenhagen, 23.05.08

Dematerialization

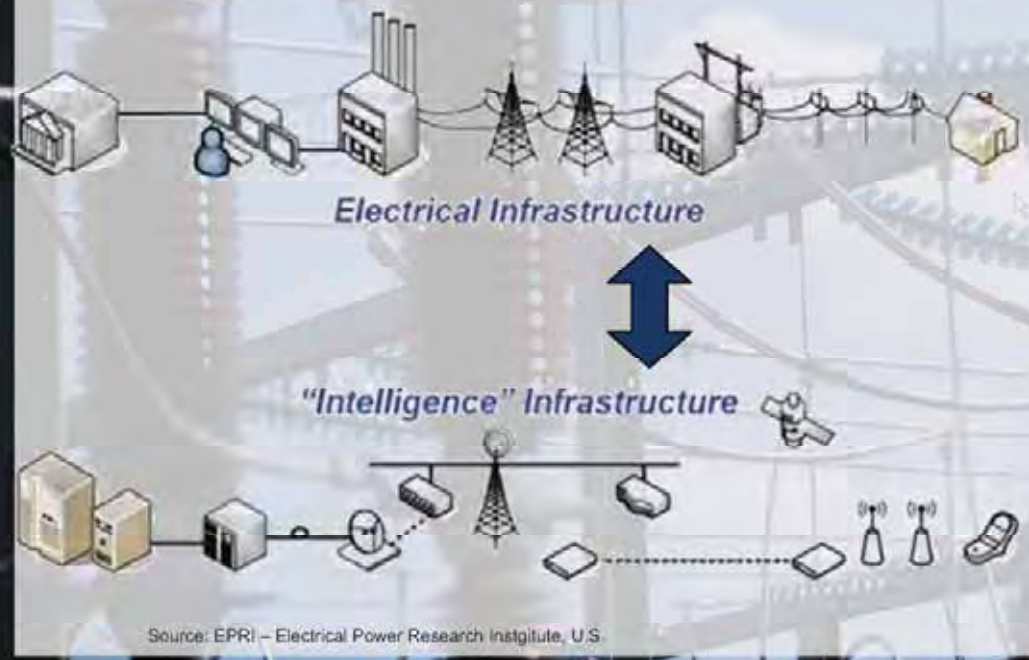
But: Bandwith means Energy



Smart Grids



But: Interdependent Critical Infrastructures

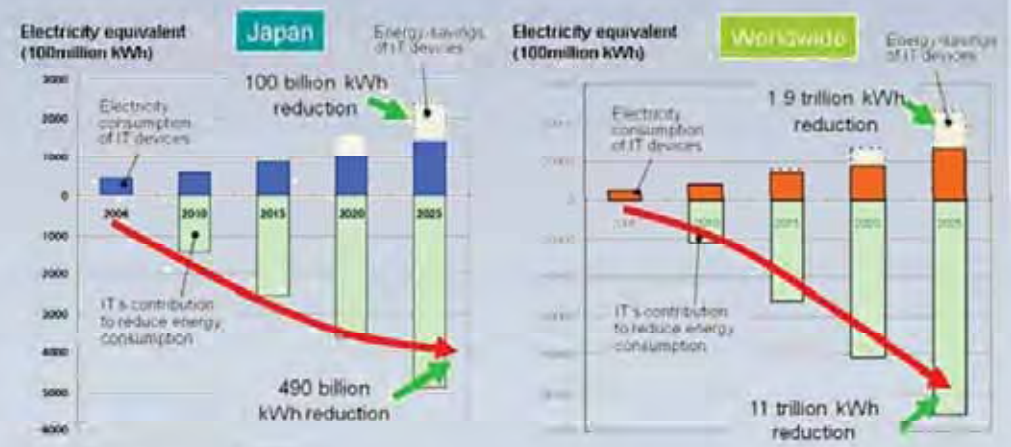


Source: EPRI – Electrical Power Research Instgitute, U.S.

Growing Expectations for Green ICT Worldwide – e.g. Japan

2. Growing expectations for green IT

The amount of "energy-savings by IT use" will exceed that of "energy consumption of IT devices" and IT can contribute the reduction of energy consumption of whole society if "Green IT" is actively promoted.



Source: Hidekazu Hasegawa, Executive Senior Vice President, JEITA (Green IT Promotion Council in Japan)

„Greening“ is the Goal

GREENING WITH IT - THE 98% POTENTIAL
refers to the low carbon IT solutions like virtual meetings, smart buildings, smart grid and dematerialization that can help to reduce overall GHG emissions from all sectors significantly.

GREEN IT - THE 2% EMISSIONS
refers to more energy efficient IT equipment that helps to reduce the emissions from the IT sector itself.

Source: From "Green IT" to "Greening with IT", wwf 2009

What can we expect?

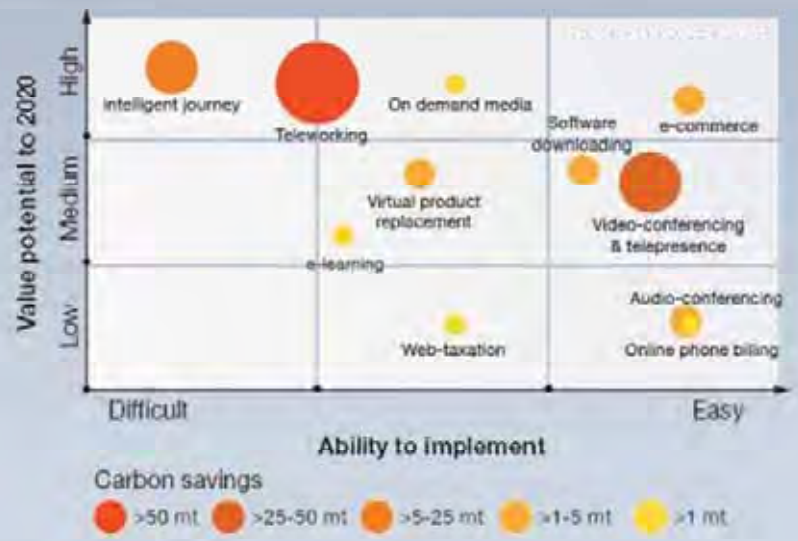
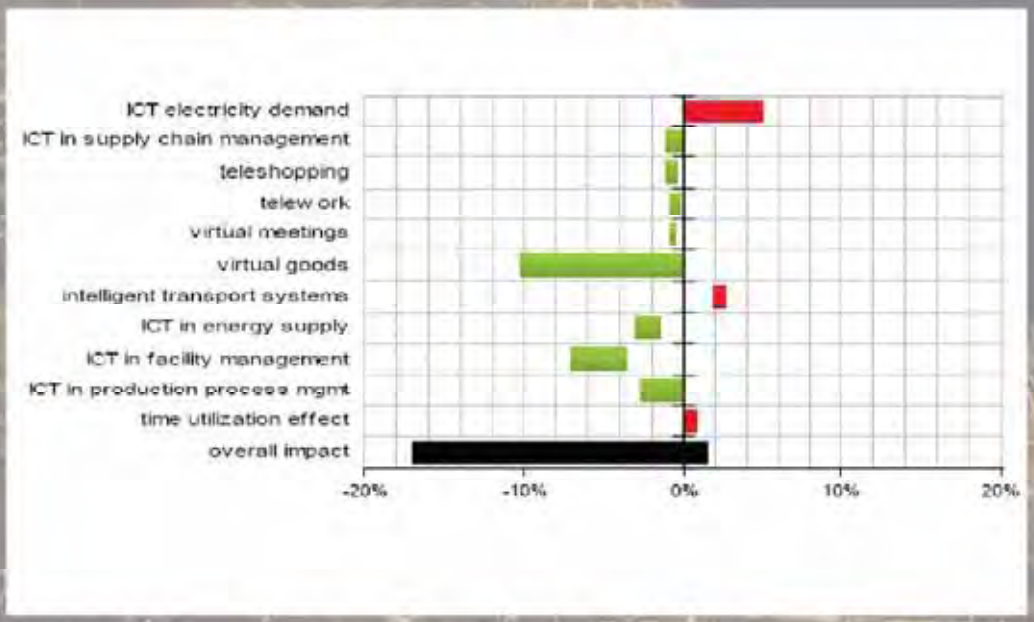


Figure 4
Carbon Management - A Business Opportunity

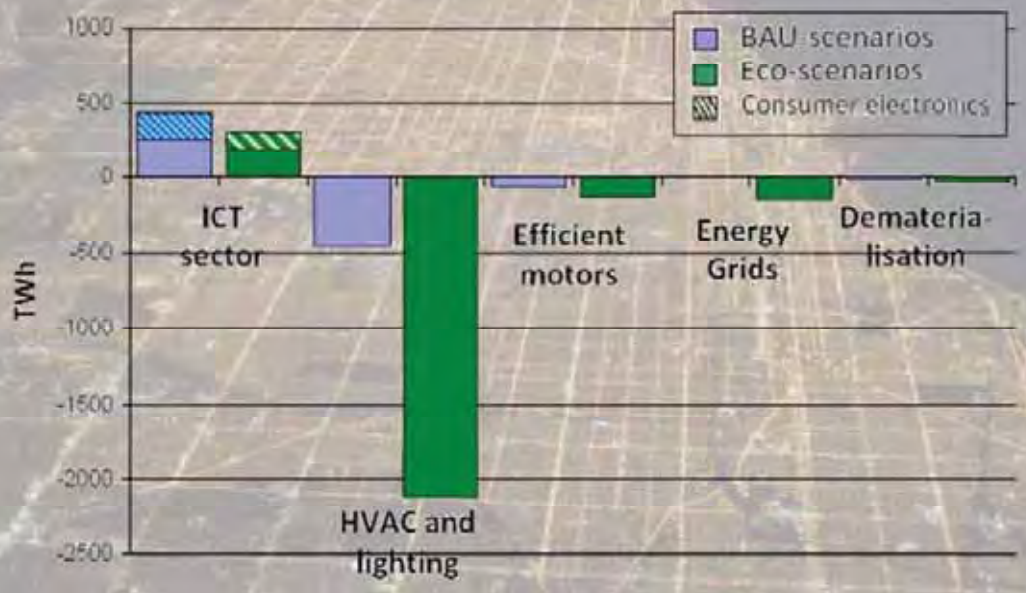
Source. From "Green IT" to "Greening with IT" , wwf 2009

Efficiency Potentials with ICT&Electronics



Quelle: Lorenz Erdmann, Institute for Future Studies and technology Assessment (IZT), OECD-Workshop on ICTs and Environmental Challenges", Copenhagen, Mai 2008

Efficiency Potentials with ICT&Electronics (EU27)



Source: Impacts of Information and Communication Technologies on Energy Efficiency- Final Report, EC DG-INFSO,

Efficiency Potentials with ICT&Electronics

Fraction of electrical energy per application	Energy Split		Energy Saving Potential
Con. power supply: - stand-by, - active, ...	Others 14%	- stand-by - active	>90% > 1%
I&C, Computing power supply, ...	Internet 10%	80+ / 90+	> 1%
EC-Ballast Daylight dimming HID, LED, ...	Lighting 21%	Electronic control	>25%
Factory autom. Process engineering, Heavy industry, Light industry, ...	Motor control 55%	Variable Speed Drive (VSD)	>30%
Transportation Train, Bus, Car, ...		VSD + Bi-directional energy flow	>25%
Home appliance: Fridge, WM, HVAC, ...		VSD	>40%

Source: Infineon, ZVEI, Siemens, CEMEP, CPES, EPA, NRDC

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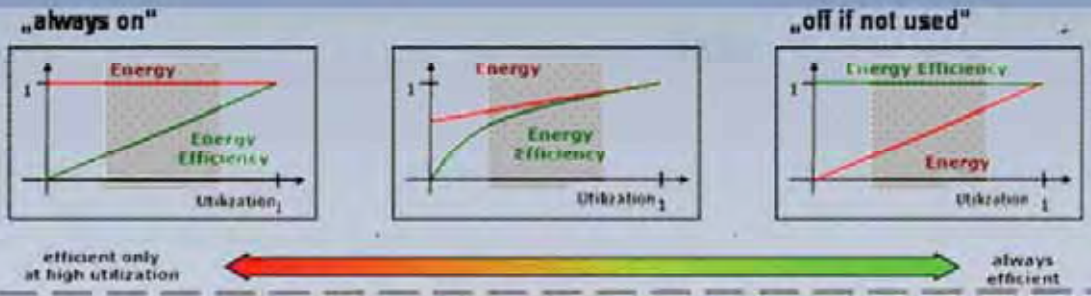
Example: Buildings

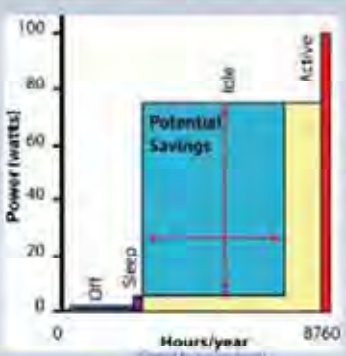
- **Building management („the energy passive house“)**
- **System integration of buildings heating and cooling loads**
- **Energy producing buildings („the energy active house“)**

Example: Standby and Beyond



Core Fact: Most PC energy use occurs when no one present

- Not only computer systems but many enduse appliancess, electronic products, networking products
- e.g.: smart meters?
- → protocols, system design, …



Most of time when idle, could be asleep

But networking often prevents sleep mode

PC savings potential is **most** of current consumption

Similar patterns apply to set-top boxes, for TVs, printer, …

Example: Lighting

- New technologies (solid state / LED, …)
- Smart lighting systems
  (demand oriented, sensor controlled, system integration, …)
- Energy autonomous lighting systems

Picture Source: Autonomous PV-Street Lamps, HEI- Hornbachner Energie Innovation

Example: Intelligent PV-Converters

- **Efficient power conversion**
- **Grid integration (power quality, ancilliary services)**
- **Building integration (shading, cascading)**

Quelle: HBI Consulting 2009

Example: Smart Grids

New Services and Market Places

To be discussed at the workshop

- **Where are major potentials in the (Austrian) energy system?**
- **Where are chances for the (Austrian) Industry?**
- **What measures can be taken to overcome the „valley of death"?**
- **What is the role of R&D (especially in Austria)?**
- **What is the role of the different players in Austrian Industry (e.g. SMEs)?**

Microsoft Innovation Award: Sonderpreis „ICT for Green“ des BMVIT

Energieforschungsstrategie für Österreich - Reden sie mit!

- Online-Diskussion bis 10. März 2010
  www.energieforschungsstrategie.at
- Gemeinsam mit dem
  Rat für Forschung und Technologieentwicklung
- **→ Inputs für die Umsetzung der FTI-Strategie können somit die zukünftige Forschungslandschaft für Energie maßgeblich mitbestimmen.**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michael.huebner@bmvit.gv.at
www.ENERGIESYSTEMEderZukunft.at

www.iea-4E.org

The future of appliance policy: ZEAP

Hans-Paul Siderius
(NL Agency)
Chairperson 4E

Wien, 5 March 2010

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Overview of presentation

- Trends in appliances
- Why appliances are important?
- Where does 4E fit in?
- Mapping & Benchmarking of appliances
- Future of appliance policy: ZEAP

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Trends in appliances

- Energy efficiency of appliances has improved, BUT
- More appliances per household
- More households, more appliances in total
- Larger appliances, increased performance: cold appliances, televisions, monitors
- Increasing time in power consuming modes: always on, network connections

Conclusion: energy consumption of appliances will increase

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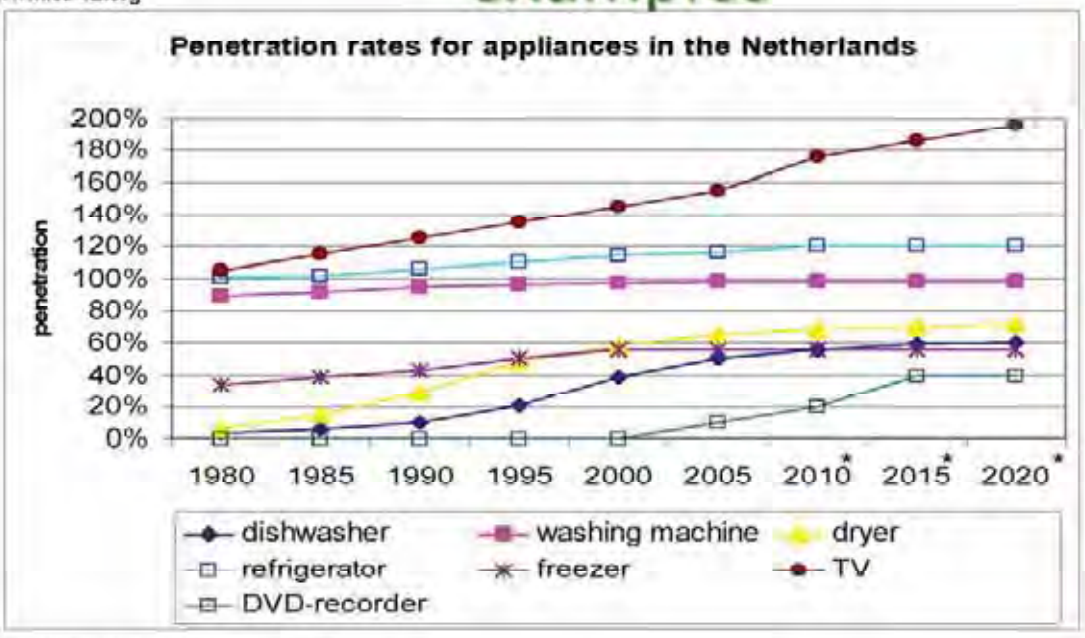
Trends in appliances examples



* 2010, 2015, 2020: estimates

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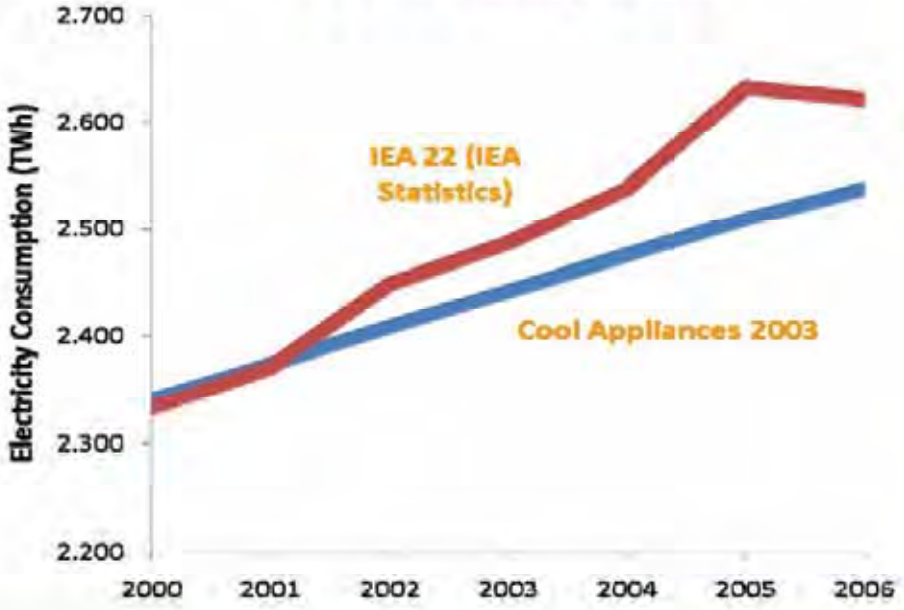
Residential electricity consumption



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4E at a glance

- 4E provides an international forum for governments and other stakeholders to:
  - Share expertise and develop understanding of electrical end-use equipment and policies
  - Facilitate co-ordination of international approaches in the area of efficient electrical end-use equipment
- 4E seeks to meet the challenges for policy makers to maximize energy efficiency on all types of non-transport electrical equipment.
- Launched in March 2008, 4E now has 11 member countries actively participating in collaborative projects.

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Participating countries

Members:	Considering membership:
Australia (vice-chair)	China
Austria	Japan
Canada	Mexico
Denmark	Sweden
France	
Korea	
The Netherlands (chair)	
Switzerland	
South Africa	
UK	
USA	

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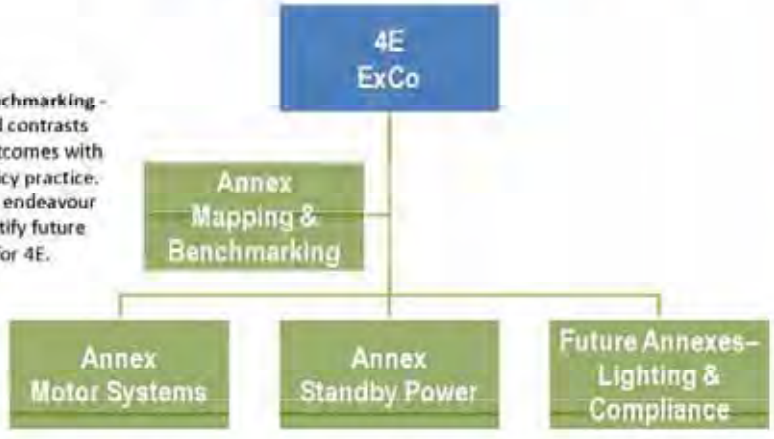
Structure of 4E

Mapping & Benchmarking - compares and contrasts policies and outcomes with global best policy practice. This long-term endeavour will help identify future projects for 4E.



Electric Motor Systems: reporting the means used to improve efficiency and encourages alignment on policies proven to be effective.

Standby Power: identifying new trends in standby power and the policies with potential to reverse increasing energy use.

Areas of high energy use, with need for policy co-operation

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Further information: on the website ...

- General information and news on 4E
- Specific information on Annexes
- Protected area for sharing information amongst participants
- Linked websites for Annexes

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... and in 4E and Annex newsletters

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Mapping&Benchmarking

Goal: provide information for policy makers to

- Identify the potential of products on the market (Mapping)
- Compare data for products in various regions of the world (Benchmarking)

The following products will be dealt with:

- cold appliances, washing machines, clothes dryers
- domestic lighting
- laptops, displays, televisions
- water heaters, airconditioners

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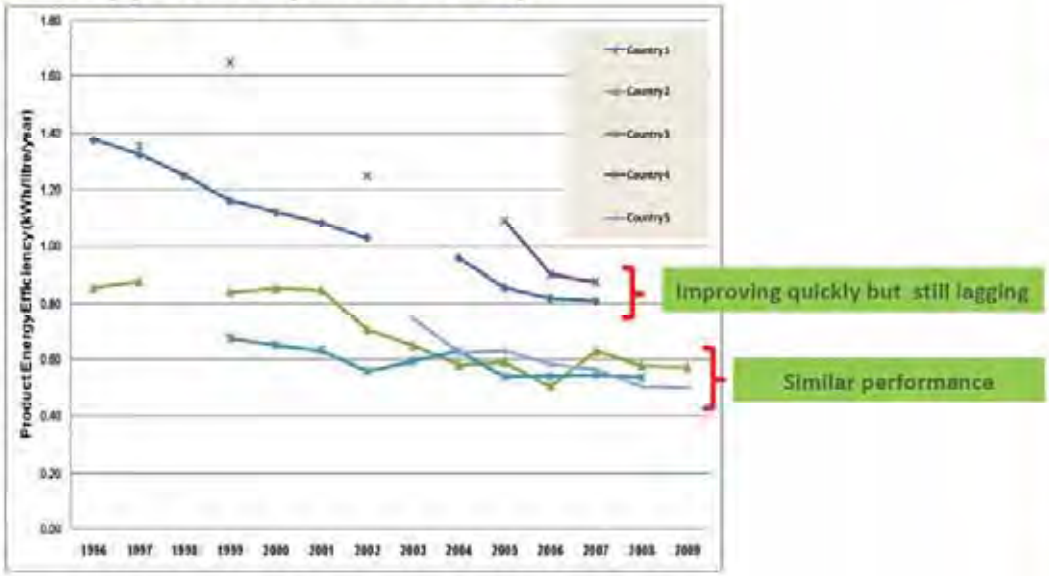
Mapping&Benchmarking across countries

Cold appliances (market data):



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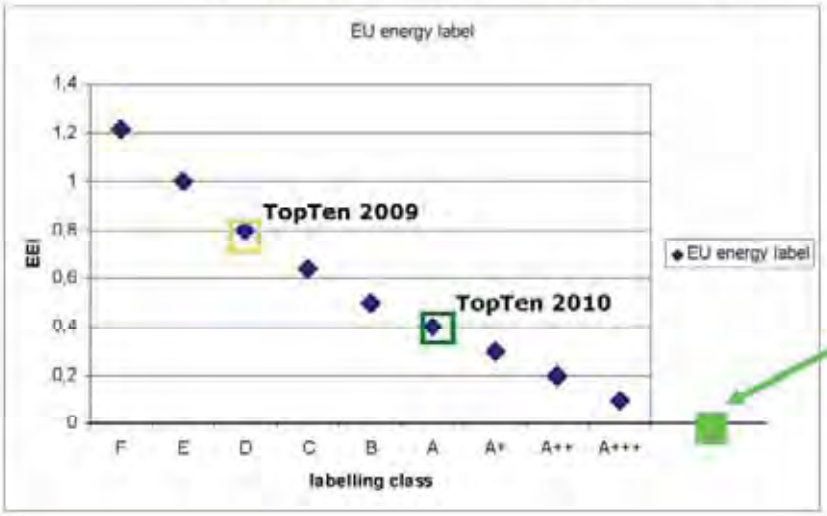
Mapping&Benchmarking

Televisions (EC proposal labelling classes):



Zero energy consumption

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Future of appliance policy

- Energy consumption per appliance is decreasing.
- What is the next step?
- Buildings and transport have shown the way forward:
  - net zero energy buildings
  - carbon neutral transport
- Future of appliance policy:
  ZEAP (zero energy appliance policy)

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What is a ZEAp?
(Zero Energy Appliance)

IEA Implementing Agreement

- Zero energy appliance: appliance that on average has a zero energy consumption from the mains.
  - No connection to the mains (230 V, 50 Hz)
  - Consumption from the mains equals production to the mains
- ZEAPs already exist/are being developed:
  - Hand powered radios, watches and flashlights
  - Mobile phones powered by ambient/body heat

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Towards ZEAps: guiding principles

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- Decrease energy consumption:
  - Eliminate all unnecessary energy consumption
  - Use extreme efficient components
  - Implement power management
- Increase energy production of the appliance:
  - Use of ambient heat
  - Solar input
  - Mechanical power: opening of doors, human power
- Very efficient storage:
  - Storage of energy generated by the appliance for later use
  - Use grid as storage: efficient exchange

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Policies supporting ZEAps

- Use the concept as an inspiring vision
- Total life cycle costing:
  - Refrigerator with a retail price of € 275 and energy consumption of 200 kWh/year has total cost of € 875*.
- Energy label 2020: A class is reserved for ZEAps.
- Policies supporting R&D towards ZEAps, efficient storage.

* Life time: 12 years, electricity price 0,25 €/kWh

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Thank you for your attention

More information on 4E:

www.iea-4E.org

Or contact the Operating Agent

Mark Ellis (m.e.a@bigpond.com)

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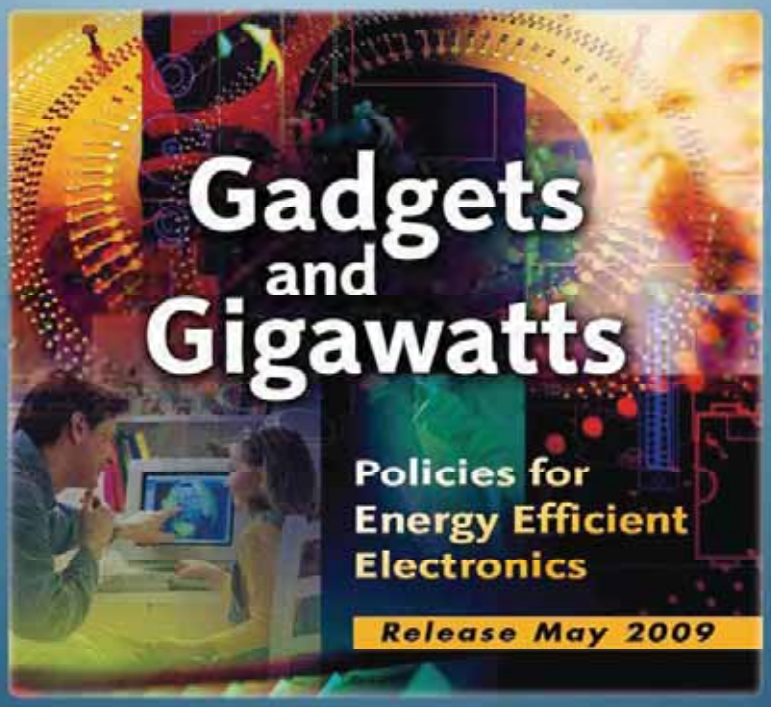
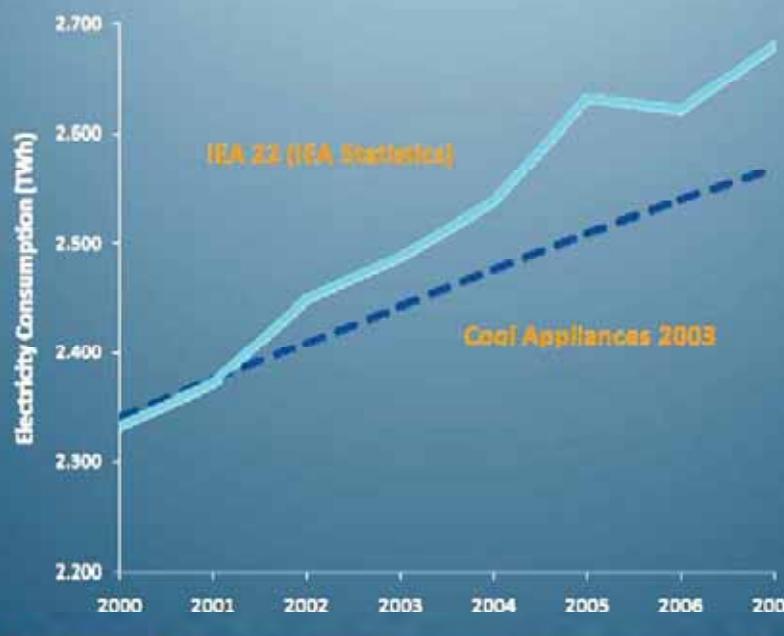
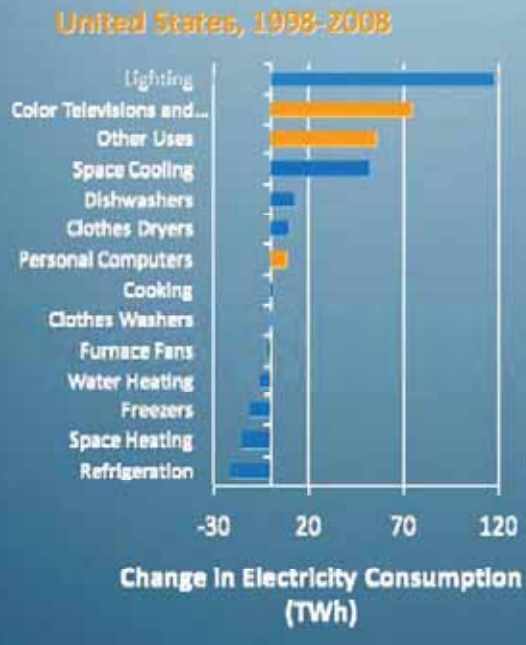


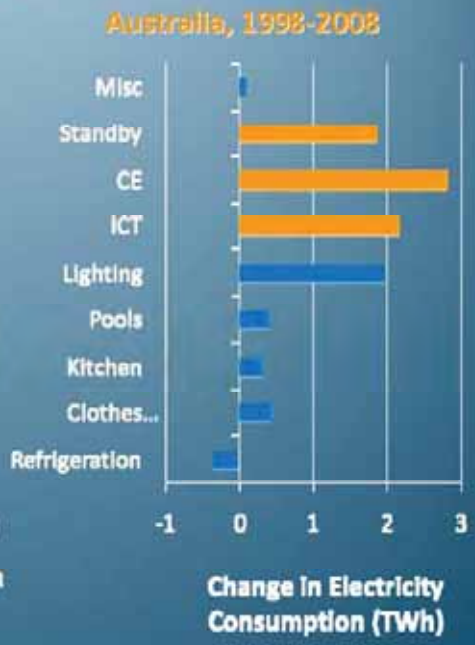
Residential electricity consumption



Despite national efforts, electricity consumption is growing at nearly twice the rate estimated in Cool Appliances, 2003

Drivers in residential electricity consumption





Gadgets and Gigawatts

Trends over past five years

- The share of electricity consumed by larger household appliances, such refrigerators, freezers and clothes washers, has declined in OECD
  - *Due to impact of efficiency programs & near 100% saturation*
- The share of lighting and air-conditioning has seen major increases in some countries
  - *Due to growing penetration rates & fewer efficiency programs*
- In all countries (OECD & non-OECD) ICT and CE equipment is rising very fast and now comprises 15% of global residential electricity demand
  - *Similar to the share for water heating or refrigeration*

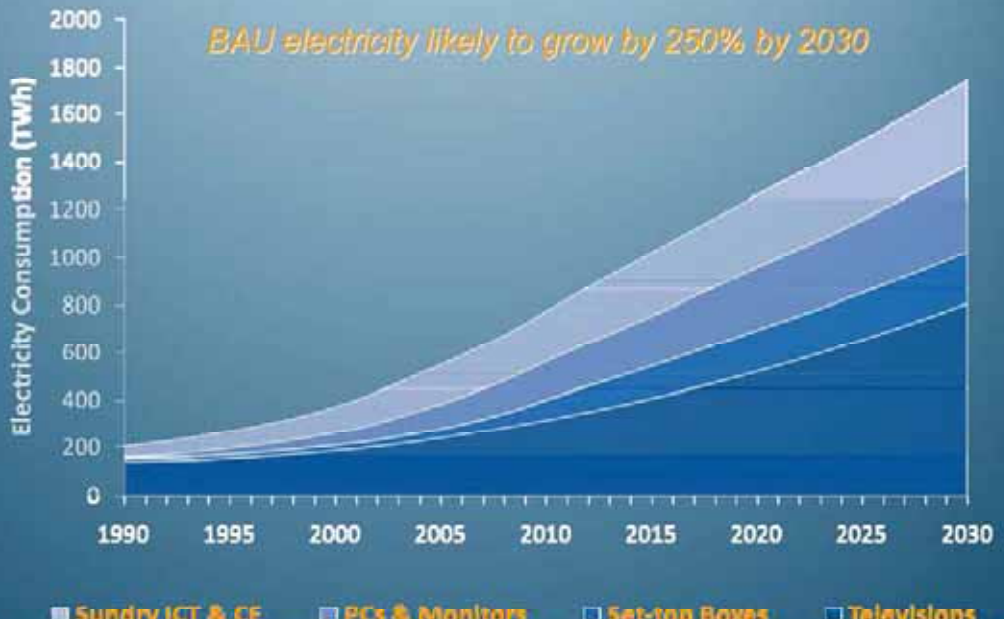
Gadgets and Gigawatts

The ICT and CE sector

- Electricity consumption by 'electronics' grew by nearly 7% each year from 1990-2008
- In 2008:
- 700 TWh of electricity each year
- 100 GW of generating capacity
- USD 80 billion in annual electricity bill

Gadgets and Gigawatts

Looking Forward



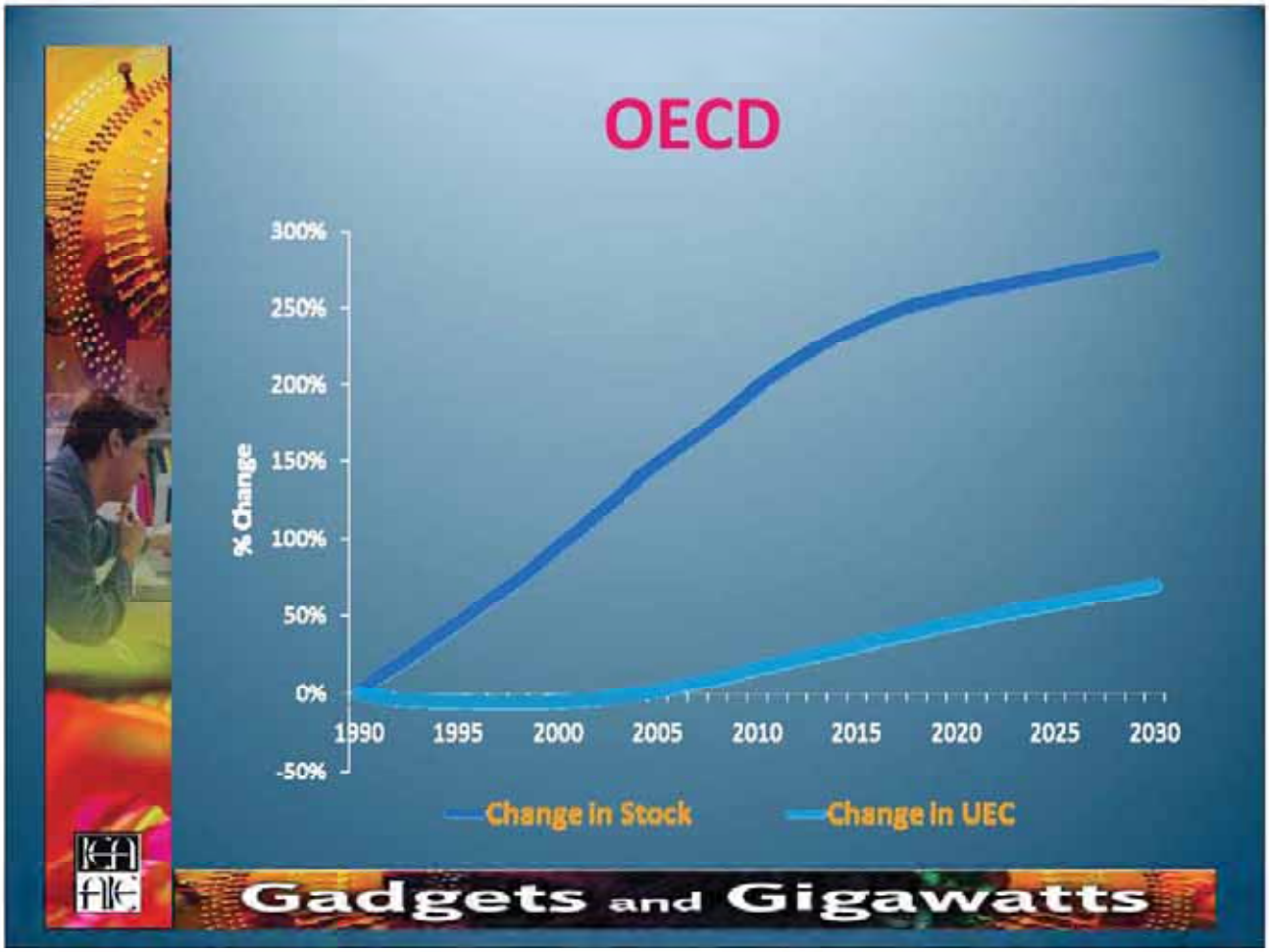
Gadgets and Gigawatts

Looking Forward

- BAU electricity likely to grow by 250% by 2030
  - *Majority of growth already coming from non-OECD countries*
  - *Equivalent total residential electricity consumption of the US and Japan*
  - *An addition of 280 GW of generating capacity*
  - *USD 200 billion in electricity bills*
- Would be more but for:
  - *convergence of technologies*
  - *growth in mobile applications, e.g. laptop computers*
- Could be more if:
  - *network devices keep products in high power modes to stay connected*

Drivers of growth

- Dramatic reduction in the purchase price of equipment
  - *Cut in cost of flat screen TVs, PCs, plus introduction of many low cost consumer items, e.g digital cameras, MP3 players, photo printers*
- Rapid growth in stock:
  - *The advent of households with multiple users*
  - *Introduction of highly desirable products, such as flat screens, but older stock remains in use*
  - *Switch off analogue TV broadcast by 2015*
    - *Leads to increased set-top boxes and digital TV*
  - *Greater access to services:*
    - *Penetration of pay-TV services, basic and specialised content*
    - *Users of Broadband grown by 300% since 2000 driving penetration of PCs*
- Increased unit energy consumption
  - *Growing hours of use per household*
    - *'New' activities and equipment: video gaming, recording, picture viewing and editing, digital picture frames*
    - *Simultaneous activities e.g. watching TV, surfing web, listening to music*
  - *Growing functionality often requires more energy e.g. high definition*

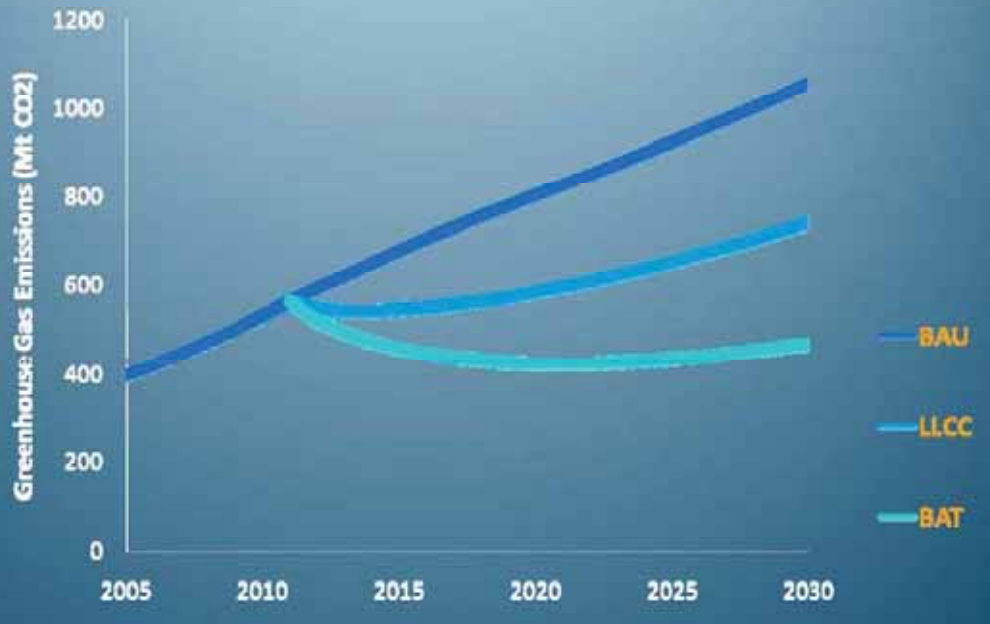

OECD
300%
250%
200%
150%
100%
50%
0%
-50%
% Change
1990
1995
2000
2005
2010
2015
2020
2025
2030
Change in Stock
Change in UEC
Gadgets and Gigawatts

An alternative future

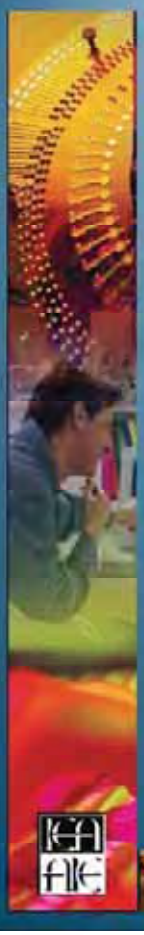
- Large savings potential though current technologies and power management:
  - *30% + savings available for no additional lifetime costs;*
  - *50% + savings available using current technologies at small cost (may be zero with a cost of carbon)*
  - *Additional savings through commercialisation of specific new technologies e.g. OLEDS*
- Best available technology (BAT) savings are:
  - *More than 50% of 2030 consumption*
  - *7% of the new electricity requirements between 2005 and 2030 (WEO)*
  - *USD 130 billion in 2030 consumer energy bills*
  - *Avoidance of 150 GW generating capacity*
  - *Stabilises GHG emissions*
- Since costs are falling fast, BAT may be LLCC soon!

Gadgets and Gigawatts

Greenhouse Gas Emissions



Gadgets and Gigawatts



Barriers to progress

- Focus on low first costs within highly competitive markets
- Poor consumer information on energy performance
- Energy saving opportunities spread over many devices
- Small benefits from individual items
- Long and complex supply chains
- Hidden costs and risks, e.g. potential for additional consumer confusion/complaints
- Failures due to principle agent issues in some market segments
- Most barriers will not be addressed by price signals, e.g. Carbon prices

Yet, where there are drivers for energy efficiency, industry has been highly innovative: see mobile devices

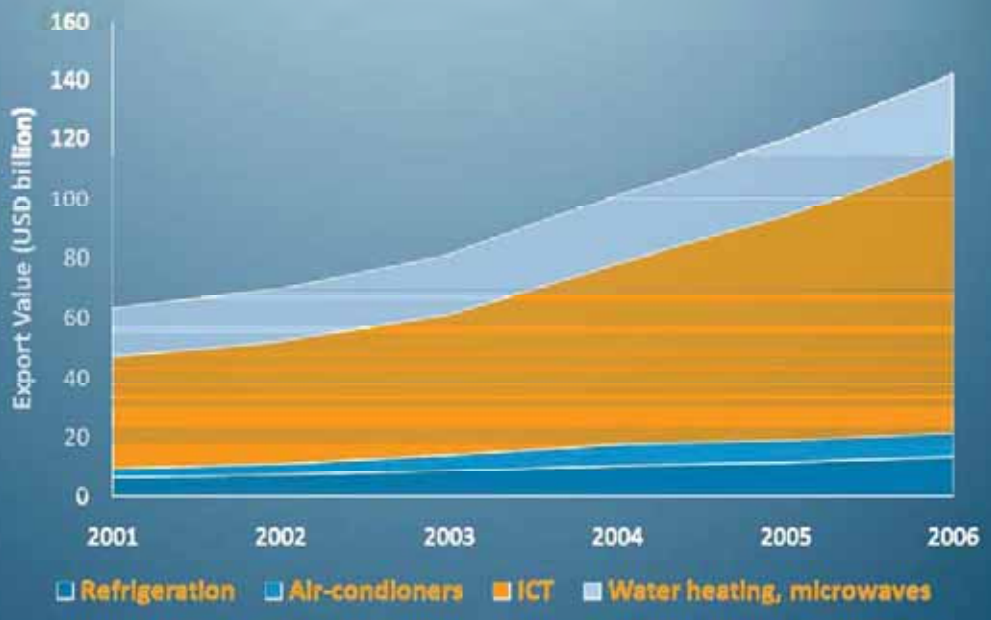
Gadgets and Gigawatts

Special attributes of electronics

- Electronic appliances reach high ownership rates *more rapidly* than many traditional household appliances
- The *ceiling* for ownership levels of electronic appliances is not well understood
- New functionality *accelerates turnover* prior to the technical end of life
- Electronic goods shipped with advanced features enabled which have an *energy cost*
- However the average consumer may *not use* these capabilities

Gadgets and Gigawatts

And traded internationally



Gadgets and Gigawatts

The role of government policies for ICT and CE

- These potential savings will not occur without policy intervention
- Policies should encouraging electronics to use their capacity to be smarter
  - *To regulate their power requirements to the functions provided, i.e. only use what they need*
  - *Automated so not reliant upon behaviour of consumers*
  - *Applied across the broad spectrum of electronic equipment*
- Countries should develop forward plans, co-ordinated with other economies and industry
  - *Specify long-term and interim targets (energy or ghg)*
  - *Identify policy measures to assist*

The book identifies more than 30 detailed policies for ICT and CE equipment

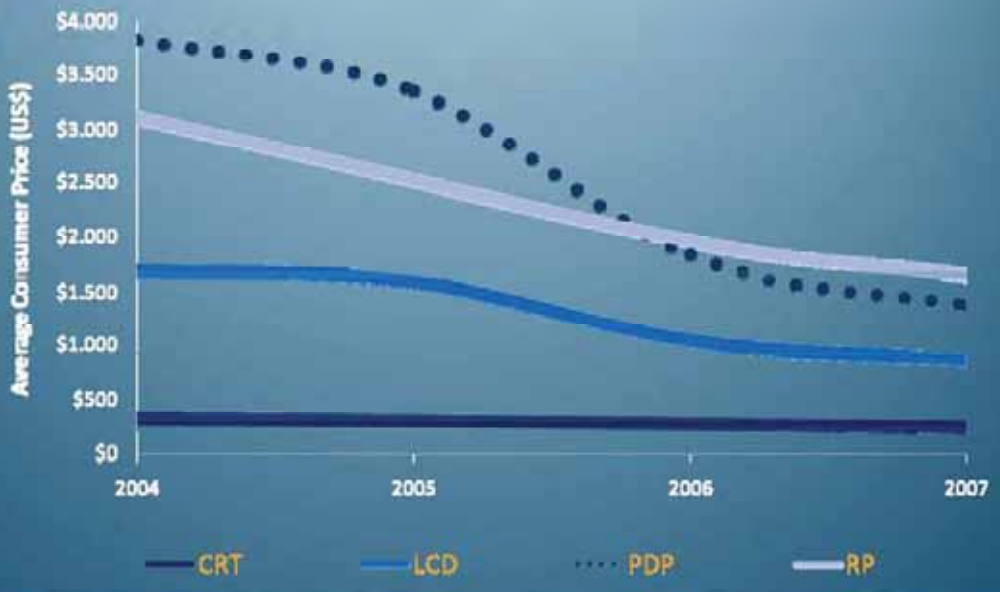
Gadgets and Gigawatts

The TV story

- A global stock of about 1.9 billion in 2005
- Over 1.3 sets per electricifed home
- TV market has experienced rapid change over past decade due to:
  - *New display technologies, more access to TV delivery platforms and the switchover to digital broadcasting*
  - *DVD players and digital recording devices have provided more choice in what and when programs are watched*
  - *TVs are connected to other devices to play video games, to view digital pictures and sometimes to listen to the radio*

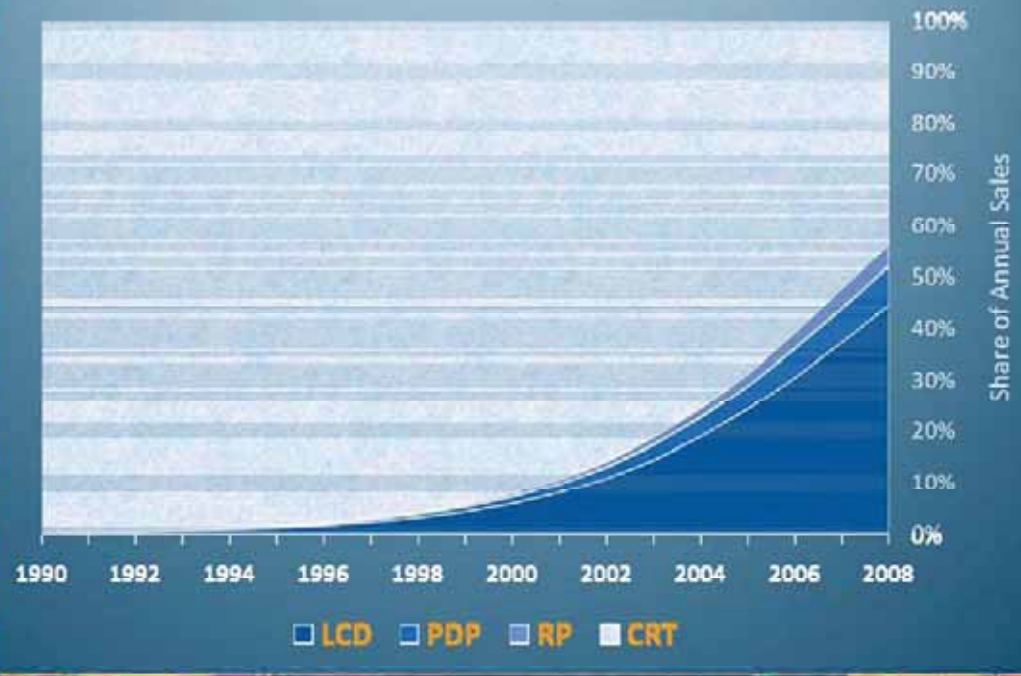
Gadgets and Gigawatts

The cost of screens have fallen



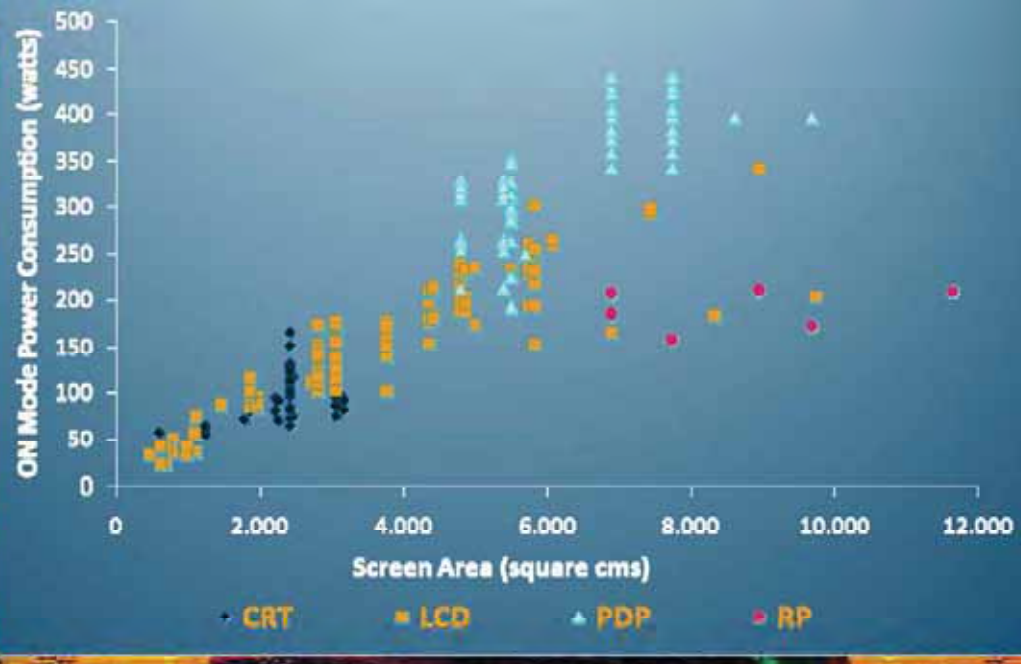
Gadgets and Gigawatts

The switch to flat screens has exceeded expectations



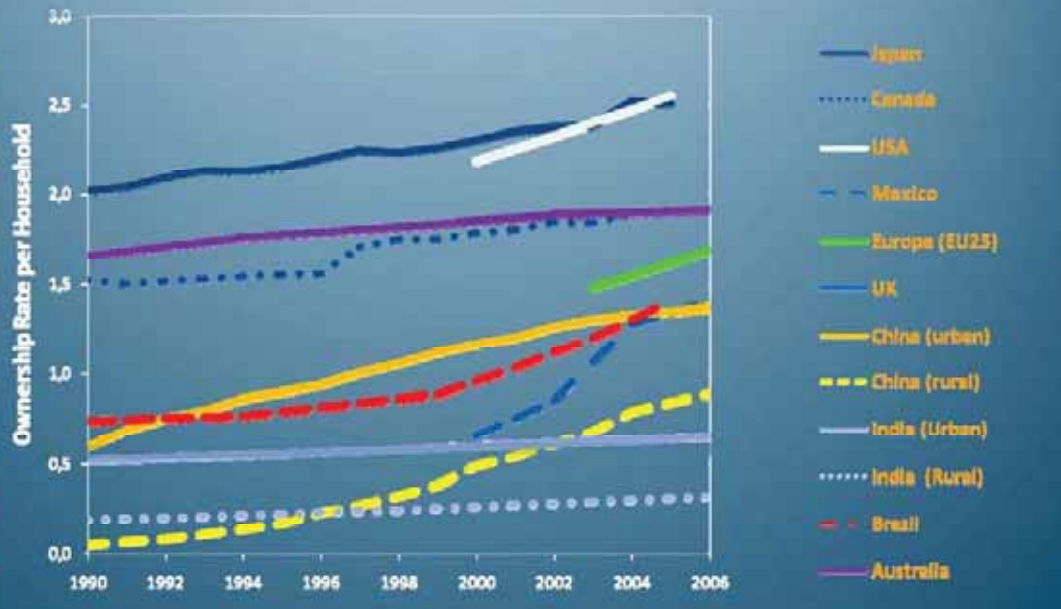
Gadgets and Gigawatts

Screen sizes have increased and also energy consumption



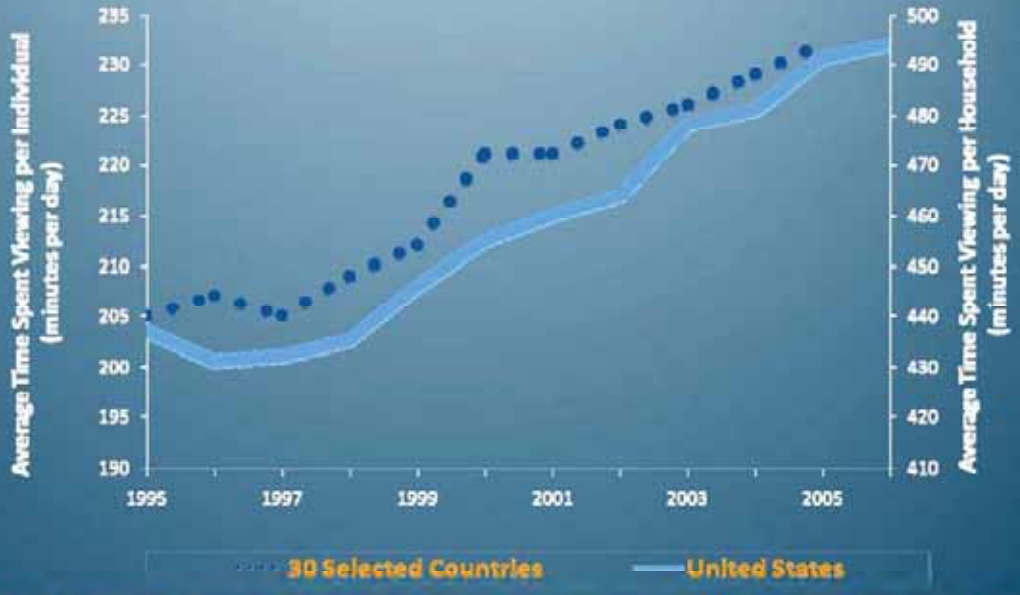
Gadgets and Gigawatts

The number of TVs per household has grown



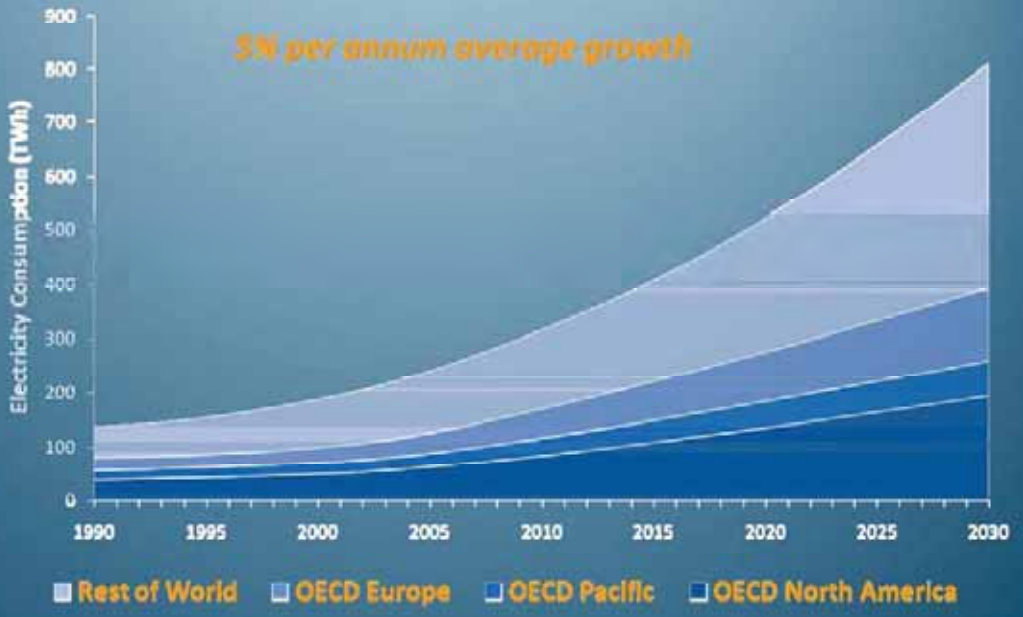
Gadgets and Gigawatts

TVs are used for more functions and are on for longer



Gadgets and Gigawatts

So energy consumption has grown, and will continue to do so



Gadgets and Gigawatts

Options for improvement

- Within each size bracket, energy consumption varies considerably
- Further savings from:
  - *Improved efficacy of lighting sources*
  - *Backlight dimming, occupancy and ambient light sensing*
  - *Improved luminosity for plasma TVs*
- More efficient power supplies
- Improved standby power consumption
- New technologies:
  - *OLED (organic light-emitting diode)*
  - *SED (surface-conduction electron-emitter display)*

Gadgets and Gigawatts

Policy approaches

- Aim to move the market towards the most efficient products available
- And provide a market incentive for manufacturers to offer increasingly efficient products.
- A combination of policies required, including minimum energy performance standards and energy labels.

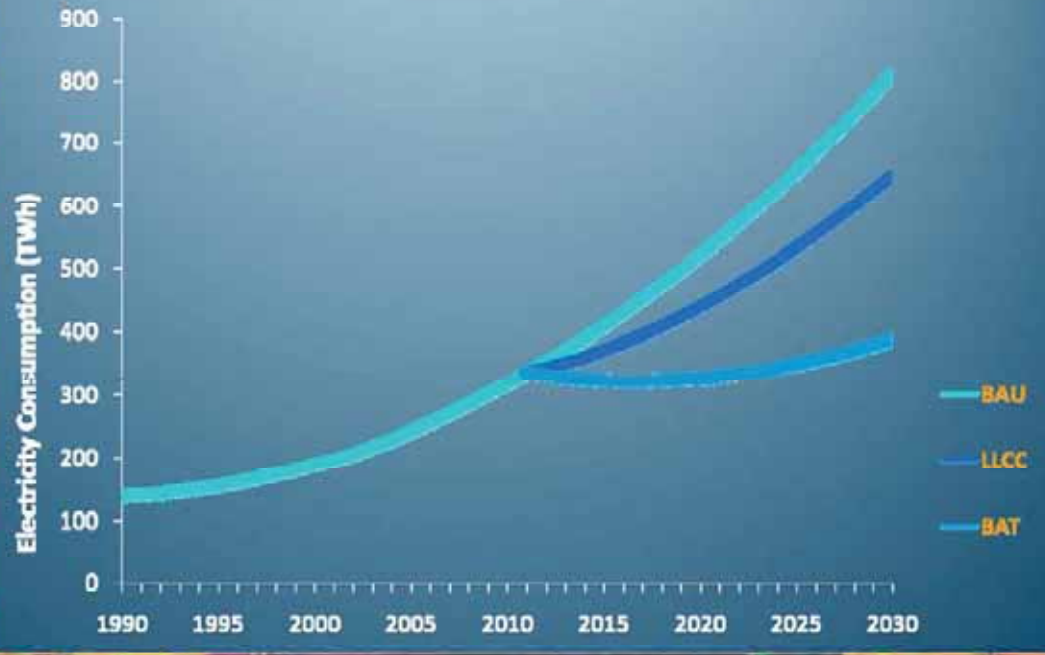
Gadgets and Gigawatts

Policy approaches

- Energy labelling should:
  - *Be technology neutral to allow consumers to compare all types of televisions*
  - *Reflect energy consumption by requiring larger screens to meet more stringent levels compared to smaller screens*
- Policy measures should move towards horizontal measures spanning all display technologies, with allowances for particular functions, such as for tuners.
- Strategies implemented to support the rapid commercialisation of new television technologies
  - *e.g. advance backlight modulation of LCDs and OLEDS, but other options may also warrant this support.*

Gadgets and Gigawatts

Implementing these measures would halve energy consumption

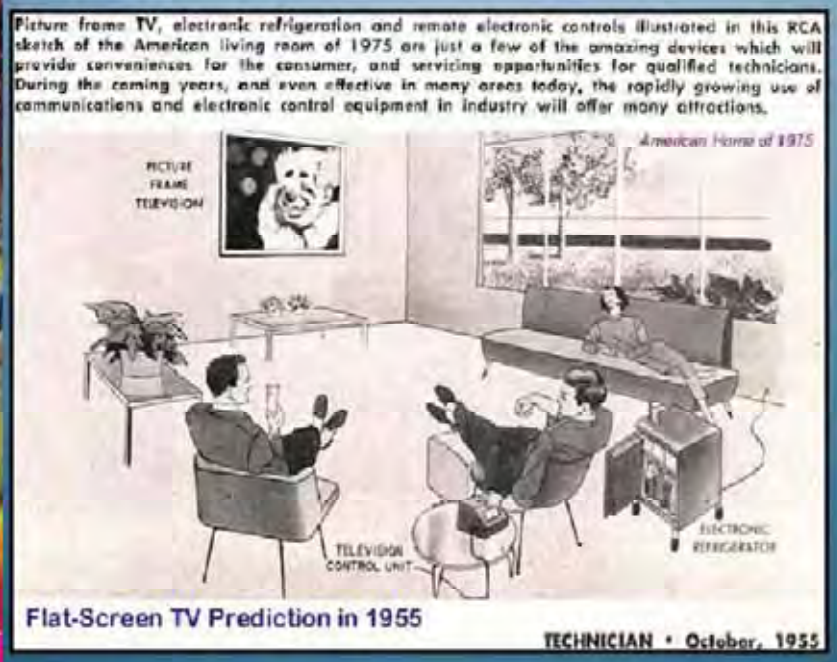


Gadgets and Gigawatts

Key messages

- Energy used by ICT and CE represents a major challenge to governments policy commitments
- Solutions are available which are:
  - *Cost effective*
  - *Available now*
  - *Neutral to consumer choice*
- But require strong government and industry leadership and co-operation
- Investment by governments in the capacity of energy efficiency programmes as primary delivery mechanism

Gadgets and Gigawatts



This was the future in 1955.

What does our vision of the future look like?

Gadgets and Gigawatts

Thank you for listening

Mark Ellis

Mark Ellis & Associates

E: mark@energyellis.com

Gadgets and Gigawatts

Trends in US Energy Consumption and US Responses

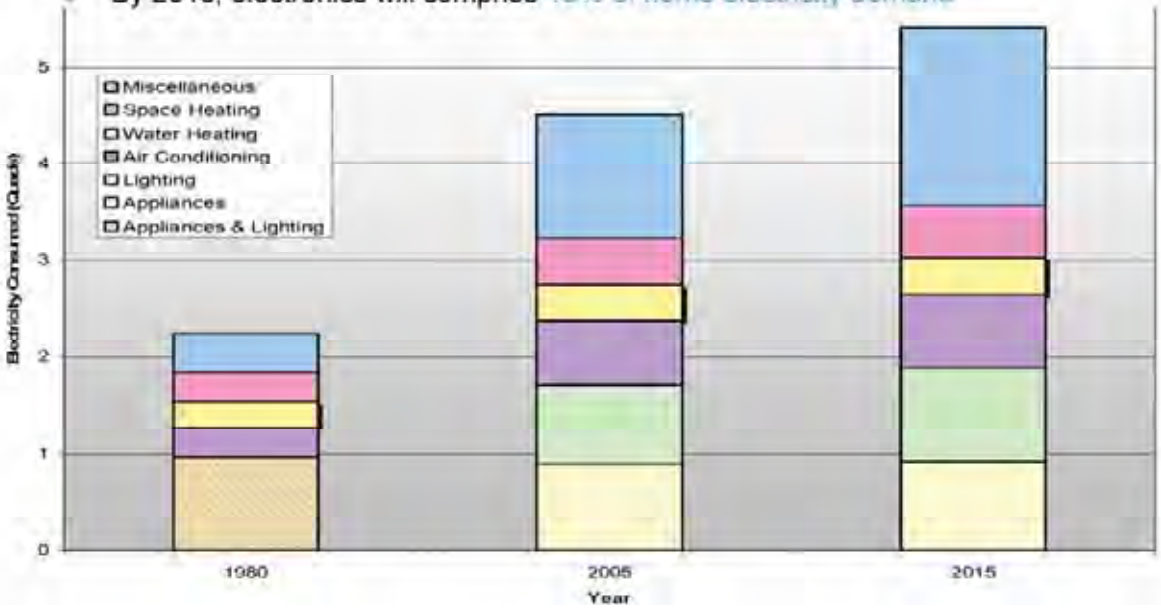
Alan Meier
Lawrence Berkeley Laboratory
March 5, 2010

Agenda

- US Energy Consumption Trends
- US Tools to Address:
  - EnergyGuide Label
  - Minimum Efficiency Standards
  - ENERGY STAR Label
- Accomplishments, next steps

Trend: Growing U.S. Energy Consumption

- Electricity consumed by the typical American household has more than doubled since 1980
  - Expected to rise another 20% by 2015
- Miscellaneous consumption quickly increasing
  - 2 categories of miscellaneous
  - Largest component of miscellaneous is electronics products
  - By 2015, electronics will comprise 18% of home electricity demand

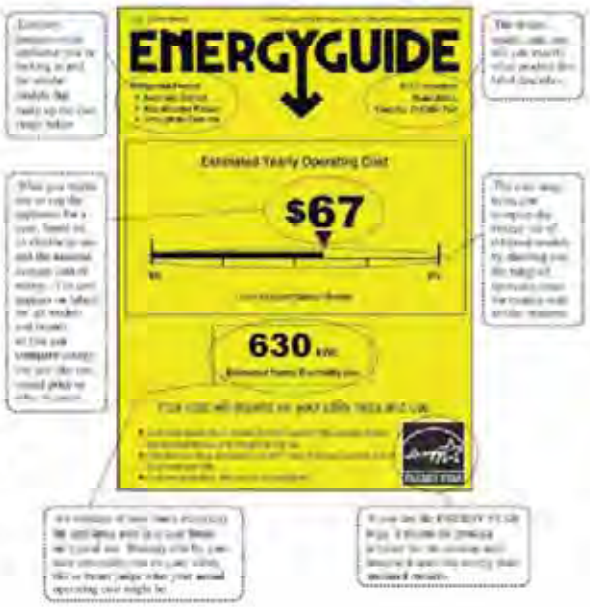


Programs to Reduce Appliance Energy Use in the U.S.

- EnergyGuide Labels "information"
- Minimum Efficiency Standards "regulation"
- ENERGY STAR Label "endorsement"

EnergyGuide Label

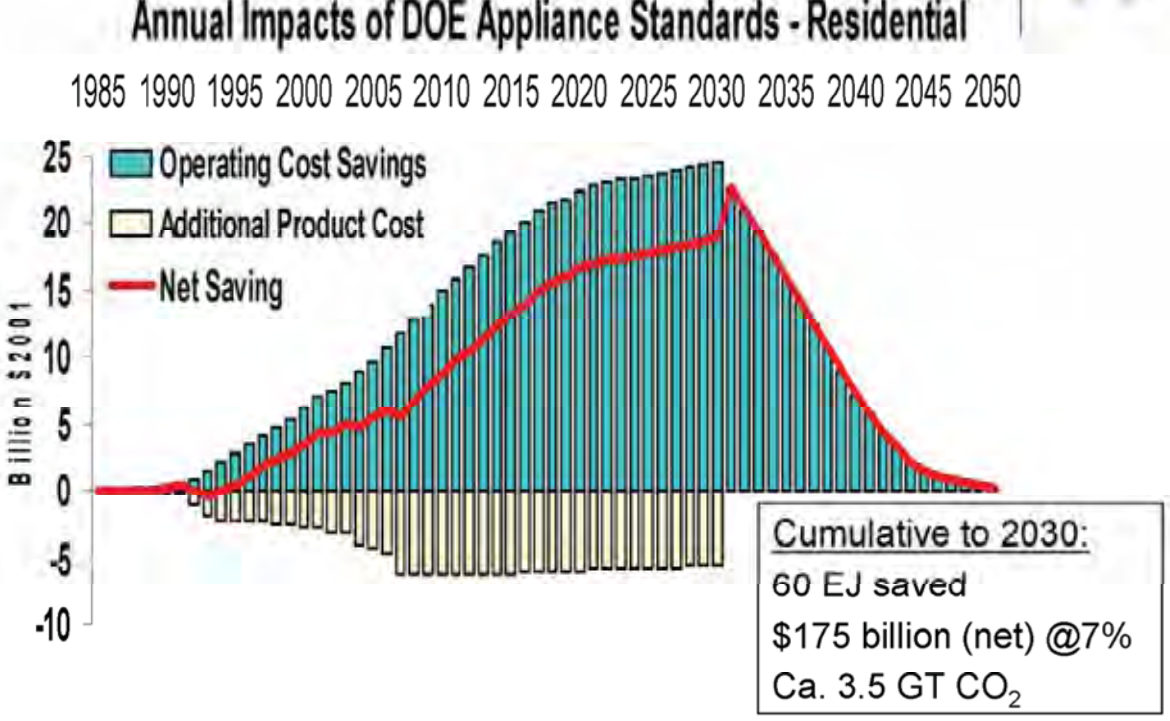
- The EnergyGuide label is the government-backed program that allows consumers to compare the energy use of different appliances
  - Products include: clothes washers, dishwashers, refrigerators, freezers, wate heaters, window air conditioners, central air conditioners, furnaces, boilers, heat pumps, ceiling fans, plumbing products, and pool heaters



U.S. Appliance Standards

- HIGH PRIORITY with the Obama administration
- DOE has ~25 rules (test procedures or standards) to complete by January, 2013
  - http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/multiyear_schedule_022310.pdf
- *Pace is about 6X previous administrations*
- Considering cost of carbon
- Increasing testing and enforcement

National Impacts: Energy Bill Savings Outweigh Increased Cost of Standards



U.S. Appliance Standards Being Updated or Developed (1 of 2)

- Distribution transformers
- Electric motors (small and medium)
- Central air conditioners and heat pumps
- Room air conditioners
- Water heaters
- Residential furnaces and boilers and furnace fans
- Refrigerators, refrigerator-freezers and freezers
- Direct heating equipment and hearth products
- Swimming pool heaters
- Clothes washers (residential and commercial)
- Clothes dryers

U.S. Appliance Standards In Progress (2 of 2)

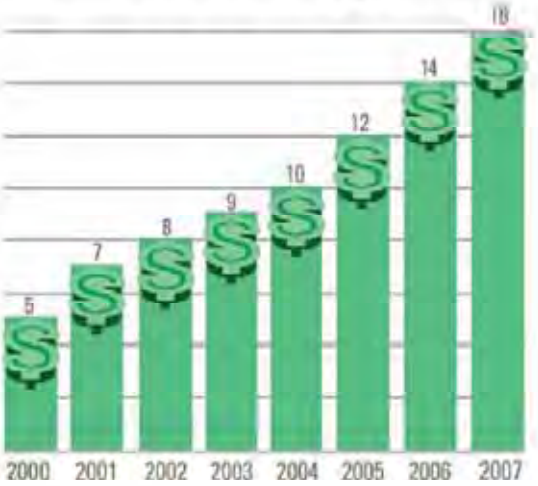
- High-intensity discharge lamps (determination)
- Fluorescent lamp ballasts
- Metal halide lamp fixtures
- ER, BR, and small diameter incandescent reflector lamps
- Dishwashers
- Cooking products, including microwave ovens
- Commercial refrigeration equipment
- Walk-in coolers and freezers
- Battery chargers and external power supplies
- Televisions

ENERGY STAR

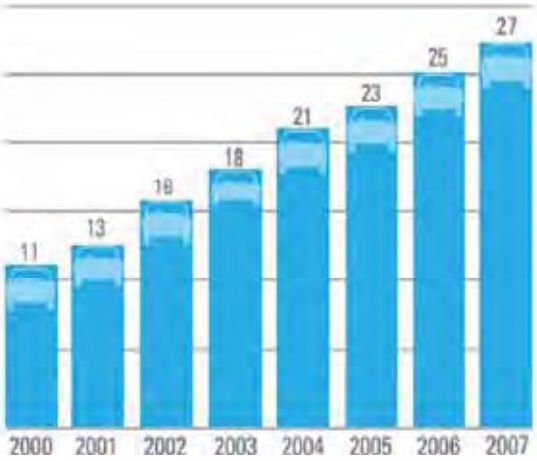
- ENERGY STAR identifies products in more than 60 categories that use less energy without sacrificing quality or performance
  - >2,000 manufacturers labeling
  - >40,000 product models
  - >1,000 retail partners
  - >550 utility partners promoting ENERGY STAR

ENERGY STAR Impacts

- Americans with the help of ENERGY STAR prevented 40 million metric tons of GHG emissions - equivalent to 29 million vehicles and saved $19 billion on energy bills

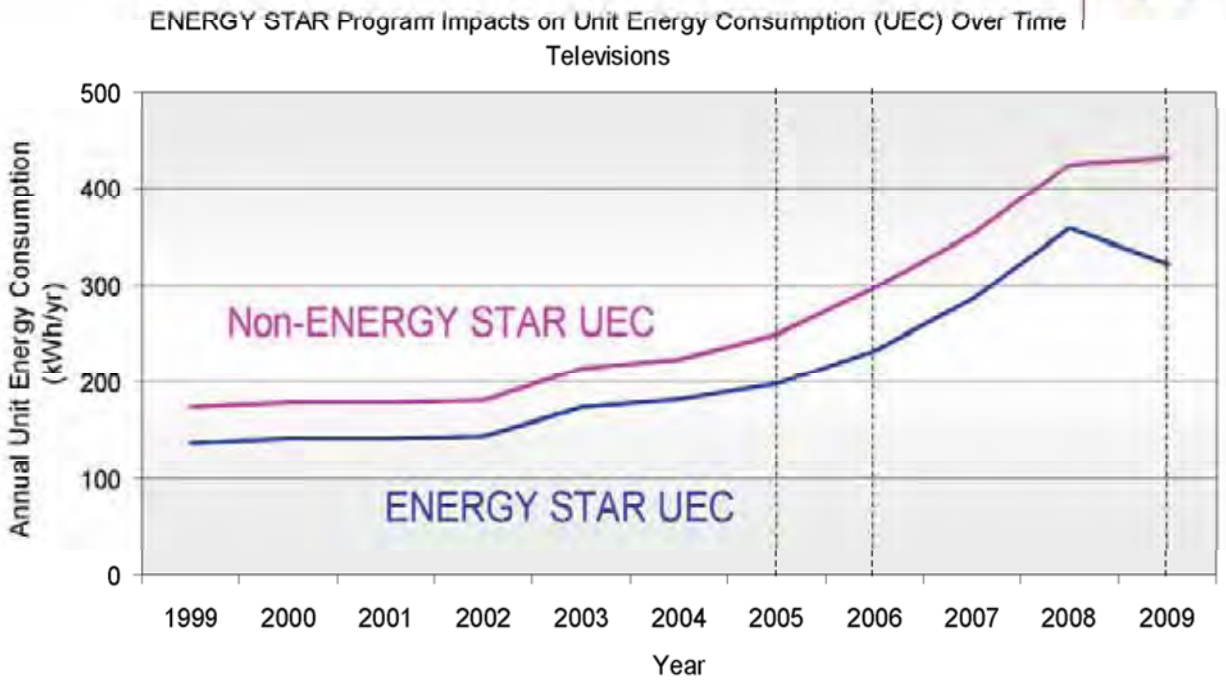


UTILITY BILL SAVINGS
(in billions)



EMISSIONS SAVED IN
VEHICLE EQUIVALENTS (in millions)

ENERGY STAR Impacts – TVs



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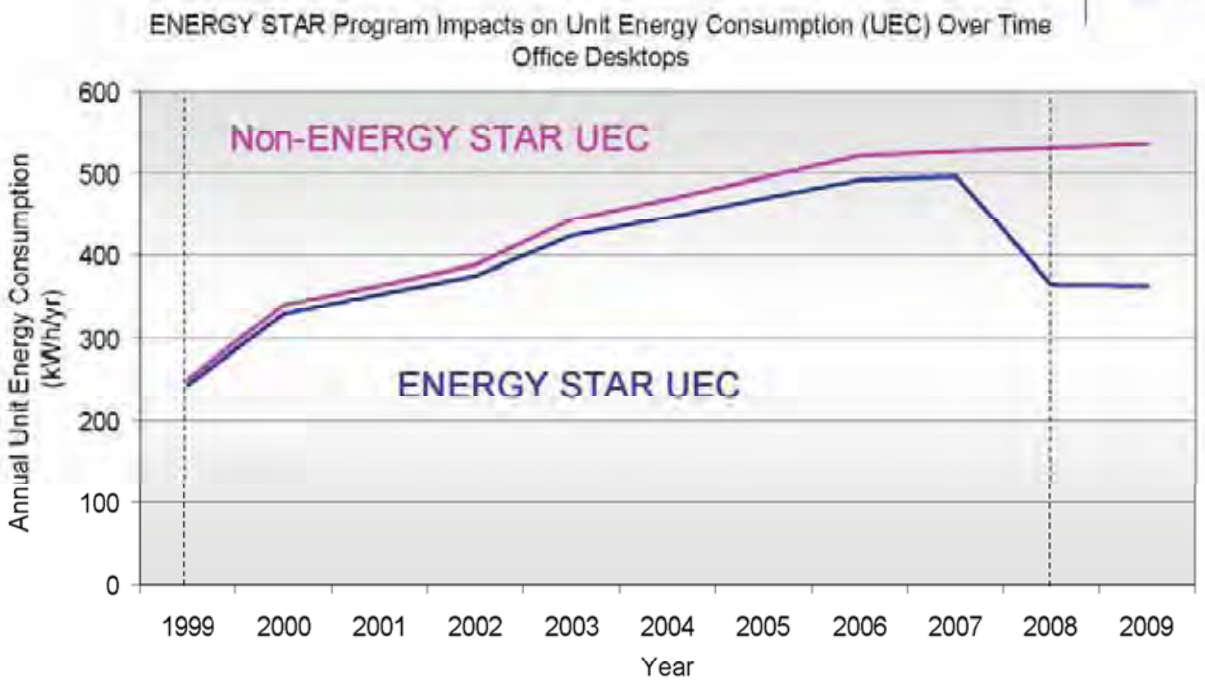
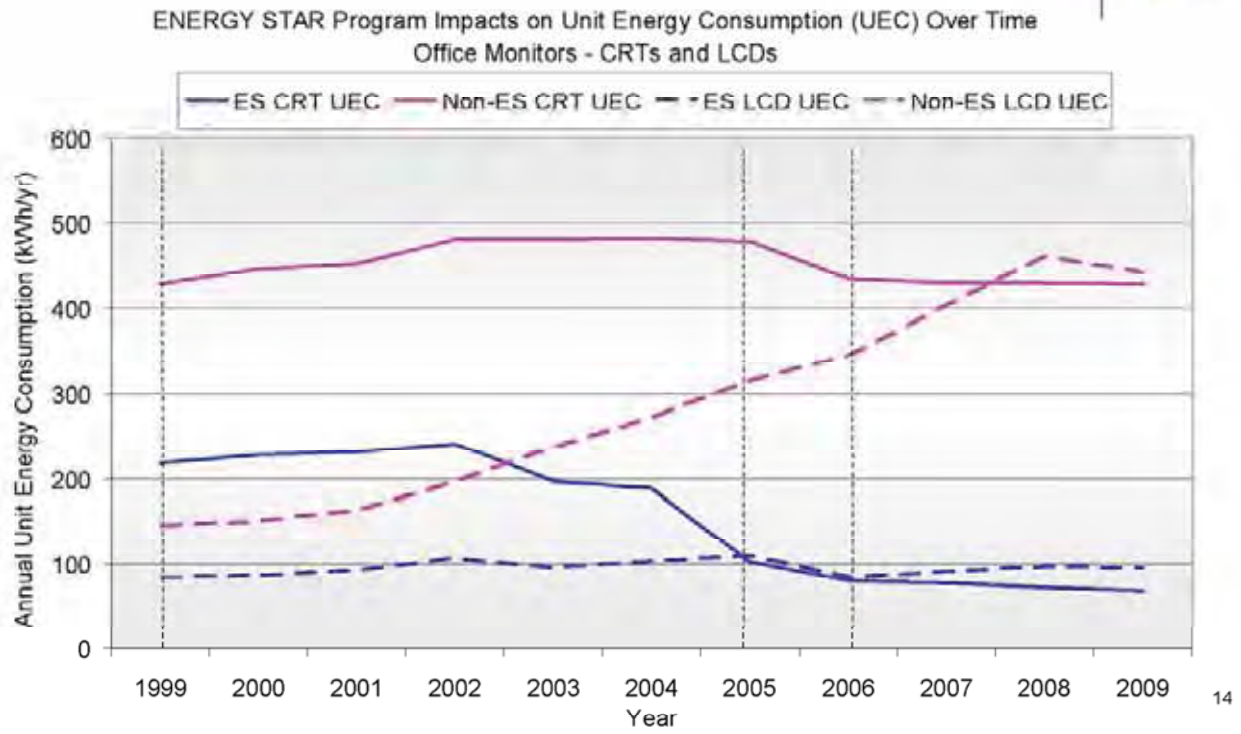
ENERGY STAR Impacts – Desktop Computers



ENERGY STAR Impacts - Monitors



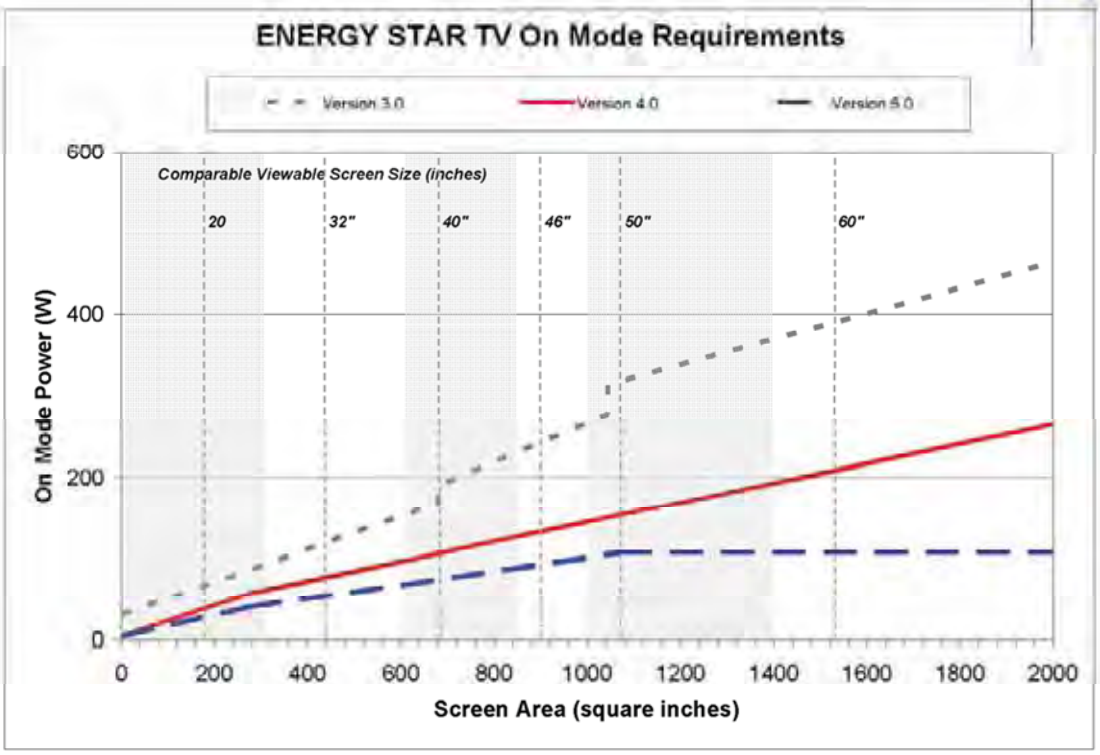
ENERGY STAR Enhancement Plans: Overview

- Increase number of new ENERGY STAR products added each year
- Complete more frequent updates to ENERGY STAR criteria
- Enhance testing procedure review, improvement, and development
- Enhance product verification, testing, and enforcement
- Complete research related to an ENERGY STAR top-tier program.

ENERGY STAR TVs: On Mode Limits

- ENERGY STAR Versions 4.0 and 5.0 TV Specification finalized September 2009
- Version 5.0, effective May 2012, requires On mode power consumption at 108 Watts for *ANY* TV larger than 50 inches
  - As TV size, functionality, and power consumption continue to grow, there are limits on what can be recognized as environmentally preferable
  - Considered limiting eligibility to 50 inch TVs or smaller, but recognized that larger TVs should be able to qualify if they too consume less than 108 Watts in On mode.

ENERGY STAR TVs: On Mode Limits



Looking Beyond the Energy Use Phase to Deliver Greater Benefits

- Goal: to secure greater GHG reductions and enhance the value of the label
- Questions to answer:
  - Are upstream and downstream GHG emissions an important part of total product GHG emissions? Under what circumstances? What type of products?
  - If GHG's significant, what are options to address them?

Conclusions

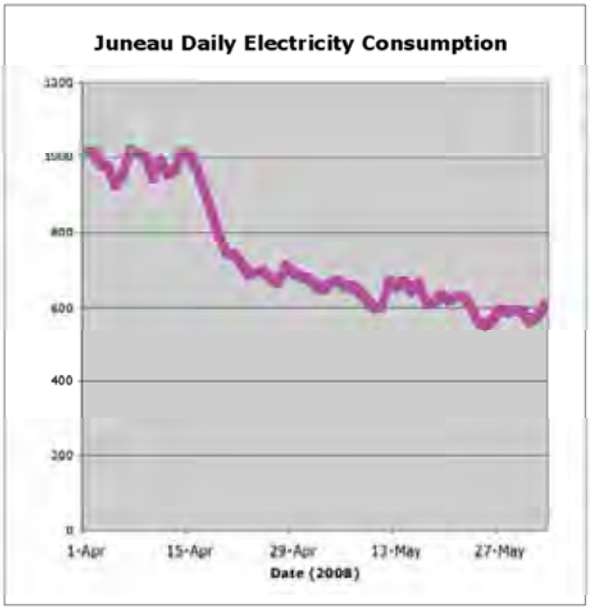
- The United States has a comprehensive program to promote energy efficient equipment through labels, endorsements, and regulations
- The efficiencies of appliances responsible for >80% of residential energy use are covered by mandatory regulations
- All of the programs are regularly updated to reflect improved technologies and products
- The missing element: behavior…

Avalanche Cuts Electricity Transmission Line to Juneau, Alaska (April 2008)

- Generation shifts from hydro to diesel
- Electricity prices rise 500%
- Repairs expected to take 3 months
- Juneau requested LBNL's advice to organize conservation campaign

Juneau Cuts Electricity Use 40% in 6 Weeks

Juneau organized a conservation campaign in 5 days



Sample conservation measures:

- Lower thermostats
- Reduce lighting
- Cut hot water use
- Install compact fluorescent bulbs
- *Reduce standby power*, unplug electronics, and use power strips
- Shorten business schedules
- Conserve cold water
- Switch off airport runway lights

An alternative approach: "Name and Shame"

Does this violate Armstrong's privacy?

Champion Cyclist and Now Champion Guzzler of Austin Water

HOUSTON — Lance Armstrong is one of the favorite sons of Texas and a model citizen known as much for his social conscience as his cycling. So it came as a surprise when it was revealed this week that he is one of the biggest individual users of water in Austin, where he lives.

Say it ain't so, Lance!

In July, Mr. Armstrong, who won the Tour de France seven times, used a whopping 330,000 gallons of water at his lush Spanish-colonial home, with an acre of gardens and a swimming pool, city water authority officials said.

This tremendous flow of H2O, which is 38 times what the average household in the city uses in the summer, comes as Texas is going through a dry spell and officials are asking people to cut back on watering their lawns. "We are definitely short on rain," Lisa Rhodes, a spokeswoman for the authority, said with a sigh.

Mr. Armstrong declined to be interviewed. He has been in Colorado and California all summer and only noticed the surge in water use when he saw his bills go up, his spokesman, Mark Higgins, said in an e-mail message. (The bill for July was $2,460.)

Let's go to Florida!

Gainesville

Population: 130,000

University town

Municipal utility

Let's examine some *real* homes

HTTP://GAINESVILLE-GREEN.COM/

Electronics for Efficient Use of Energy

Herbert Pairitsch
Senior Manager Technology & Innovation
Power Management Discretes
Infineon Technologies Austria AG

IEA 4E Outreach Workshop
Vienna, 5th March 2010

Index

Infineon at a Glance

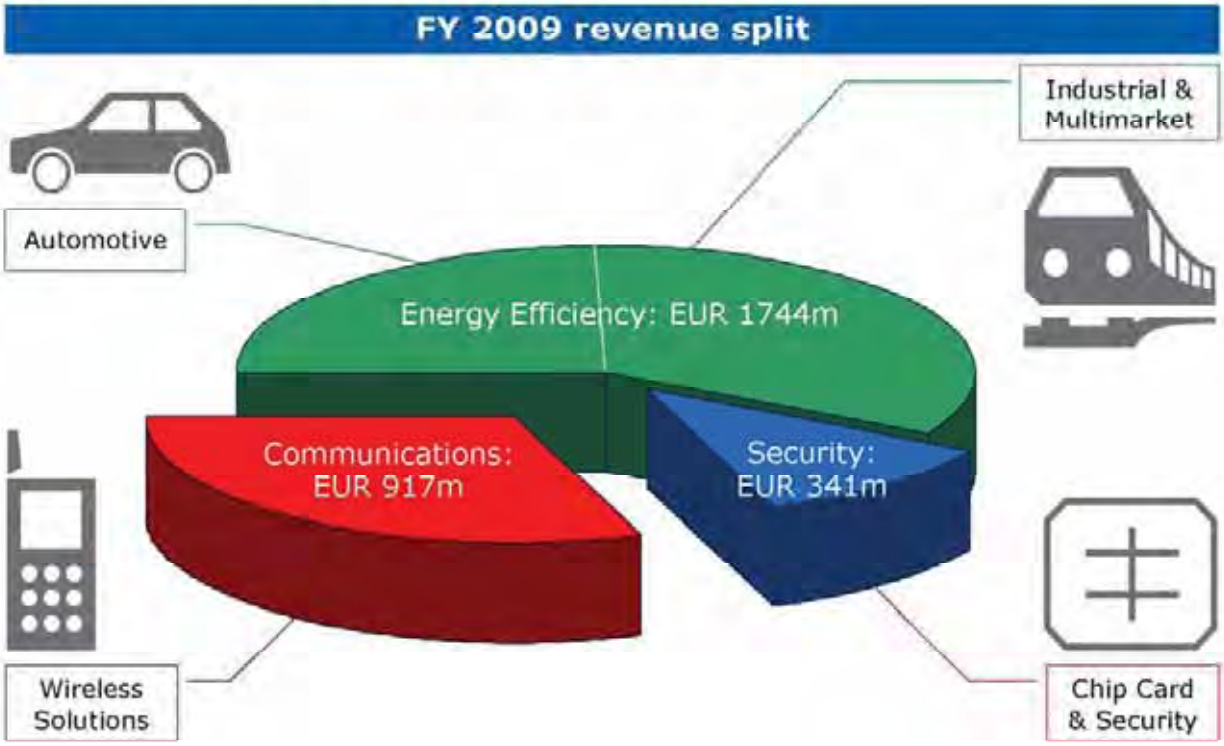
The Company

- Infineon provides semiconductor and system solutions, focusing on three central needs of our modern society: Energy efficiency, Communications and Security
- Revenue in FY 2009: 3.027 billion EUR
- Some 26,000 employees worldwide (as of Sept 2009)
- Strong technology portfolio with about 22,900 patents and patent applications
- More than 30 major R&D locations
- Germany's largest semiconductor company

Infineon's Rankings

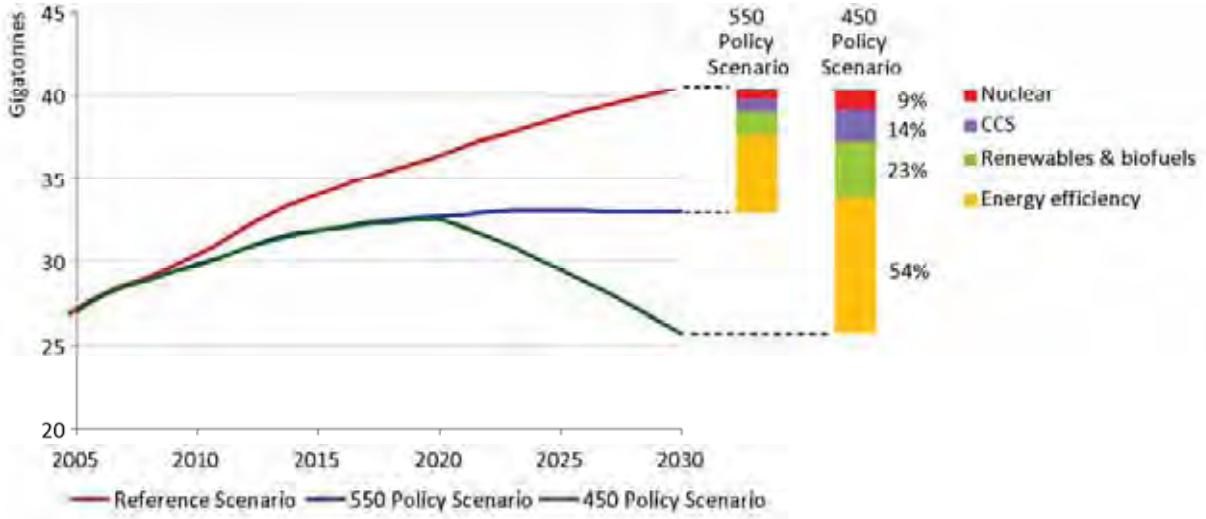
Power	Industrial	Chip Card	Auto-motive	Wireless ASSP
#1	#1	#1	#2	#4
Market share 10%	Market share 8%	Market share 26%	Market share 9%	Market share 6%
IMS Research, July 2009	Semicast, May 2008	Frost & Sullivan, October 2009	Strategy Analytics, July 2009	iSuppli, March 2009

Focus Areas and Target Markets
Revenue Split by Focus Area



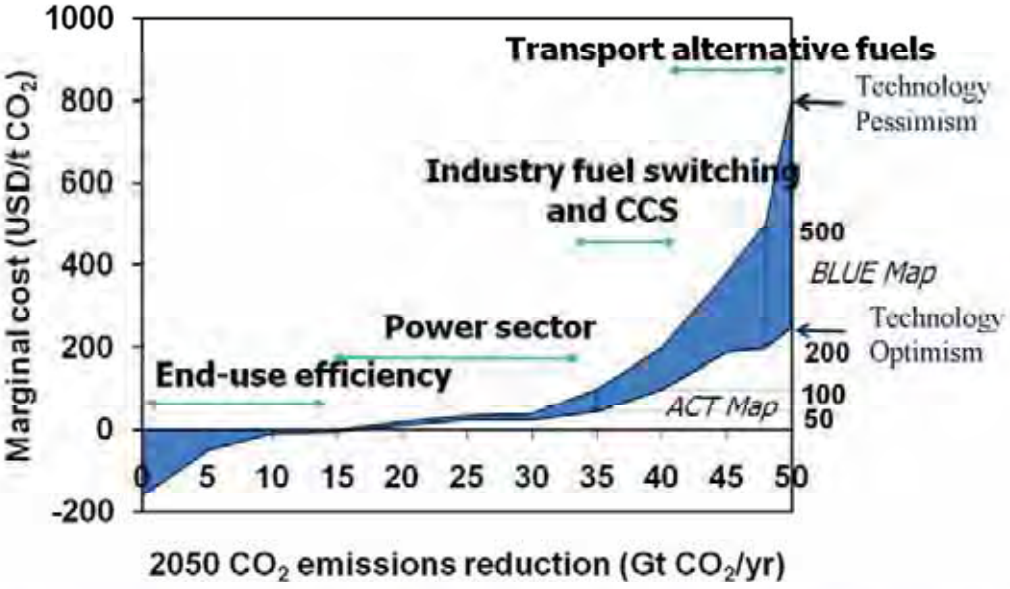
What is one of the most important topics of the present?

CO_2-Reduction in different Scenarios (WEO 2008)



Source: Peter Cunz, BMVIT Wien, 24.11.2009

Potential Savings and CO_2 reduction by improving End-use efficiency (ETP 2008)



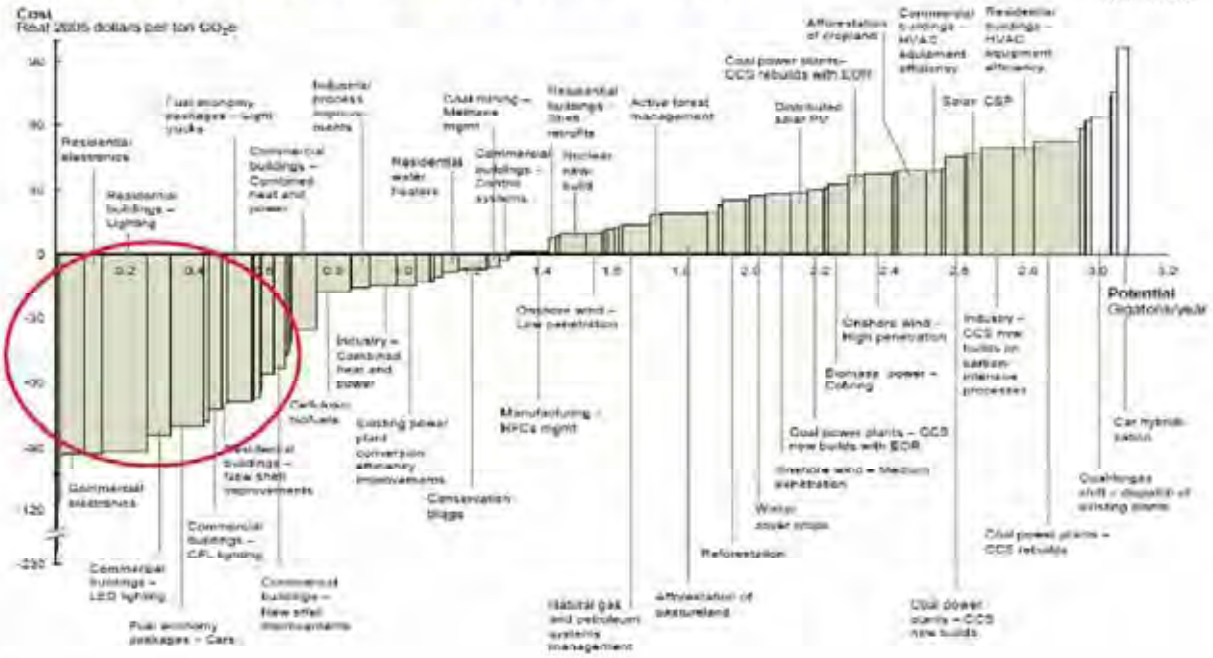
To bring emissions back to current levels by 2050 options with a cost up to USD 50/t are needed. Reducing emissions by 50% would require options with a cost up to USD 200/t, possibly even up to USD 500/t CO_2

Source: Peter Cunz, BMVIT Wien, 24.11.2009

More detailed CO_2 abatement cost (McKinsey 2009)

Exhibit 11

U.S. MID-RANGE ABATEMENT CURVE – 2030



Source: McKinsey analysis

Usage of electrical energy per application

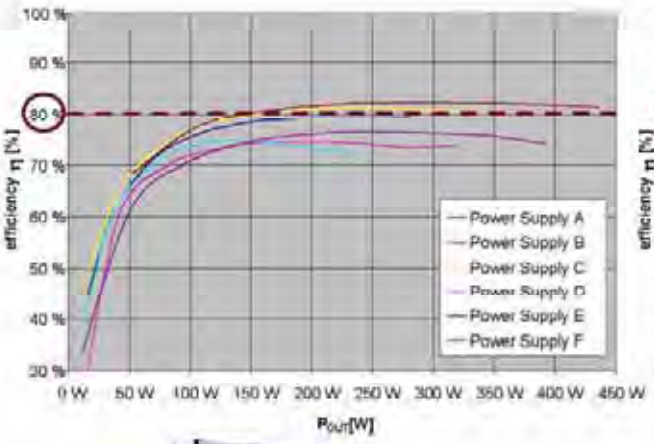
Consumers electrical energy (ww)	Energy Split: ww		Energy saving potential	Key technology
Con. power supply: - stand-by, - active, …	Others 14%	- stand-by - active	>90% >>1%	CoolMOS, SiC Smart control IC CoolSET
I&C, Computing power supply, …	Internet 10%	80+ / 90+	>>1%	CoolMOS, SiC, Smart control IC, Low cost µC
EC-Ballast Daylight dimming HID, LED, …	Lighting 21%	Electronic control	>25%	CoolMOS Smart ballast IC Low cost µC
Factory autom. Process engineering, Heavy industry, Light industry, …	Motor control 55%	Variable Speed Drive (VSD)	>30%	IGBT Modules CiPOS EMCON CoolMOS CT
Transportation: Train, Bus, Car, …		VSD + Bi-directional energy flow	>25%	
Home appliance: Fridge, WM, HVAC, …		VSD	>40%	Optimized µC 8 bit / 16 bit / 32 bit

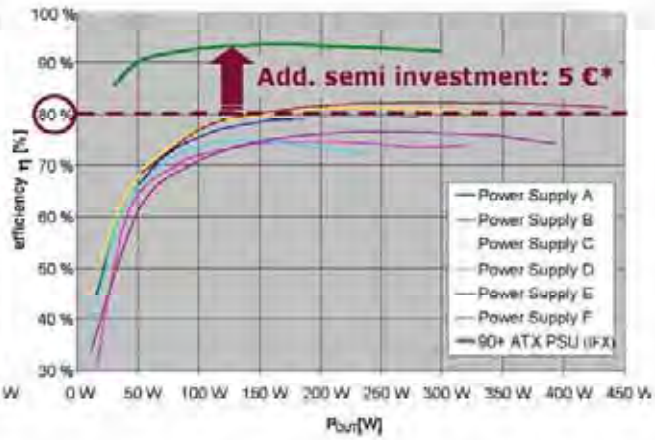
Source: ZVEI, Siemens, CEMEP, CPES, EPA, NRDC

Examples: PC power supply

Conventional power supplies achieved efficiency of around 70%-80%

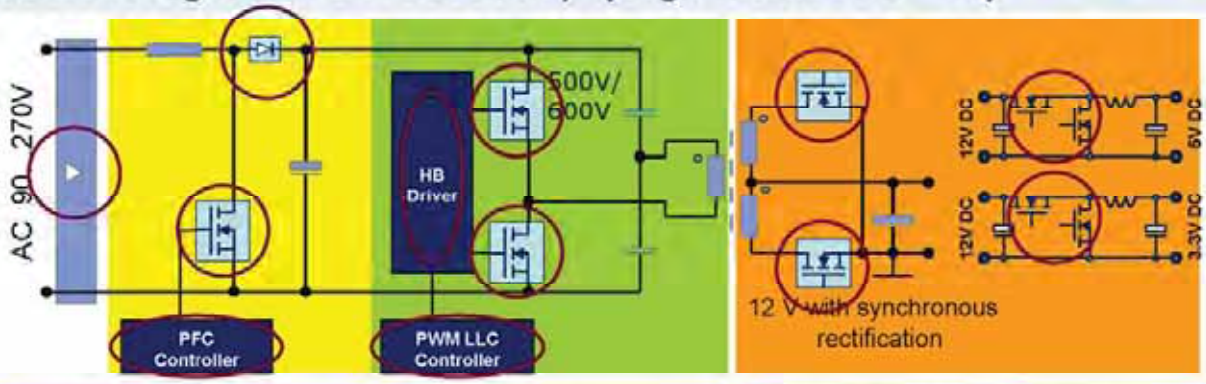
Today, we are able to achieve >90% efficiency, with an additional expense of ~ 5€





*Infineon estimation at system level for a 300W power supply

New circuit topologies and advanced power technologies are necessary (e.g. CoolMOS™ ...)



PFC stage
- ensures current to follow voltage sine wave, PF=1
- hard sw., 64..100 kHz
- CoolMOS 500V/600 V, 199 mOhm
- SiC Schottky diode 600V
- CCM PFC IC

PWM stage
- Galvanic insulation
- hard or resonant sw., 100..200 kHz
- CoolMOS 500V/600 V, 199 mOhm
- PWM IC and Half Bridge Driver

Secondary rectification
- synchronous rectification for 12V
- hard commutation, 100..200 kHz
- OptiMOS 60..100 V, 5..10 mOhm
- Buck Stages for 3.3V and 5V

Indicates Power Semiconductor content

Huge savings and CO2 reduction potential

In EU alone, :

- Approx. 40 mio[1] new PCs are sold per year
- 300W silverbox running at average load of 50%;
- For 8h per day;
  - ⇨ Electrical energy consumption would be **17,5 TWh per year**
  - ⇨ 10% efficiency increase ≙ saving of **1,75 TWh per year**

Applying:

- 0,13 €/kWh[2]
- 500g CO_2/kWh[3]

Would result in:

228 mio € in electricity consumption savings and subtracting addtional expense of €5 per power supply per new PC (200 mio €) would result in :

⇨ **Net savings of ~ 28 mio € per year &**

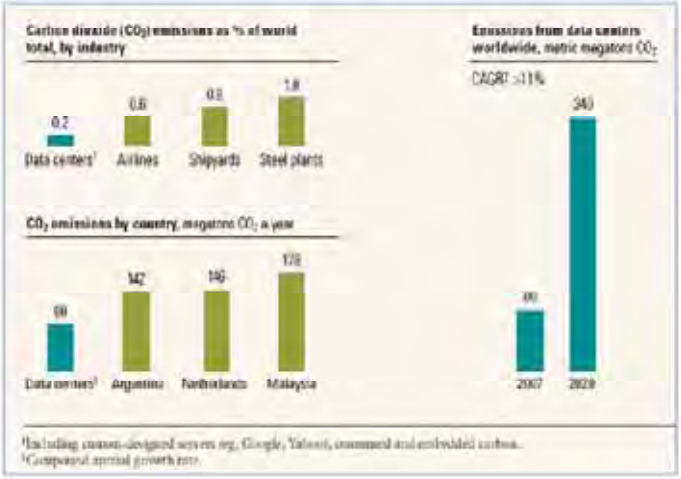
⇨ **875.000 tonnes CO_2 per year**

≙ elimination of 300.000 cars[4] per year !

Sources: 1) Infineon estimate based on external analyst figures (Gartner 2008)
2) estimate based on mix for Households and Industry for 2007 in EU-27 (Eurostat yearbook 2008)
3) average based on values from literature ranging from 375g CO_2/kWh (EU-commission) to 750 g CO_2/kWh (Solar World)
4) 150g CO_2/km, 20.000 km per year

Data centers' global emissions approach those of Argentina or Netherlands

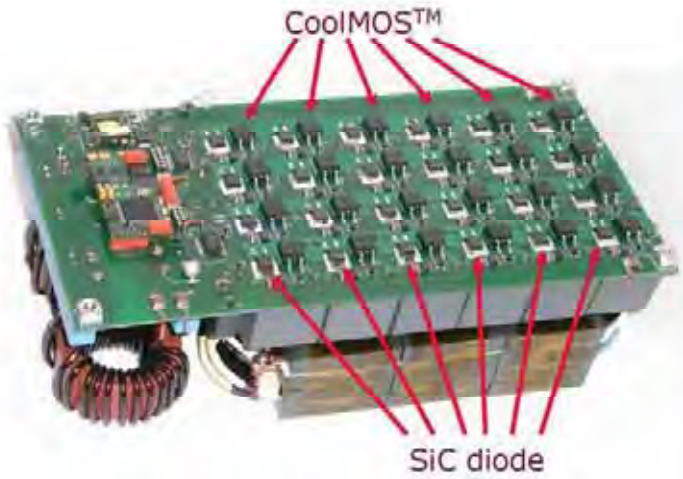
Data centers account for 1-2% of global electricity consumption



Raising number of servers

Sources: Advanced Micro Devices; Financial Times; Gartner; Stanford University; Uptime Institute; McKinsey analysis, 2008; iSuppli, 2009

Ultra-efficient 3.3kW demonstrator in SMD technology for Servers

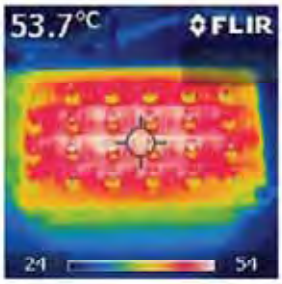


World record efficiency achieved!

Input:	195...254V
Output:	365V, 3.3kW
Dimensions:	275 x 130 x 85mm³
Power Density:	1.11kW/dm3
Efficiency:	**>99%**

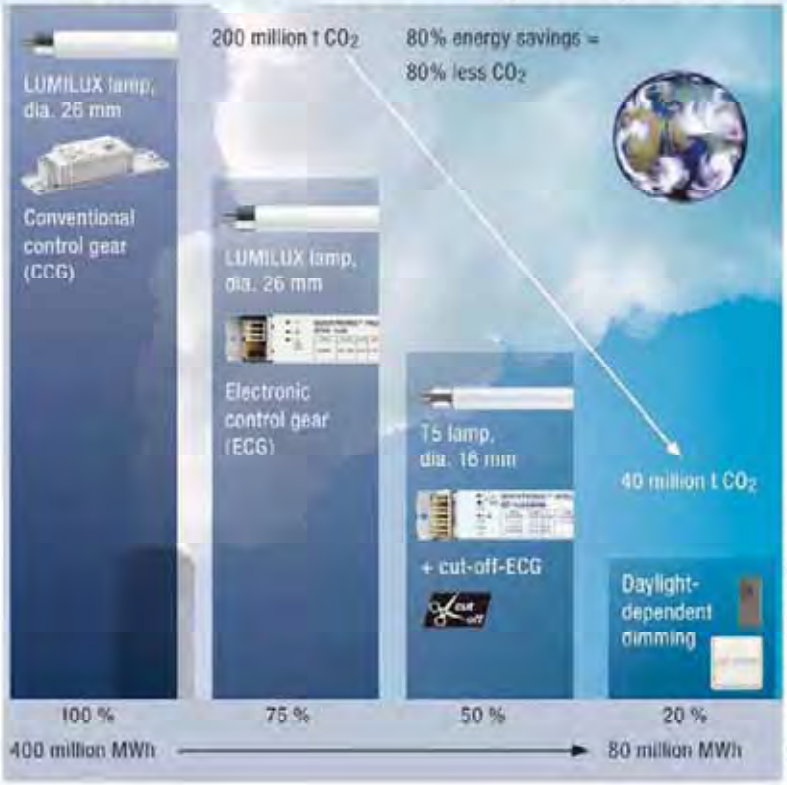
Due to low losses in the semiconductor devices neither heat-sink nor fan is required

Thermal image after 1 hour full operation



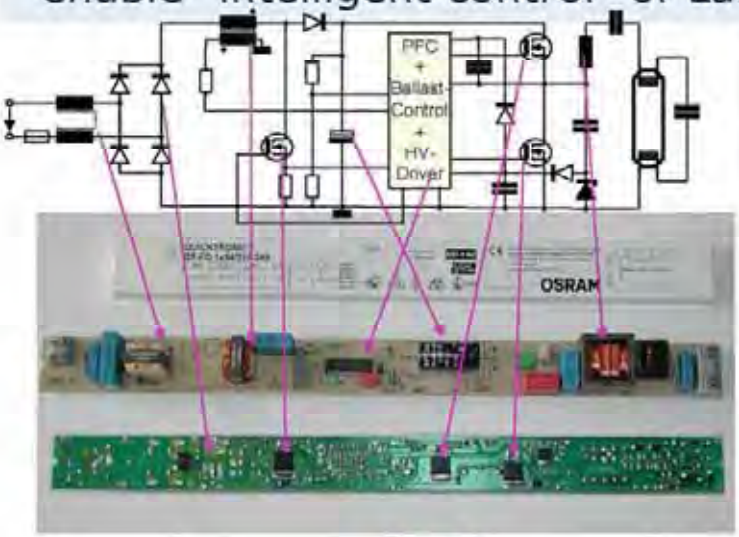
Sources: ETH Zurich, PES Laboratory, 2009

Lighting Applications Energy Saving Potential Electronic Control of Lighting Reduces Energy



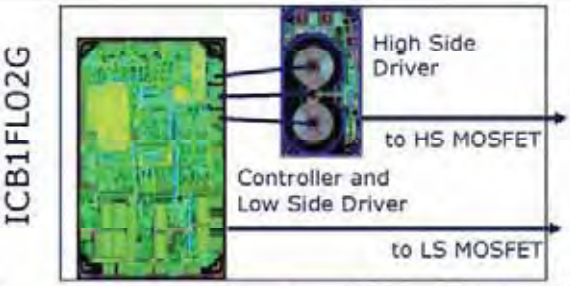
15% of worldwide electrical energy is used by lighting

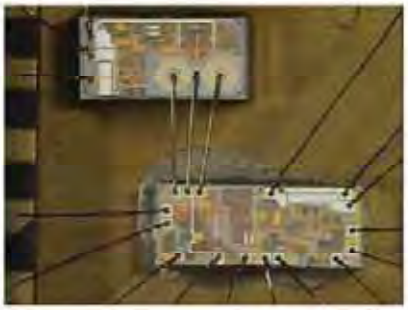
System integration with multi-chip in a Package enable "intelligent control" of Lamps



Lamp Ballast Inverter

- Supports Restart after Lamp Removal and End-of-Life
- End-of-Life (EOL) detection
- Adjustable Inverter Over current Shutdown
- Self-adaptation of Ignition Time from 40ms to 235ms
- Parameters adjustable by Resistors only



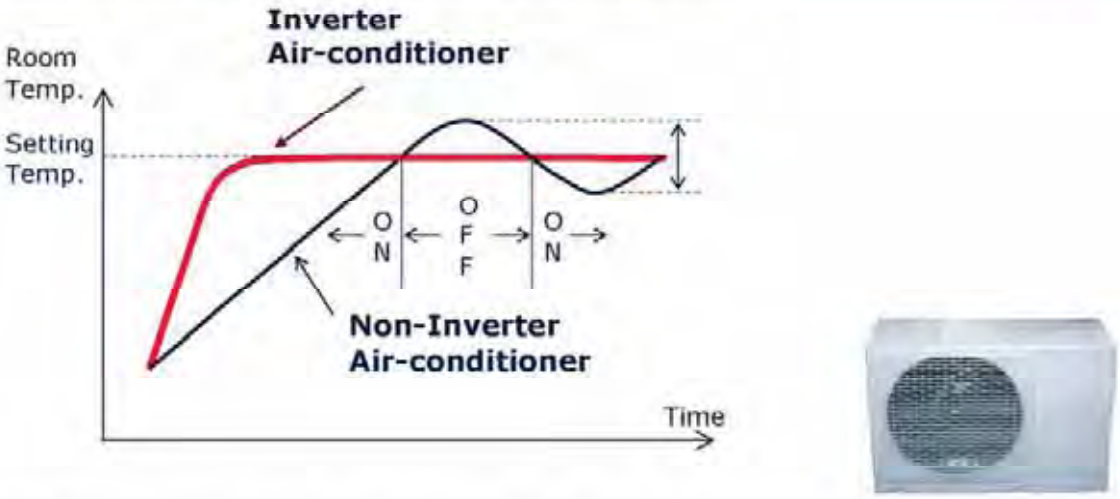


LED-bulbs are ready to replace incandescent

Coming soon!

60W replacement will be presented at „Light & Building" by LEDON

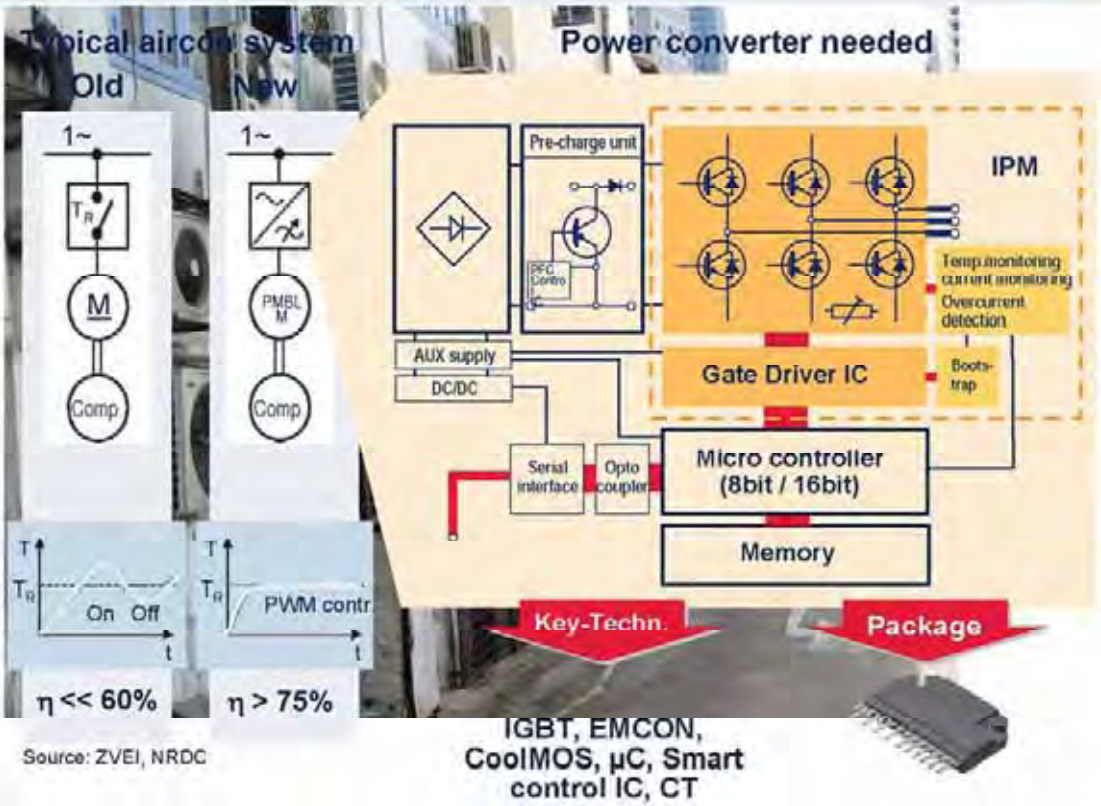
Air-conditioners – Infineon products enable improved efficiency and convenience



- Takes 1/3 less time to achieve the desired temperature
- Energy savings up to 30 – 40%
- Permanent control without disturbing noise and constant draft

Source: eupec GmbH, 2005

Energy Saving with High Efficient Variable Speed Controlled Motor



Source: ZVEI, NRDC

Conclusions for the future of Power Electronics

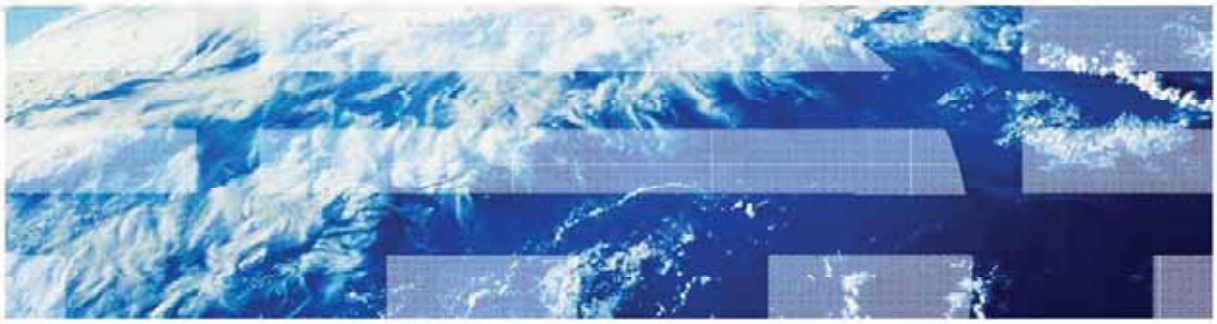
- **Many energy saving opportunities are not used because of a purely price driven market**
- **Research has to be done to achieve Higher Energy Efficiency at Lower System Cost**
- **Energy efficient products become relevant for the climate only after acceptance by the mass market**
- **We are contributing to an efficient energy management future**

ENERGY EFFICIENCY
COMMUNICATIONS
SECURITY

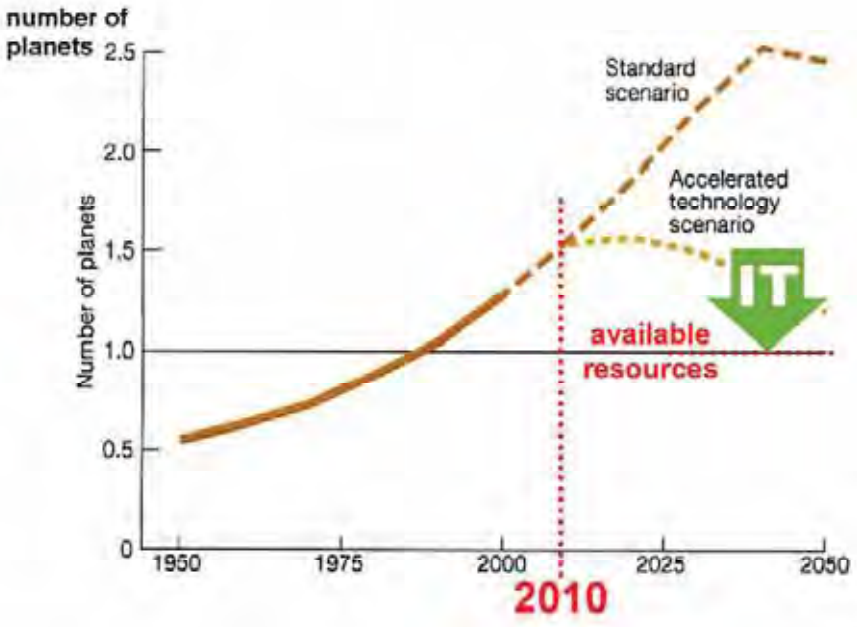
Innovative semiconductor solutions for energy efficiency, communications and security.

Green ICT: Consistent Actions to Reduce Energy Consumption

Input to Conference "Energy Efficiency Chances of Green ICT and Electronics"
Vienna, 2010 03 05

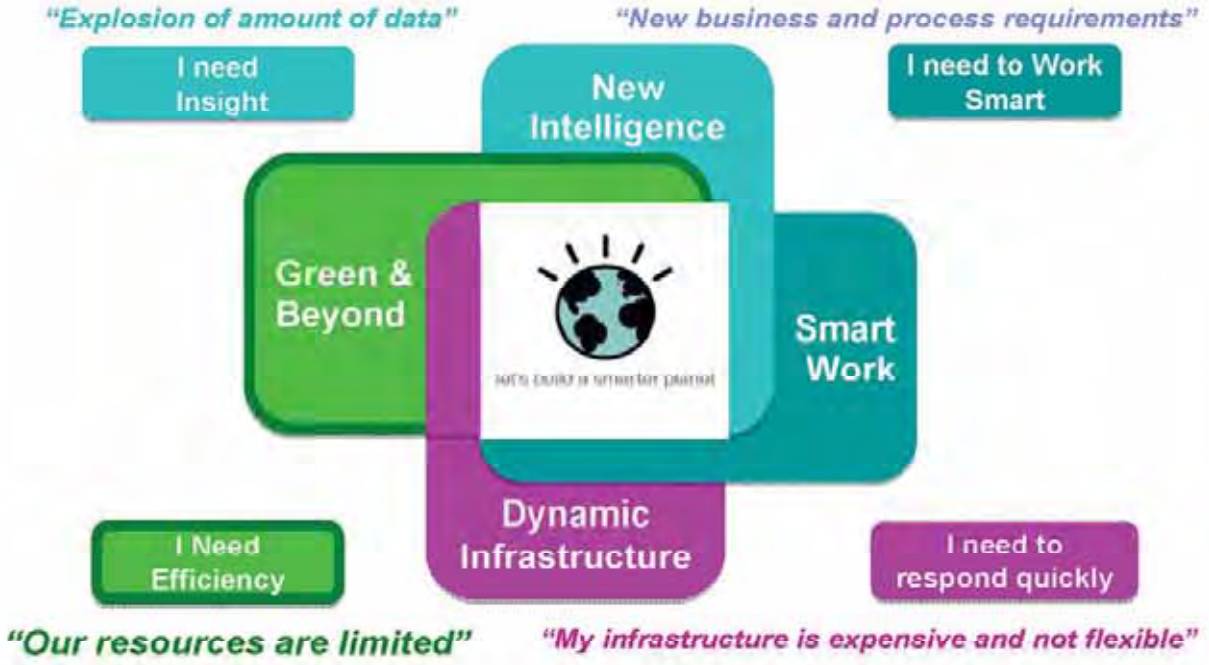


Is it really smart to utilize more resources than we have available on our planet?

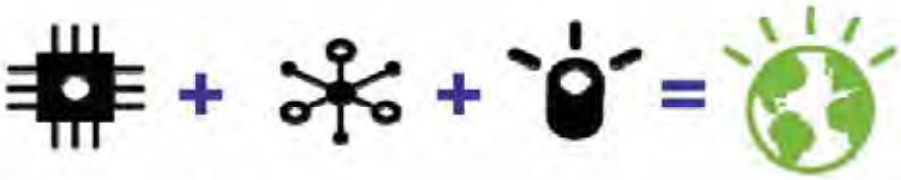


Source: WWF Climate Group Österreich, 2008

Introducing: The IBM Smarter Planet Initiative



Green & Beyond: A dogma of NGO's only? No! It is all about economical competitiveness.



INSTRUMENTED

We now have the ability to measure, sense and see the exact condition of everything.

INTERCONNECTED

People, systems and objects can communicate and interact with each other in entirely new ways.

INTELLIGENT

We can respond to changes quickly and accurately, and get better results by predicting and optimizing for future events.

Lower costs while overcoming operational barriers.

Strengthen reputations while meeting regulations.

Create products and services that give rise to new markets.

An opportunity for smarter organizations to find value in 'Green'.

Call to Action: Innovative information technology and services that really matter to businesses, governments, people and the planet.

Intelligent Transportation Systems

Measure & improve transportation usage

- Reduce traffic congestion
- Reduce CO_2 emissions
- Increase mass transit usage
- Reduce energy usage
- Improve environment

Intelligent Utility Networks

Measure & improve energy mgmt

- Improve efficiency usage,
- Reduce outages
- Improved grid management
- Mange distributed energy

Carbon Management

Measure & reduce carbon emissions

- Carbon Mgmt Strategy
- Carbon Mgmt Intelligence
- Supply chain management
- Property, buildings, workplace

Energy Efficient Technologies & Services

Create &manage efficient IT

- Active energy management
- IT facilities infrastructure efficiency
- IT operations efficiency
- Monitoring and verification of efficiency goals
- Demand-side efficiency

Advanced Water Management

Measure and manage water systems usage and quality with real-time knowledge

- Weather event mgmt: flood management
- Real-time monitoring and analytics for water usage and water quality

Leading by example: IBM's environmental tradition and leadership

1971
T.J. Watson Jr. issued IBM's first corporate policy on environmental protection

1976
Think, the company magazine, devoted an entire issue to IBM's energy conservation and environmental programs

1989
IBM offers its first product take-back program

1990-2006
44%
Between 1990 and 2006, IBM's global energy conservation actions reduced or avoided CO_2 emissions equal to 44% of its 1990 emissions

1990
Think devoted an entire issue to IBM's environmental programs – beginning IBM's annual Corporate Environmental Reporting

1991
Established IBM's Product Stewardship Program

1992
IBM becomes charter member of Energy Star program

1994
Established Global Materials Recovery Center Network for product re-use and recycling

1997
IBM became the first major multi- national to earn a single global registration to the ISO 14001 environmental management system standard

1987-2006
95%
Reduction in hazardous waste generation since the 1987 base year of this pollution prevention metric

2005
Amount of IT product and product waste processed by IBM's Product End-of-Life Management operations that was reused or recycled

2005 Global Innovation Outlook 2.0

2006
IBMers "jam" on innovations for a better planet, and IBM invests $20M
- Big Green Innovations
- Intelligent Utility Network

2007
Intelligent Utility Network
Intelligent Transportation Systems; Project Big Green

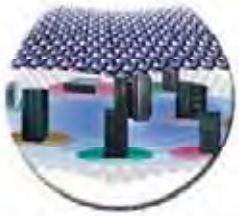
Collaborating to develop solutions...

IBM's holistic approach to Green ICT with focus on the Data Center

Diagnose

Facilities

Compute Resources



Virtualization

Active Energy Management

Cooling Innovations

Responsible Disposal

We listen to our customers and know their challenges …

Increasing IT demand

54% growth in storage shipments due to explosion of information[1]

85% of distributed computing capacity sits idle[1]

Continued cost pressure

14% of CIO's time is spent removing costs from the technology environment[2]

75% of CIO's anticipate a strongly centralized infrastructure in 5 years[2]

Responsive to change

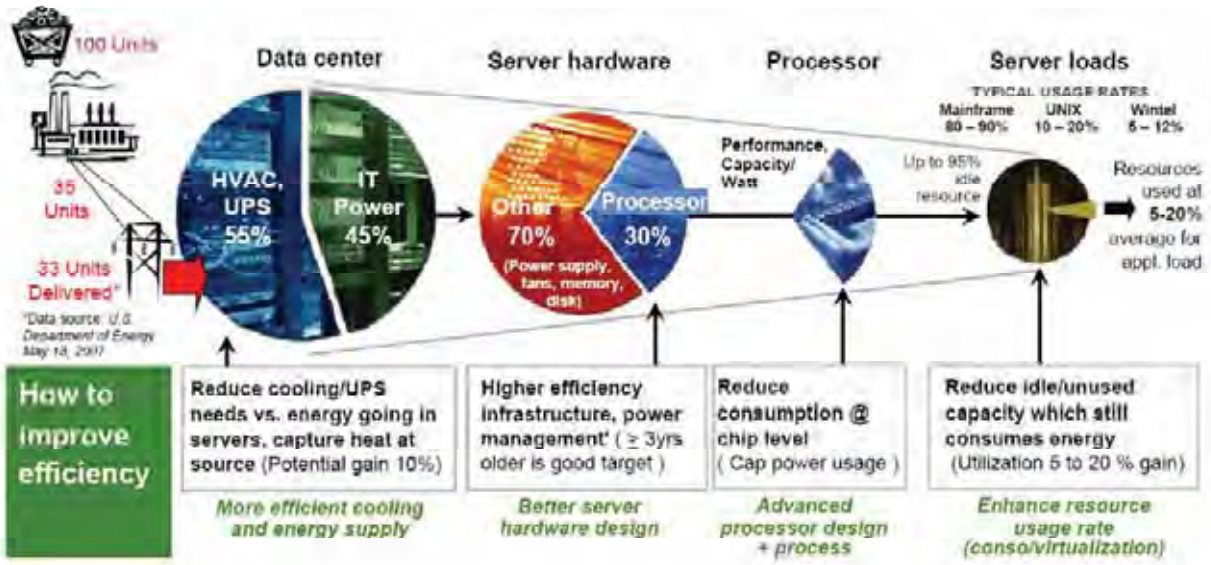
64% of CIO's expect significant change ahead[2]

70% of every $1 is spent to maintain and manage the existing infrastructure[1]

5-60% of IT workloads may be cloud-enabled[3]

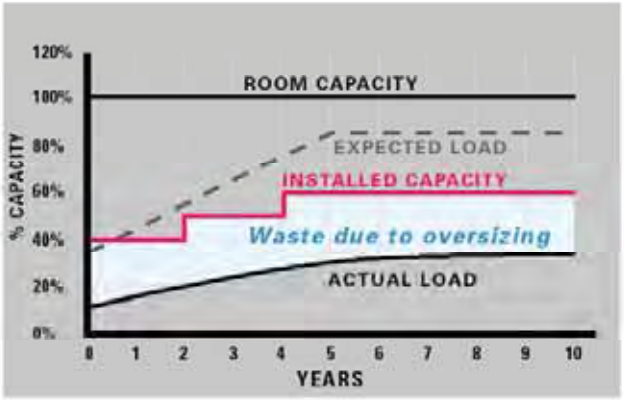
1. IBM Dynamic Infrastructure client presentation, July 2009
2. IBM Global CIO study, September 2009
3. IDM research, September 2009

... and we know all the common inefficiencies.



Some inefficiencies are even too big to spot at first glance!

Scenarios for typical high-availability DC, life cycle >10 yrs	Saving TCO %
Equipment with efficiency factor +2%	1,1
Electricity prices reduced by 1 Cent per kW/h	2,3
No raised floor in the DC	3,1
No rental payments	8,9
50% discount on procurement of equipment	11,7
Rightsizing of systems to actual capacity requirements throughout life cycle	58,3



Source: APC

IBM offers to cut cost and improve effectiveness in the DC in three simple ways…

Extend the life of an existing data center infrastructure.

Double IT capacity or reduce operational expenses by 50%.

Rationalize the data center infrastructure across the company.

Improve operational efficiencies while reducing operational expenses by 50%.

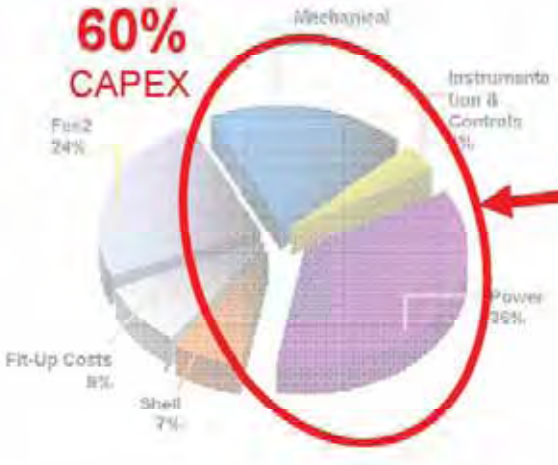
Design new infrastructure to be **responsive** to change.

Pay as you grow by deferring 40-50% of capital and operational costs.

Learning from 2008 and 2009 reference projects: Design new infrastructure to optimize lifecycle costs.

Data center capital costs

60% costs from mechanical / electrical systems



Source: IBM Estimates

Data center operating costs

75% costs from energy use

Source: IBM engineering estimates, 2008

Extend the life of your data center adressing energy efficiency, both the IT and physical infrastructure uses of energy.

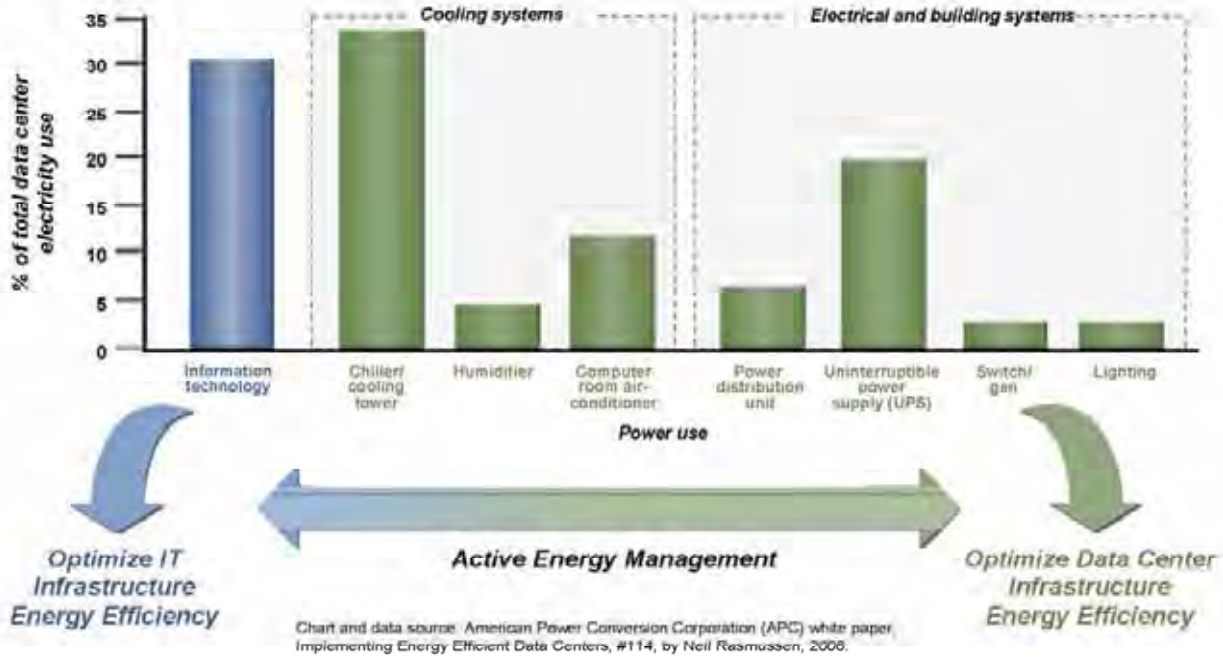
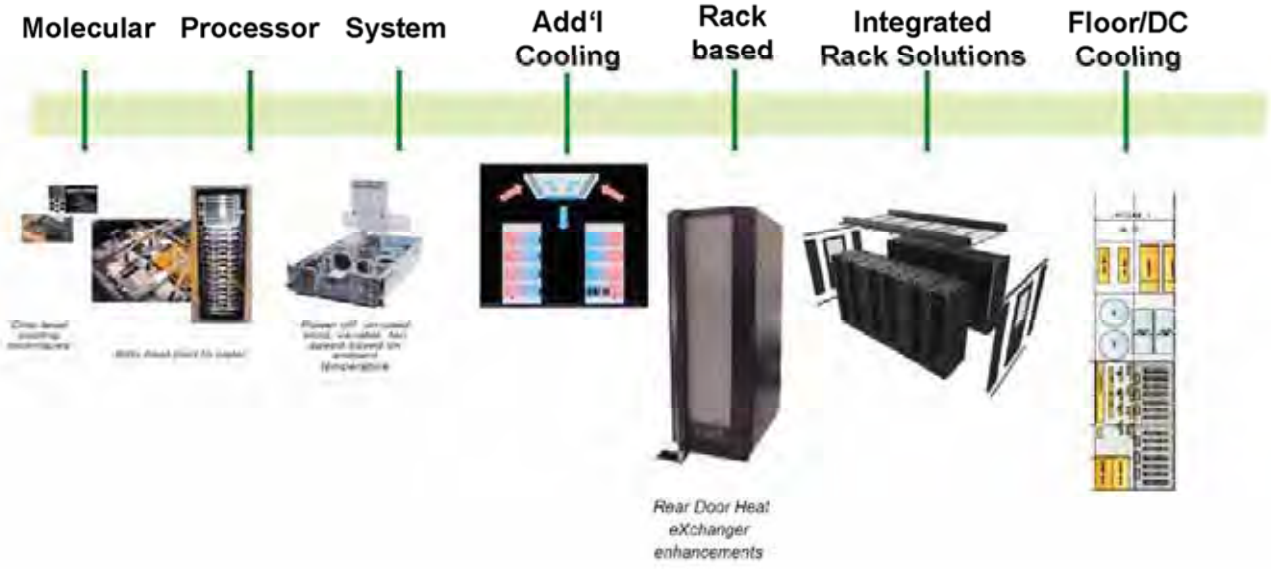


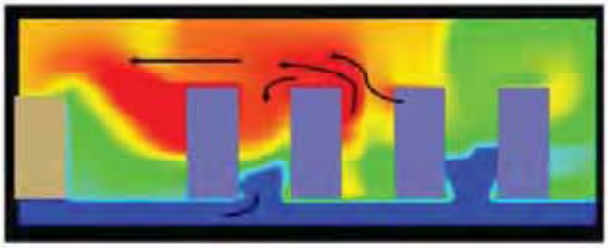
Chart and data source: American Power Conversion Corporation (APC) white paper Implementing Energy Efficient Data Centers, #114, by Neil Rasmussen, 2006.

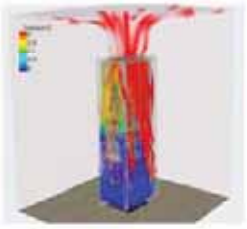
From α to Ω: Innovative cooling technologies allow a true leap forward in energy efficiency and operating cost savings.

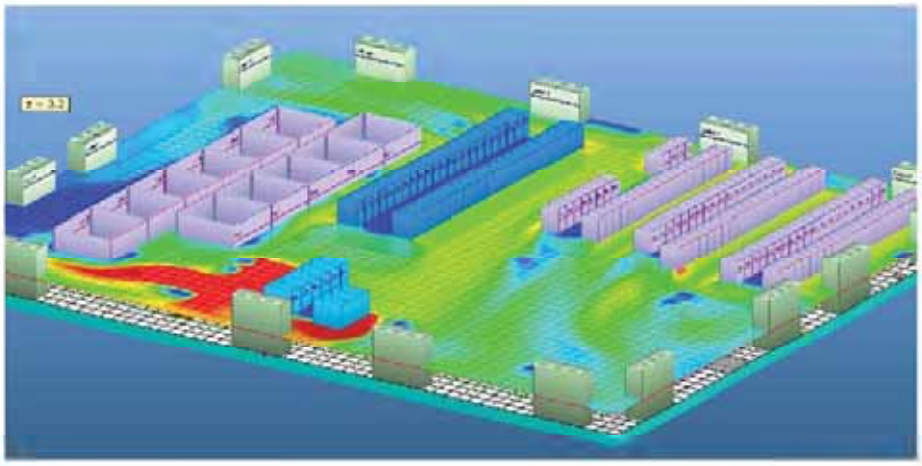


Sources: Emerson, IBM, APC

Thermal Analysis: Starting point for critical questions in the DC







Where does all the energy go? Re-use excess heat in the DC for indoor swimming pool.

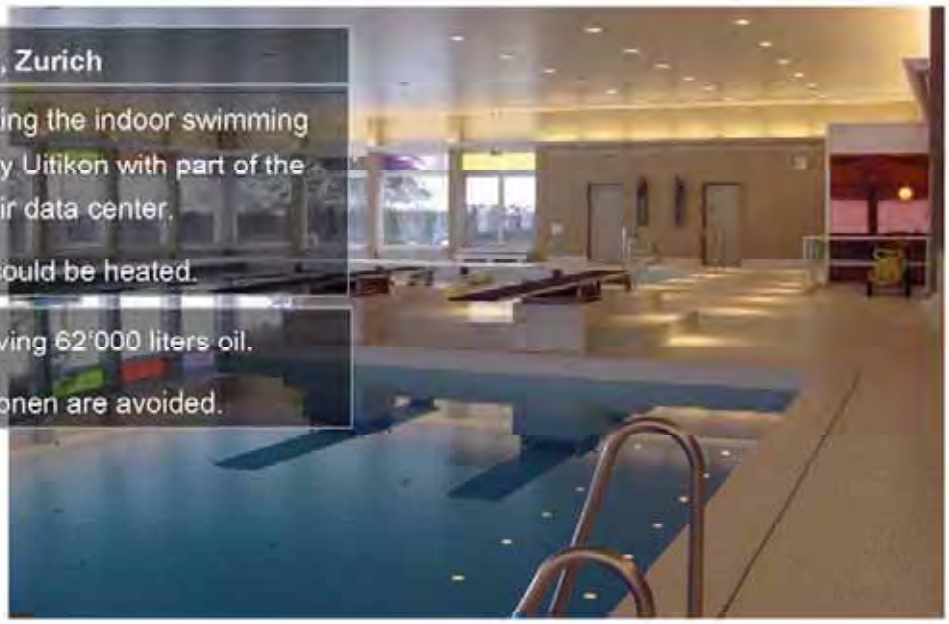
Data Center Uitikon, Zurich

GIB Solutions is heating the indoor swimming pool of the community Uitikon with part of the excess heat from their data center.

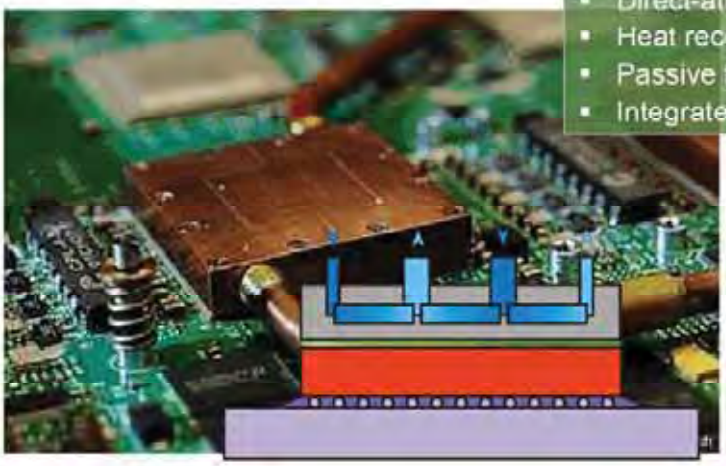
Additional buildings could be heated.

The community is saving 62'000 liters oil.

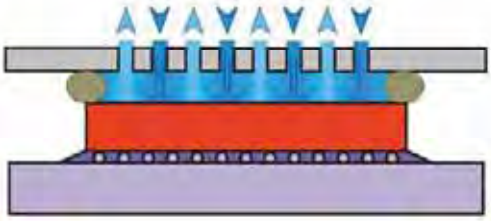
130 tons CO_2-emissionen are avoided.



*Hot water is even more **cool**:* Future generation cooling technologies go up to 60 degrees Celsius.



- Direct-attach micro-channel cooling
- Heat recovery increased with heat collector
- Passive fluid coupling through the mid-plane
- Integrated micro-channel cold plate



Thermal energy in water is simple to be elevated to higher temperature and delivered for second use (e.g. heating, warm water, processes)

Cooperation of IBM Research and ETH Zurich on testing chip cooling with project Aquasar

Kika/Leiner: Green Data Center transformation supports expansion plans of one of Europe's top 5 furniture businesses.

Client requirements

- Business expansion across Europe and Middle East
- Need for IT services to support business has grown significantly
- Aging data center threatens growth due to out dated air conditioning, fire-protection and building issues
- Need for a rapidly deployable DC concept on limited floor area
- Want a green data center to support corporate sustainability goals

Solution

- Implemented an IBM Scalable Modular Data Center solution with advanced InfraStruXure® architecture from IBM Alliance Partner APC for 120 square meter data center
- Standardized on IBM BladeCenter®
- Uses "green" design concepts such as free cooling, separate high density computing area, flexible expansion area for future growth
- Fulfils all state-of-the-art technical security requirements

Benefits

- Supports corporate sustainability "Grüne Linie" (Green Line)
- Reduce electric power consumption by up to 40%
- Uses energy efficient servers which require 24% less energy than competition
- Improved security and reliability of the data center, lowered TCO

"In IBM we have an IT partner who meets our ideal expectations for sustainable business"

Dr. Herbert Koch, manager of the kika/Leiner group

Lord Kelvin: "If you cannot measure it, you can not improve it.„
PUE factor as key measurement for energy efficiency in the DC.

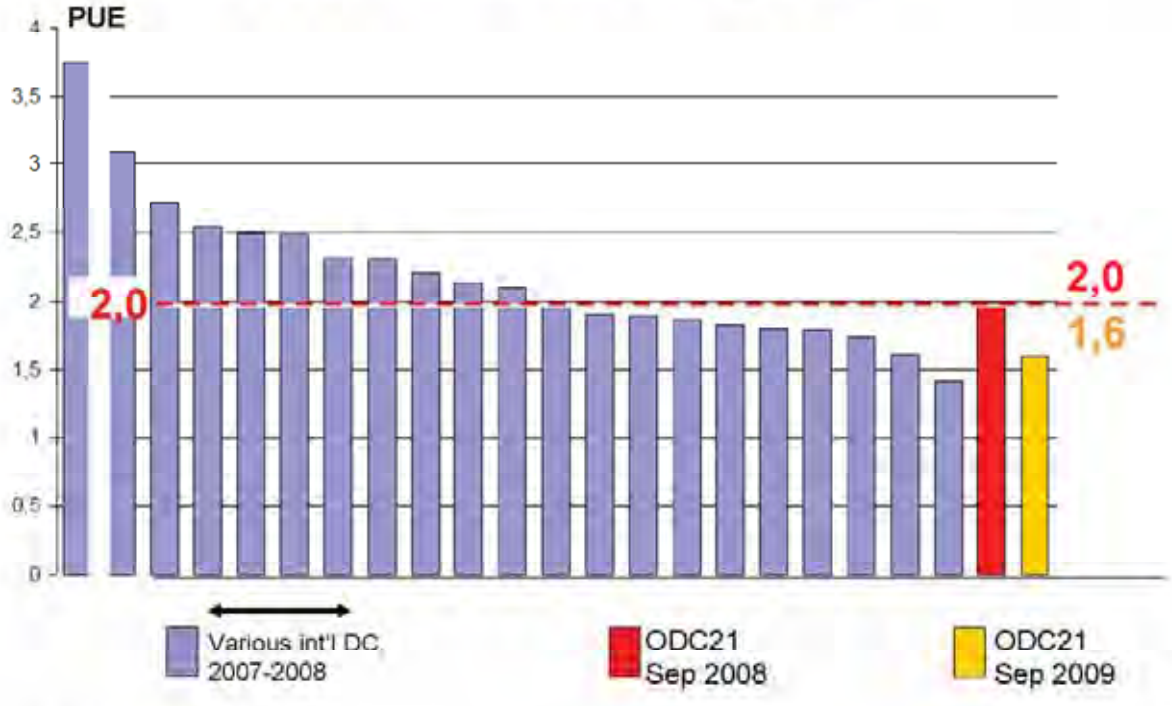
Power Usage Effectiveness (PUE) by The Green Grid =

$$= \frac{\text{Annual delivered Power to Data Center}}{\text{Annual delivered Power to IT}} = \frac{\text{P mech + P elect}}{\text{P IT}} = \text{PUEm + PUEe}$$

- Power Mechanical (PUEm>0)
  - Cooling systems (Chillers, pumps, cooling towers, CRAC compressors)
  - Air movement in Data Hall (CRAC/CRAH fans)
  - Ventilation (FA AHUs)
  - Humidification (AHUs, CRAHs)
- Electrical Power (PUEe>1)
  - IT power (P IT)
  - UPS losses
  - Generator
  - Lights

Energy Rating	Power Usage Effectiveness (PUE)
Excellent	< 1.5
Very Good	1.5 - 2
Good	2 - 2.5
Fair	2.5 - 3
Poor	> 3

PUE Benchmarking:
IBM Austria ODC21 in international comparison



Smarter Planet here and now?
Global footprint of 150 countries

Source: Footprint, Plattform Footprint, Wien, Stand 2003

Mag. Martin Chaloupek

Leader
Site & Facilities
Services

IBM Österreich GmbH
Obere Donaustraße 95
A-1020 Wien

Tel: +43 1 21145 2948
Mobil: +43 664 618 7268
Martin_Chaloupek@at.ibm.com

Annex 45 ‚E3Light'

Bartenbach
L˙chtLabor

International Energy Agency (IEA)
Energy Conservation in
Buildings and Community
Systems Programme (ECBCS)

Annex 45
Energy Efficient Electric
Lighting for Buildings

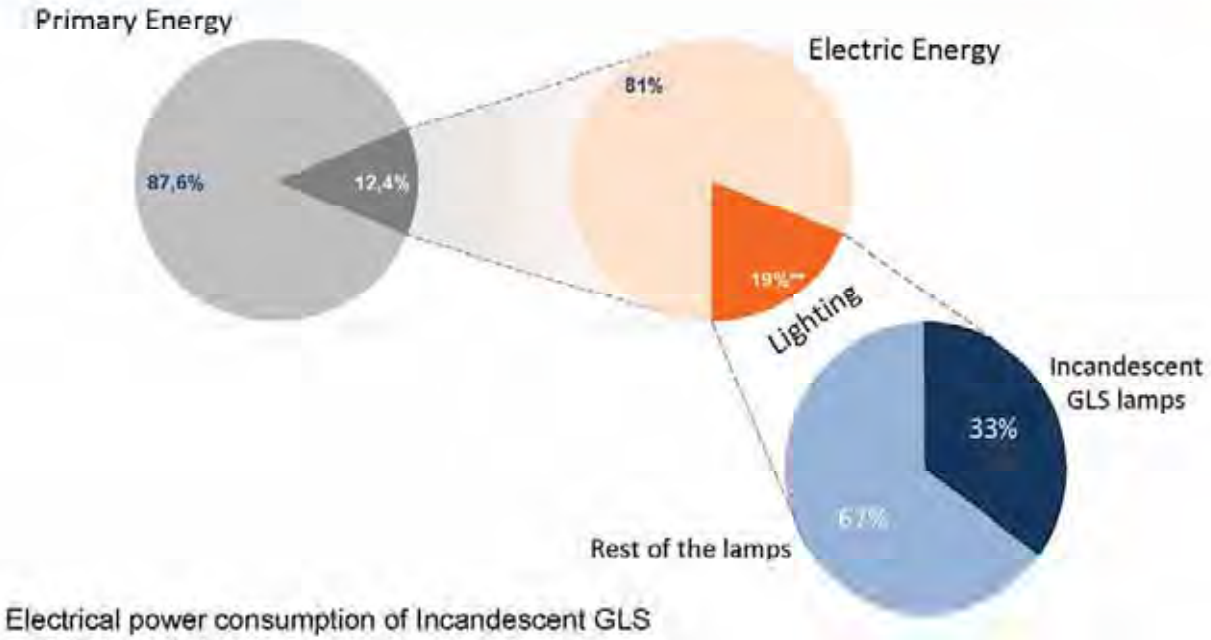
Guidebook on Energy Efficient Electric Lighting for Buildings

Edited by Liisa Halonen & Eino Tetri
Helsinki University of Technology
Lighting Laboratory

Available spring 2010 !

Worldwide electrical power consumption

Bartenbach L'chtLabor

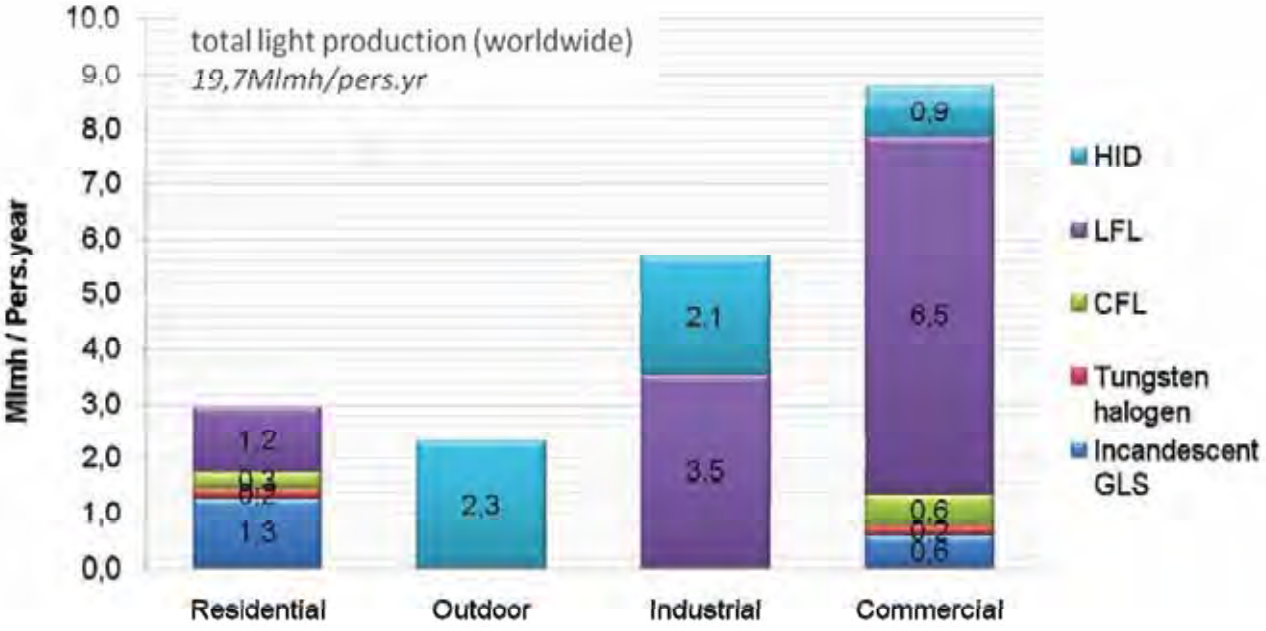


Electrical power consumption of Incandescent GLS
→ 6% of total electrical power consumption

Total electric power consumption of Incandescent GLS = *153 kWh/pers.yr* = ***33%***

Estimated electrical light production 2005

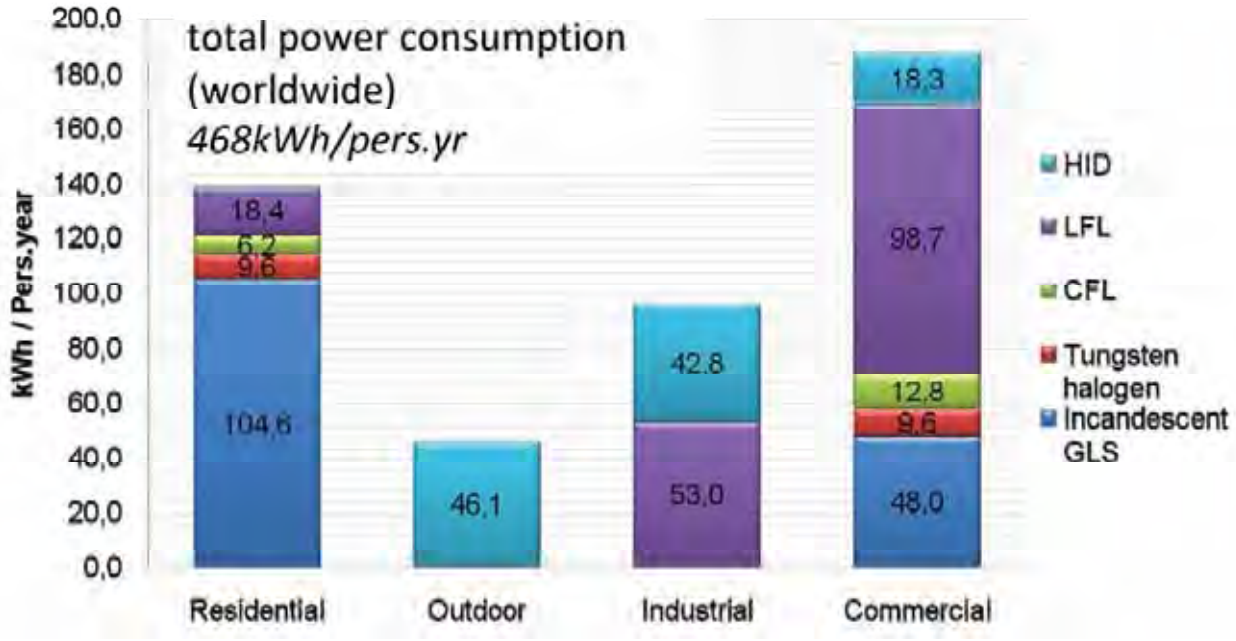
Bartenbach L'chtLabor



Total light production of Incandescent GLS = *1,8 Mlmh/pers.yr* = ***9%***

Estimated electrical power consumption 2005

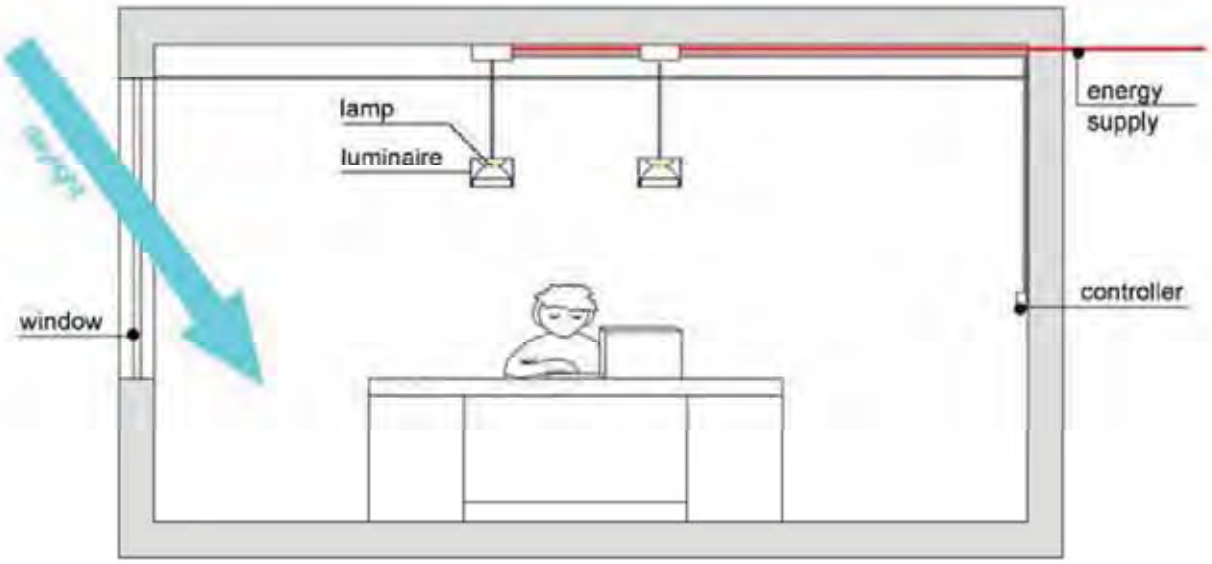
Bartenbach L'chtLabor



Total electric power consumption of Incandescent GLS = *152,6 kWh/pers.yr* = ***33%***

Lighting installation efficiency

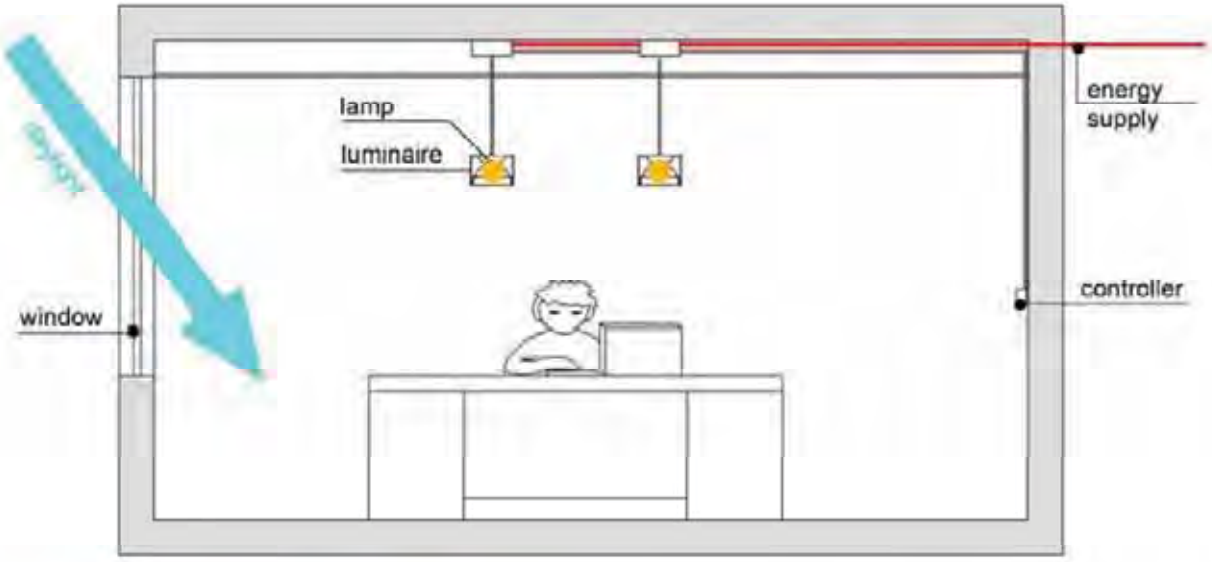
Bartenbach L'chtLabor



energy supply ⟹ lamp ⟹ luminaire ⟹ room

Lighting installation efficiency

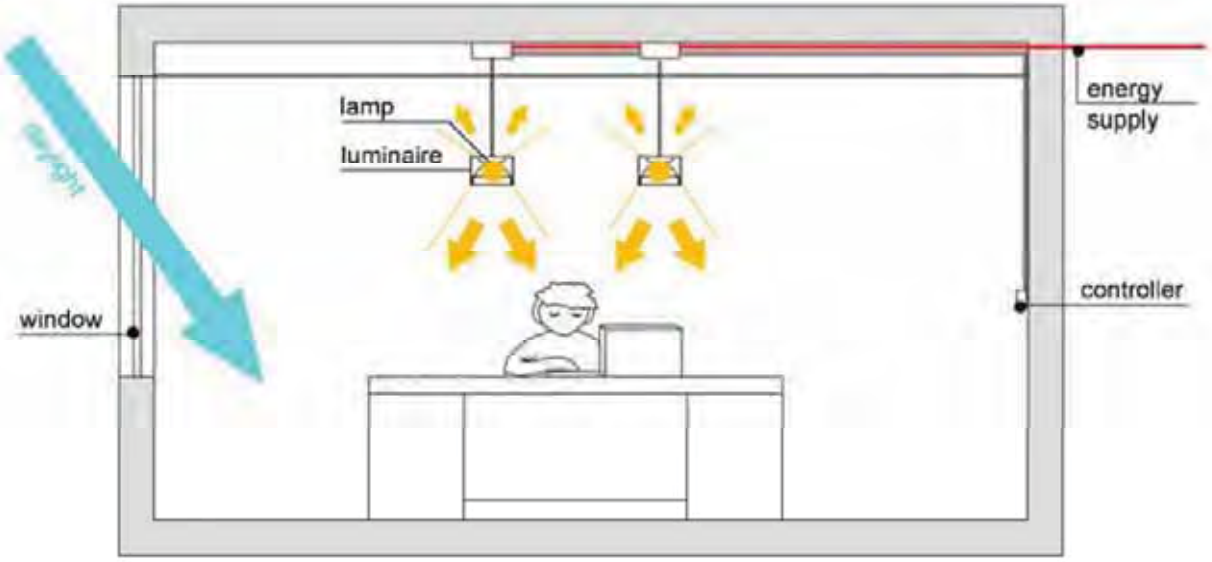
Bartenbach LichtLabor



energy supply → lamp → luminaire → room

Lighting installation efficiency

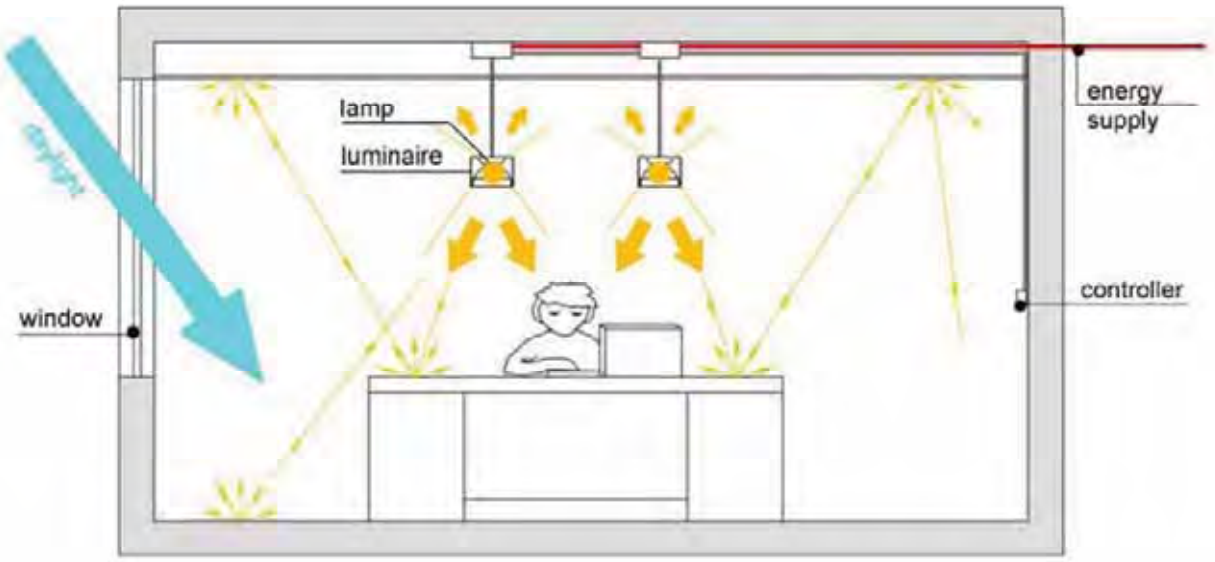
Bartenbach LichtLabor



energy supply → lamp → luminaire → room

Lighting installation efficiency

Bartenbach LichtLabor



energy supply → lamp → luminaire → room

Energetic performance factors

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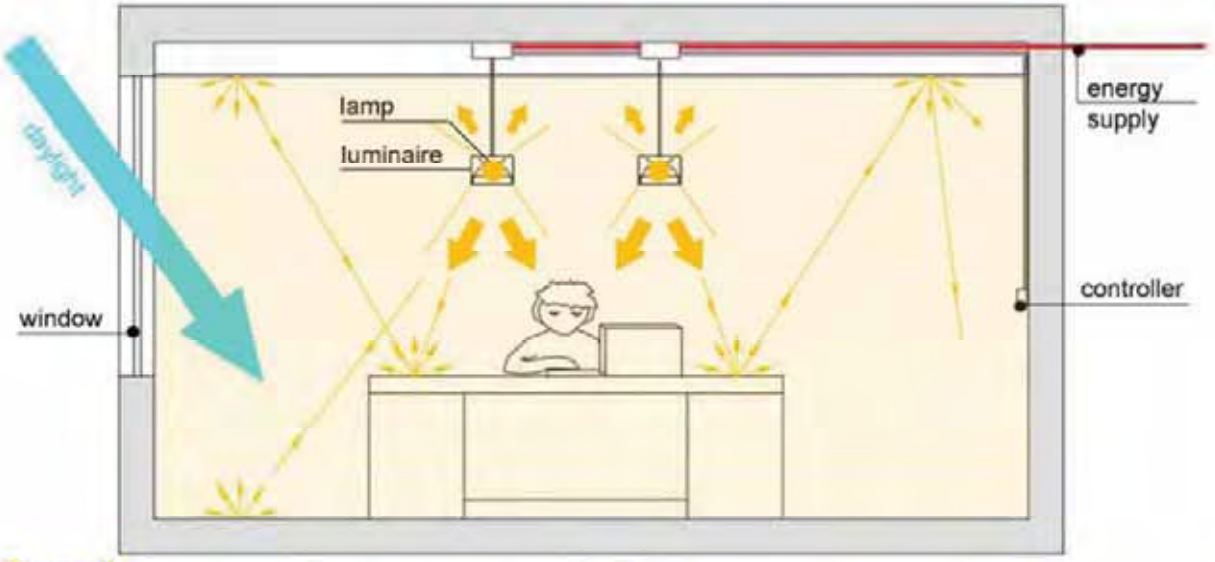

Energetic performance factors: = lamp efficacy → luminaire light output ratio → room utilization factor

Ultimate (total) efficiency of the electric light installation

Candle > (O)LED

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1. Generation	2. Generation	3. Generation	4. Generation
			
			

GLS - bulb

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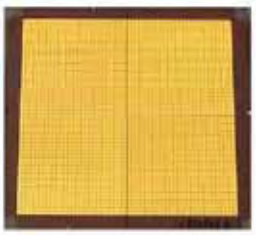

Lamps

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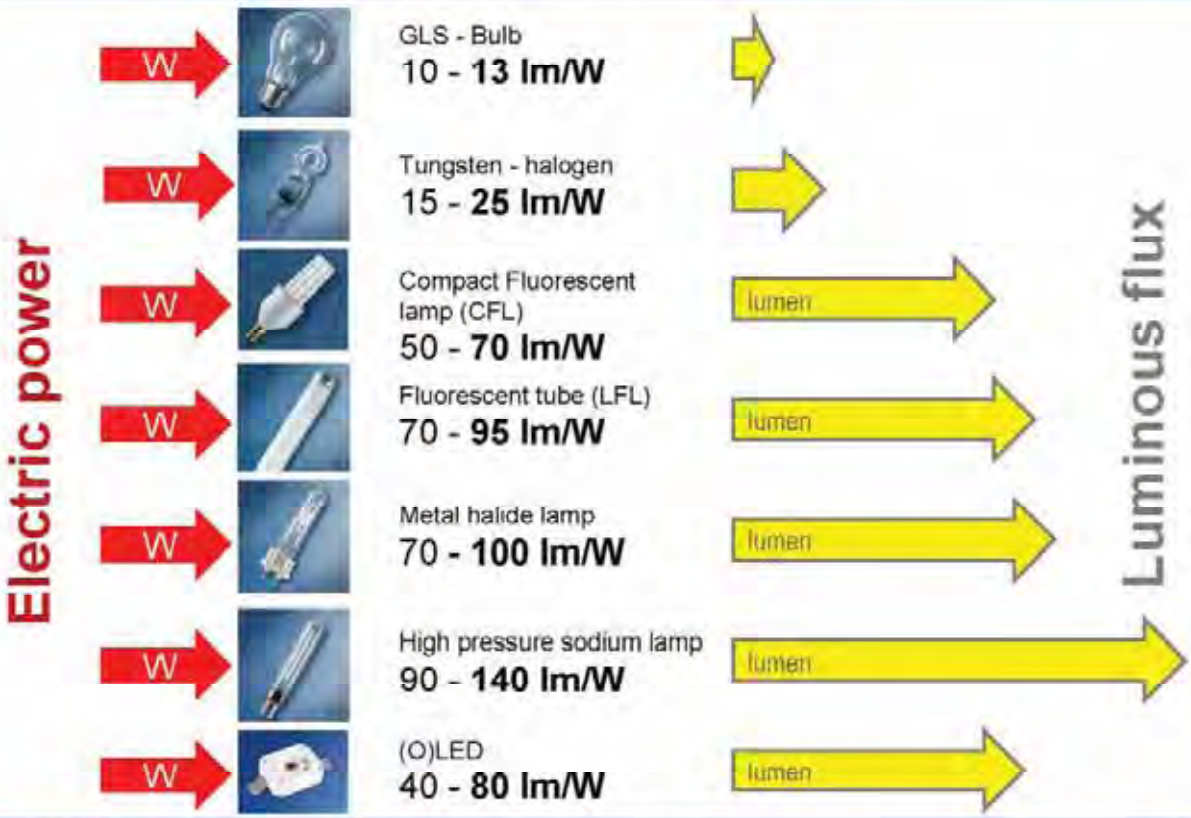
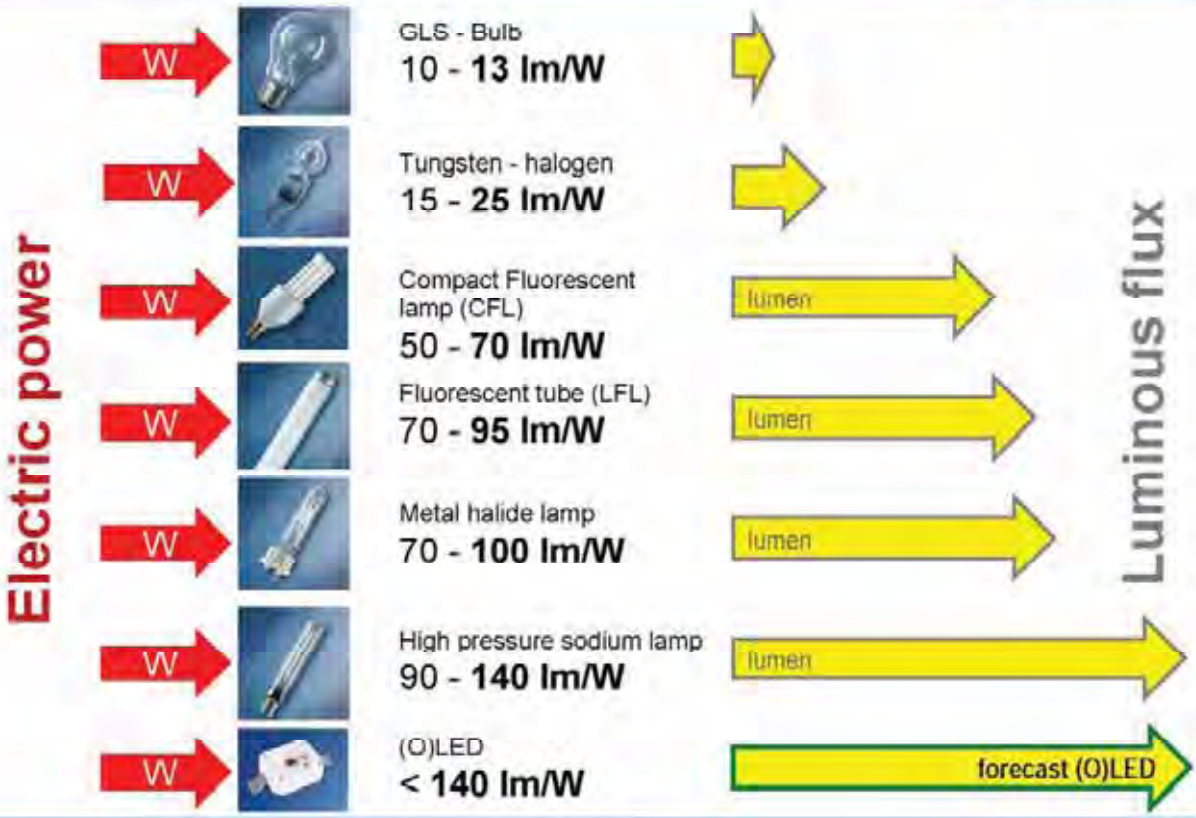


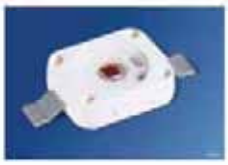
Lamps

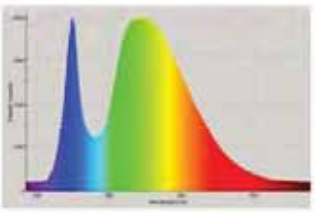
Bartenbach L'chtLabor



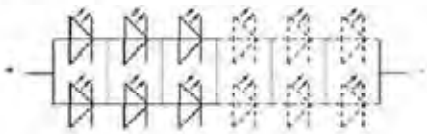
LED benefits:

- Lifespan < 100.000h
- colour mixing possibility (flexible colour temperature CCT)
- 'cold' spectrum (no infrared)
- design flexibility
- brilliant light due to its small size
- easy control and dimming
- safety due to low voltage operation
- high efficacy compared to incandescent lamps





Metal working > electronics



Lamp - Luminaire

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Lamp and Luminaire

Luminaire light output ratio

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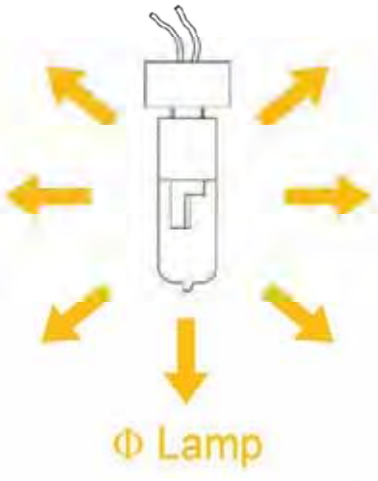
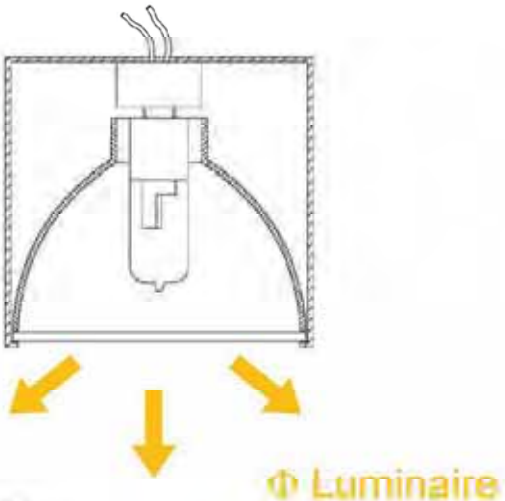
Luminaire light output ratio





$$\eta_{LB} = \frac{\Phi \text{ Luminaire}}{\Phi \text{ Lamp}}$$

Radiation principles

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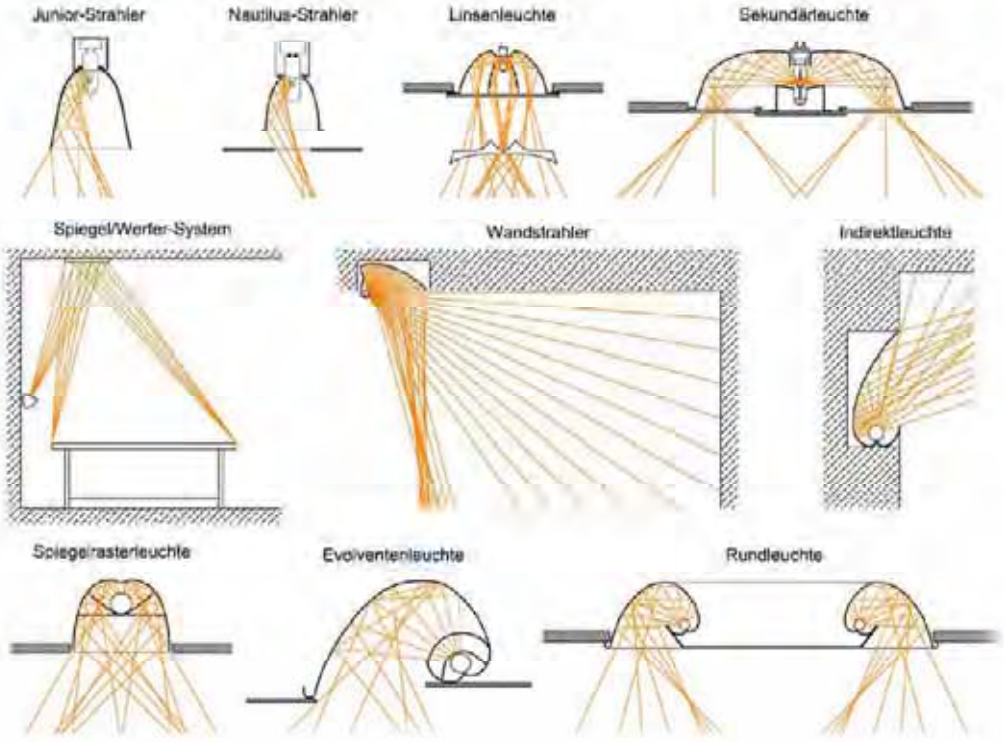

Luminaire Example

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Luminaire Example

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Room Utilization Factor (RUF)

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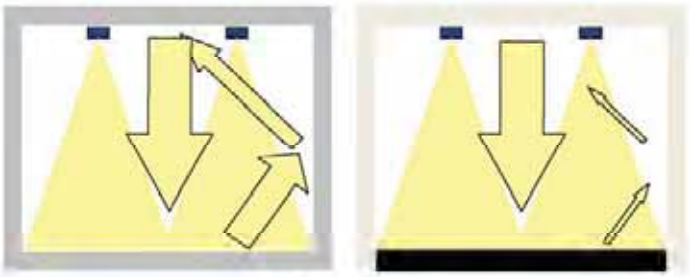
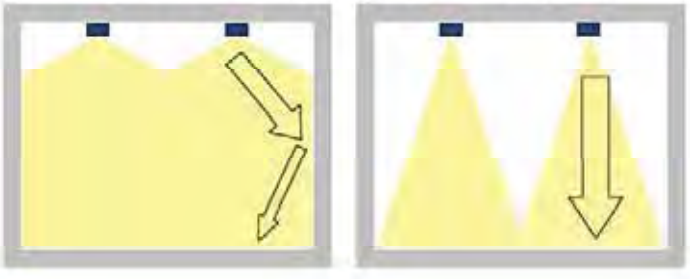
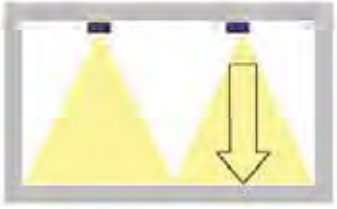


Reflection

Luminous Intensity distribution (LID)





Room geometry

Room surfaces <-> Indirekt - portion

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$$\eta_{utilization} = f_{direct} + f_{indirect} \Rightarrow f_{indirect} = \frac{A_{workplane}}{A_{room}} \cdot \frac{\rho_{mean}}{1-\rho_{mean}}$$

Example: office-room $A_{workplane}/A_{room}$ = 30%

Additional indirect-portion over multiple reflections at the room surfaces ($f_{indirect}$)

ρ_{mean} = 0,2 > $f_{indirect}$ = 8%

ρ_{mean} = 0,7 > $f_{indirect}$ = 70% !!

Faults

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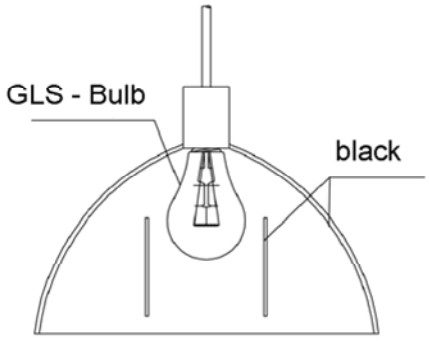

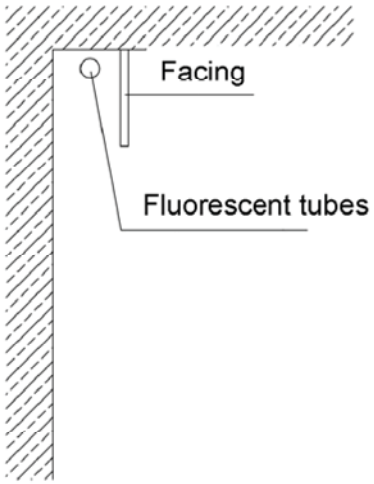

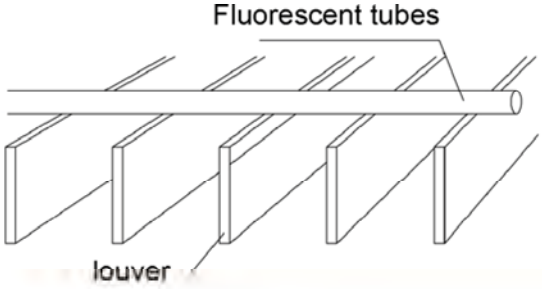

Bad example

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Bad example

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Inefficient lighting solution

A simple appraisal (Shop):

Installation costs	30,- €/m²
Installation power density	20 W/m²
operation time	3000 h/year (non-daylight space)

This results in

energy consumption	60 kWh/m²year
costs for electricity (0,15€/kWh prize)	9,- €/m²year
costs for electricity for 10 years	90,- €/m²

In such cases the **electricity costs exceed the installation costs by far** !

composition of total costs (final values)

Total cost 15,- €/year.m²

Life cycle costs (LCC)

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Operation cost neglected !

Biggest part!

Maintenance

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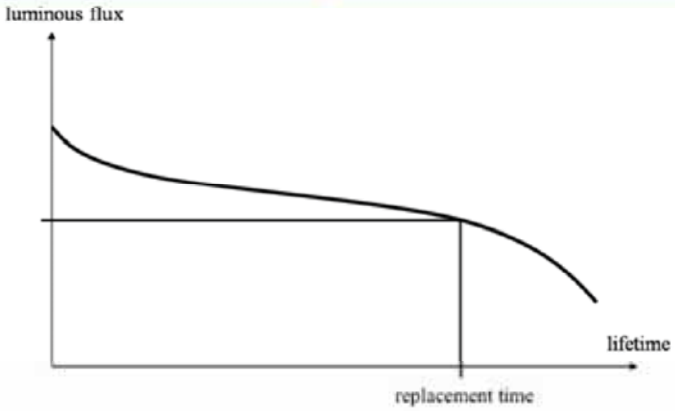
Aging | Dirt Depreciation



decreasing efficiency

Negative effect on visual perception, human performance, safety and security, and wastes energy

A regular maintenance schedule:

- cleaning of luminaires, daylighting devices and rooms
- relamping (usually before burn-out)
- replacement of other parts
- renovation resp. retrofitting of antiquated systems and components
- proper control (at least switch off if not needed)

Lack of control

Bad example

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Lack of control

Standards – EUP-directive

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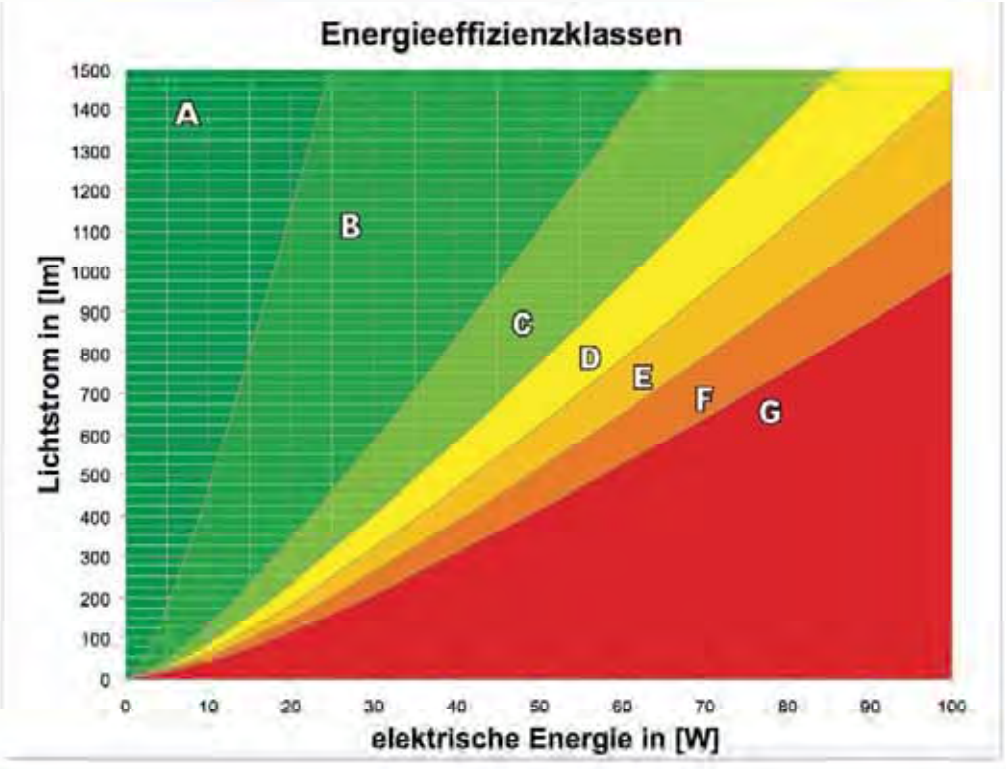

Standards – EPBD-directive

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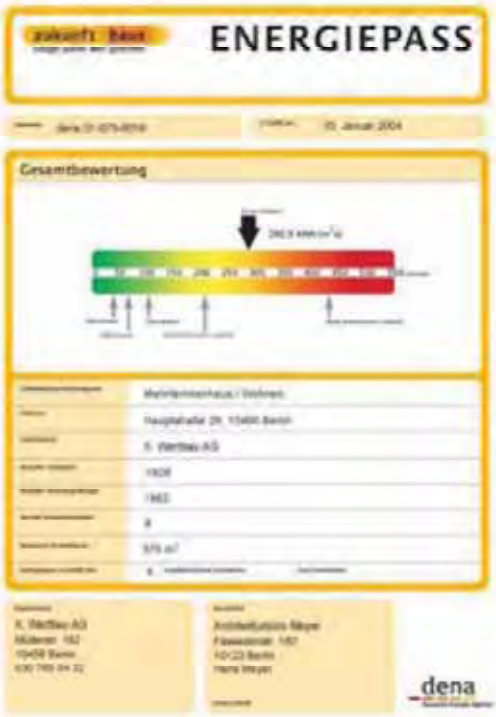

EN15193 Power limits

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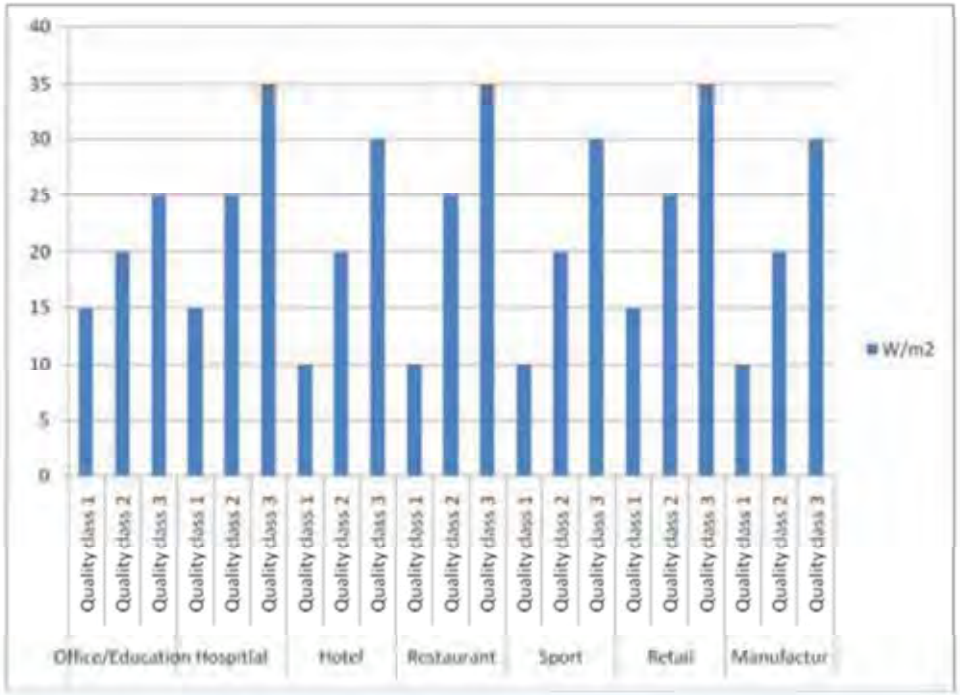
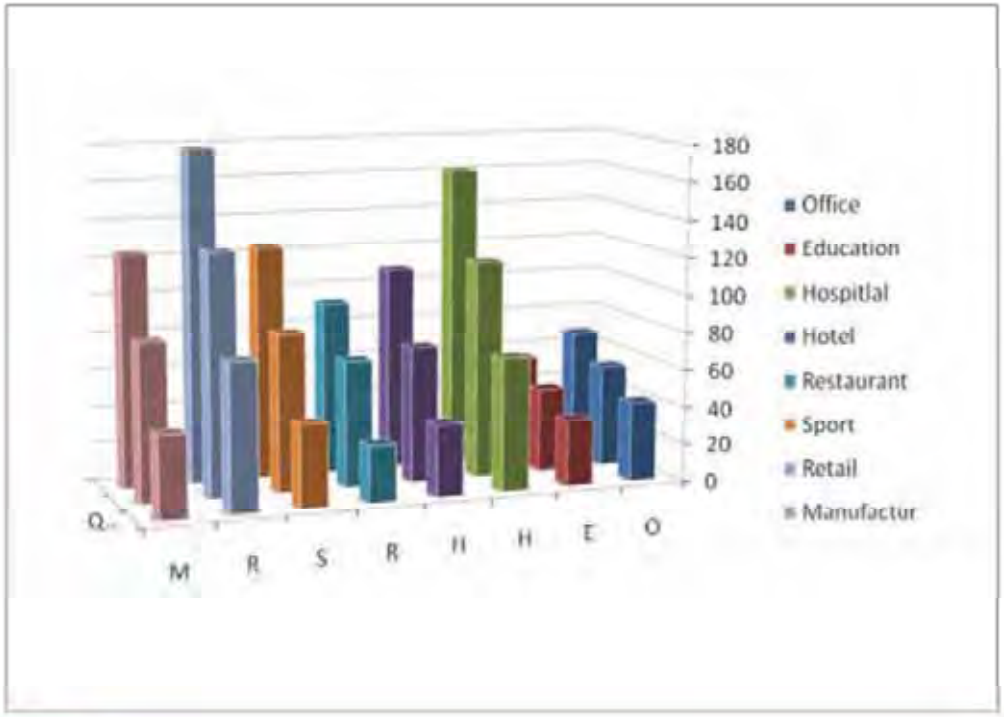
Limits for connected lighting power (in W/m²) according to EN15193 for different building types and quality levels.



EN15193 Energy limits

Bartenbach LichtLabor

Limits for energy consumption (in kWh/m²year) according to EN15193 for different building types and quality levels



Measures

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What can we do?

Existing Installations

- 95% > 10 years
- 90% > 20 years

> Extreme energy saving potential

Antiquated (> 20 years old) T12 – Louver - Luminaire

Fluorescent lamp

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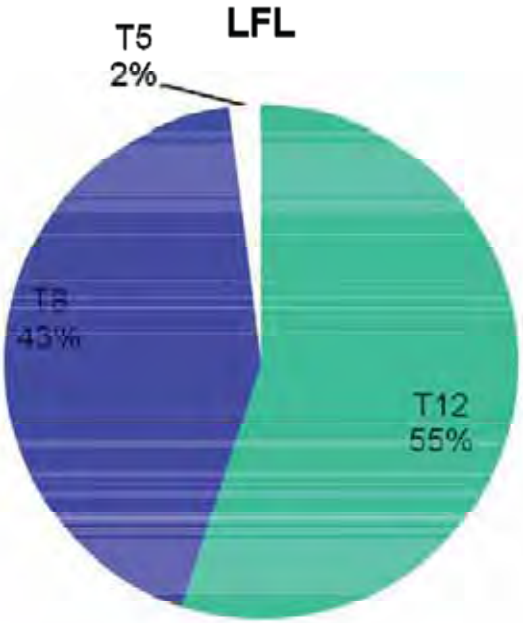

Upgrade measures

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Office Lighting

55% of the worldwide LFL connected power is for the antiquated T12 (38mm diameter)

Antiquated T12

Magnetic ballast

change

New generation T5

High frequency ballast

Upgrade measures

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Domestic Lighting

> 80% of the connected power is for the inefficient GLS-Bulb

GLS-Bulb

change

Tungsten Halogen

CFL

LED

Upgrade measures

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Development of

- high reflective surfaces
- new manufacturing technologies

'efficiency' (LOR) of luminaires reach 80% or more

Retrofitting: Street lighting Amsterdam

Bartenbach L'chtLabor

Change of 8.000 luminaires

Retrofitting: Street lighting Amsterdam

Bartenbach L'chtLabor

Refurbishment of historic „Ritter Lantern", City of Amsterdam, Netherlands

EXISTING LANTERN
SON-T 50W
$E_{mean/street}$ = 2.6 lx

15 W Energy-Saving

20 € Savings/Lantern
(operation cost a year)

3.400 Lanterns

68.000 € Total Savings
(operation cost a year)

Power: x 2/3

Illuminance: x 3

NEW RITTER LANTERN
CDM-T 35W
$E_{mean/street}$ = 7.5 lx

Daylight utilization

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Most effective measure to save electric lighting

- intelligent facade
- daylight construction

E. g. Office building – daylight for more than 70% of the working times

Saving potential

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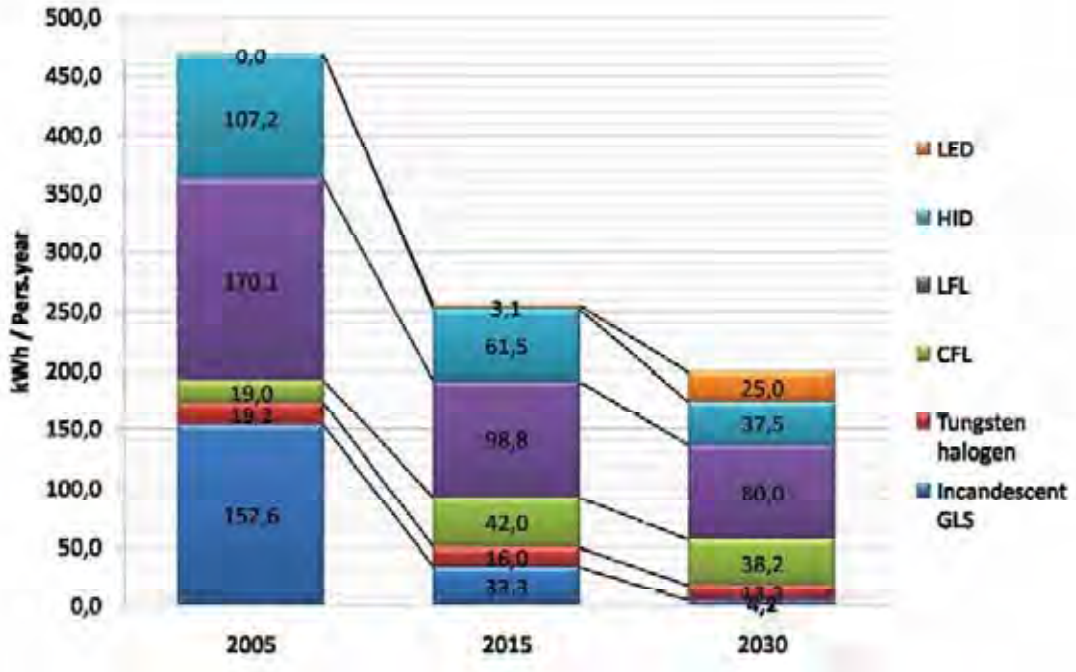

(Source: IEA Annex 45)

Design & quality

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Recommendations for energy efficient lighting:

1. Intelligent architecture and facade constructions (use of daylight)
2. Efficient lighting concepts (high room utilization factor, e.g. bright surfaces)
3. Use of high quality luminaires and lamps
4. Proper controls (on/off, daylight, occupancy)
5. Good maintenance

Bright Future !

Bartenbach LichtLabor

Thank you!

Wilfried.Pohl@bartenbach.com

www.bartenbach.com

Green Telecommunications

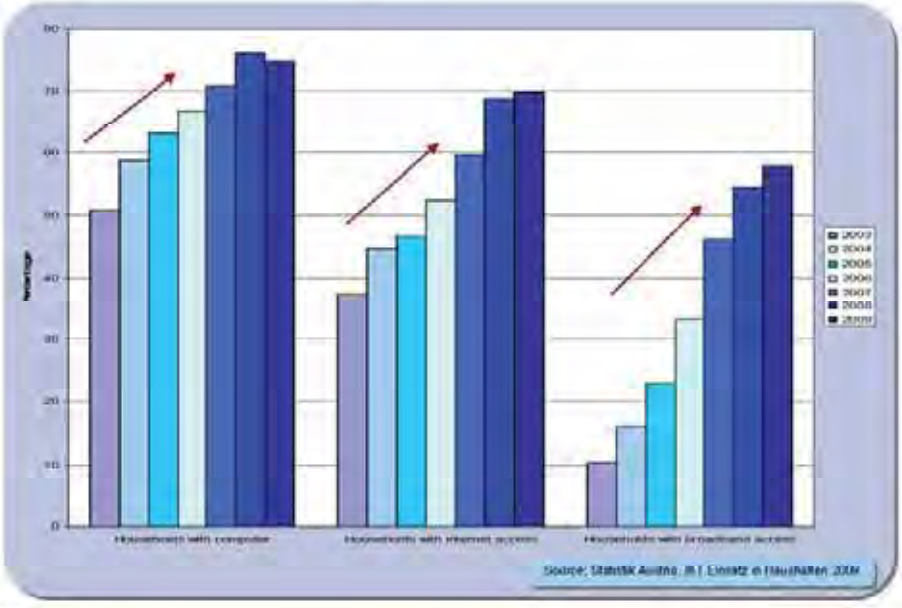
Dr. Georg Serentschy

CEO Telecommunications

Austrian Regulatory Authority for Broadcasting and Telecommunications

Slide 1

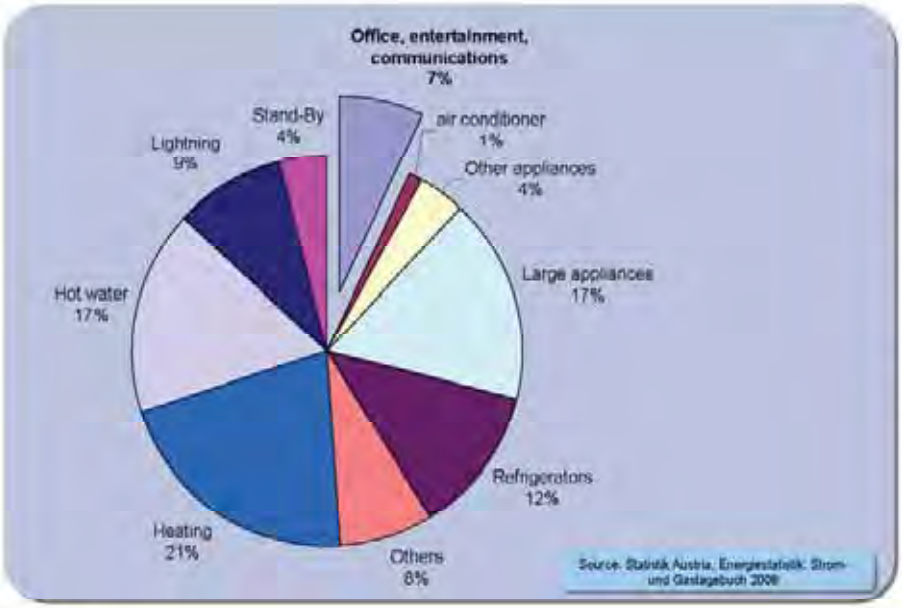
Private IT usage in Austria has shown steady growth



- In Austria, the number of households with network connections and ICT equipment has increased steadily
- More than 70% of the Austrian households have access to at least a computer and to the internet
- Due to decreasing prices households with broadband access have increased over the last years
- A growing energy demand for ICT equipment is expected in the next years

Slide 2

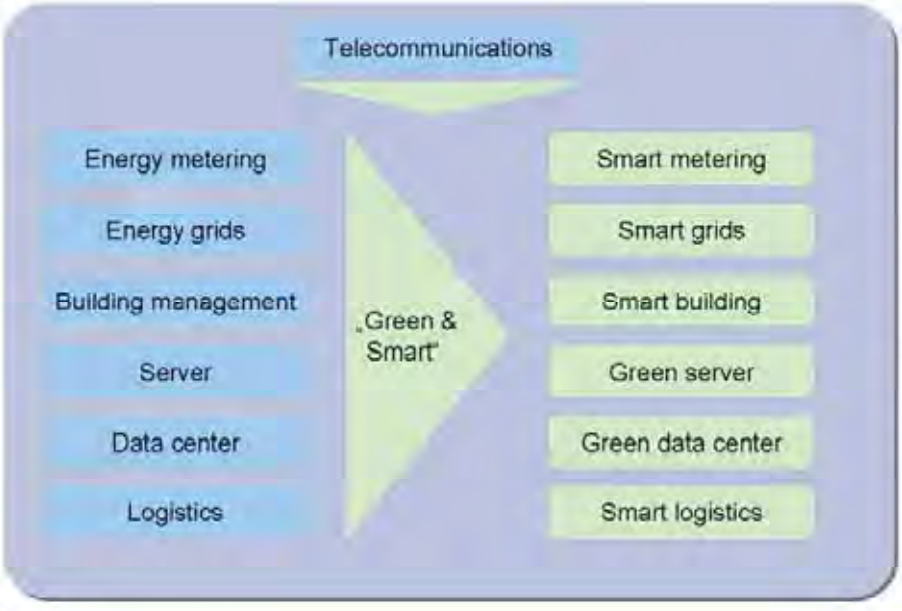
Office, entertainment and communications equipment consume 7% of an Austrian household's electricity demand



- Heating, hot water and appliances account for the majority of electricity consumption of an Austrian household
- Computers, notebooks, printers, TV-sets and other entertainment equipment consume about 7% of the a household's electricity spending
- With increasing number of entertainment equipments electricity demand has grown over the last years.

Slide 3

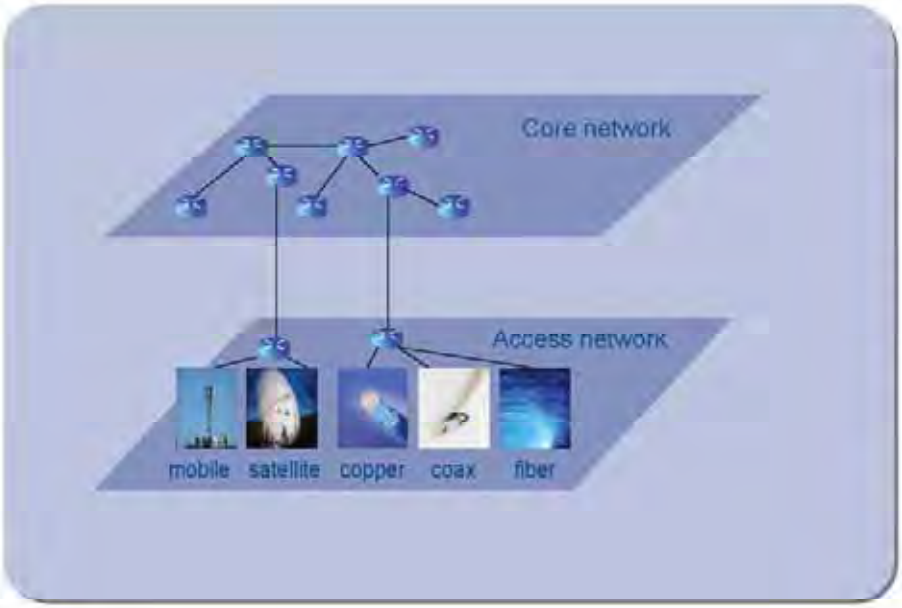
Telecoms is an enabler for a transformation towards green ICT



- Telecommunication supports other ICT fields to become "green and smart"
- Due to improved communications and information exchange energy spending could be better adapted to changing situations
- Measures taken to reduce energy spending in one field should also consider the potential of savings in other fields (like smart grids and telecommunications)

Slide 4

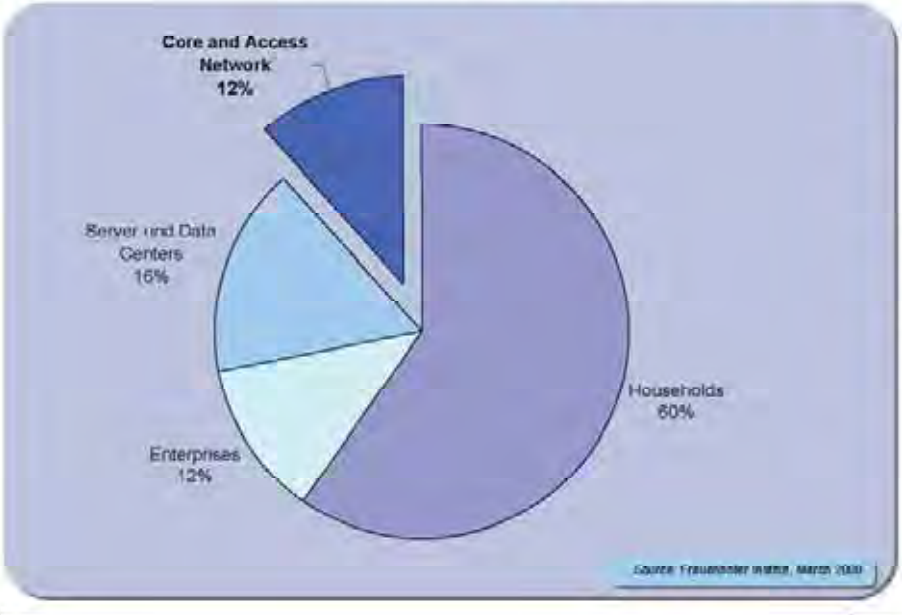
The potential of energy savings in telecommunications networks depend on the used technologies



- In the core network the transition from electronic to optical elements will reduce the energy spending per bit
- There are also encouraging results from R&D to reduce the energy spending of routers and processors
- Smart cooling of the network elements improves the ecological footprint
- In the access network the energy saving potential depends significantly on technologies implemented

Slide 5

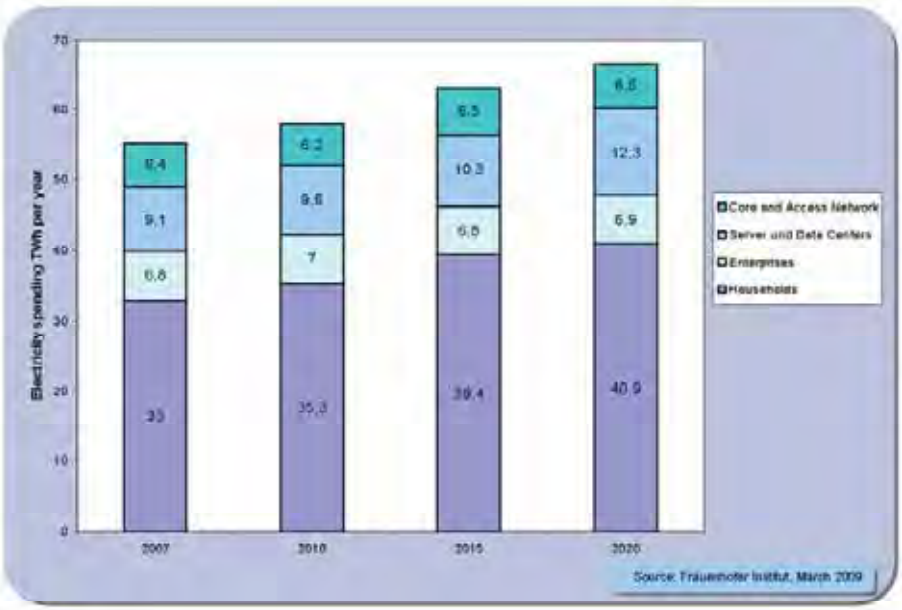
12% of electricity spending in the ICT-sector is consumed by the core and access network (data applicable for Germany)



- According to a study conducted by the Fraunhofer Institut, the whole ICT sector in Germany consumed 55,4 TWh of electricity in 2007
- 60% of the spending was caused by the households
- Although the fraction of network spending is small, the study identified promising potential for energy savings

Slide 6

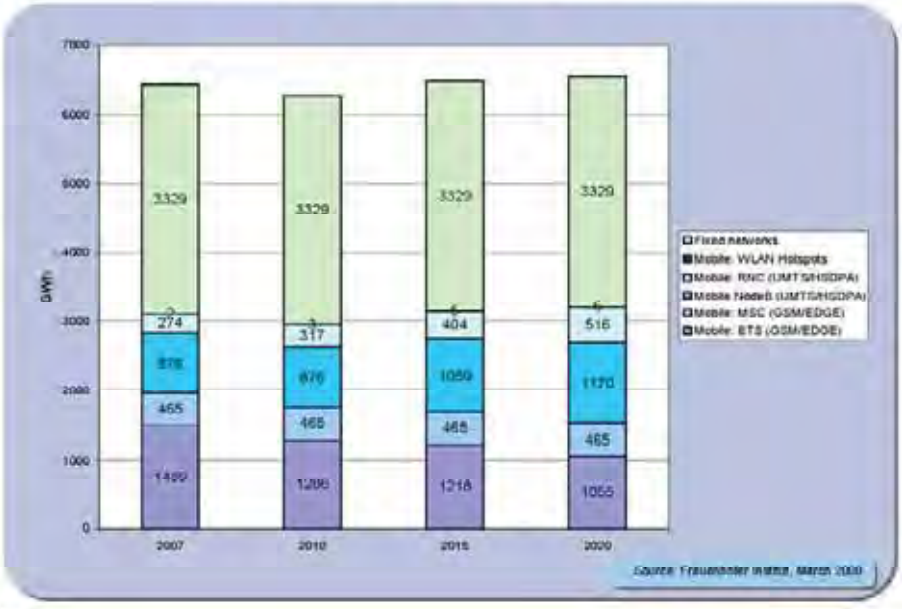
Electricity consumption of the ICT sector is expected to grow in Germany



- Due to the study the German electricity spending of the ICT sector will sum up to more than 65 TWh in 2020 (+20%)
- It estimates the largest growth in energy spending for households and servers/data centers without appropriate measurements taken
- With the transition to new technologies the energy consumption will probably decrease in networks in 2010, but with steady increasing demand a higher spending is expected

Slide 7

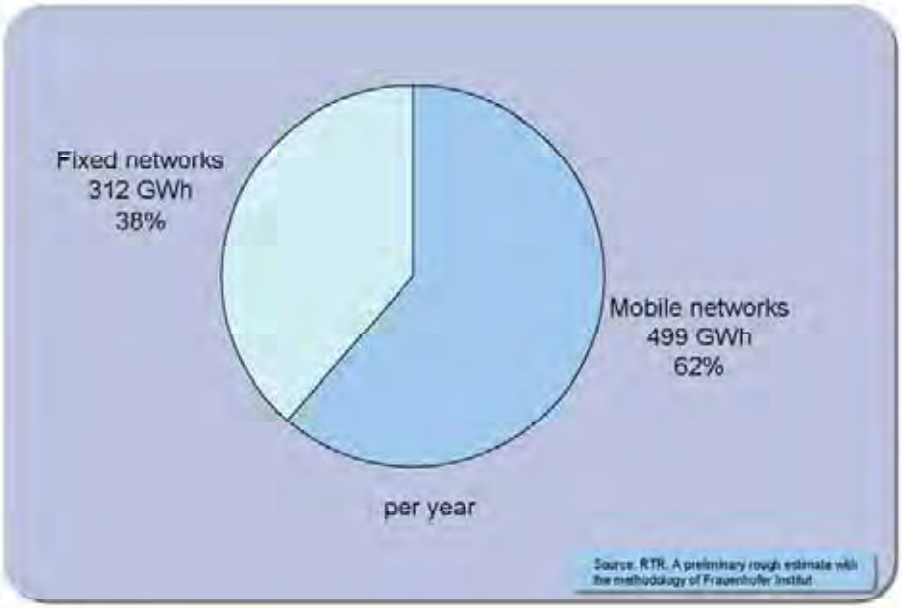
Fixed and mobile network operations in Germany require 6,4 TWh per year, equally distributed between them.



- In detail, the energy spending is equally distributed between mobile and fixed networks
- The estimation of spending in fixed network is based on number of households. It is expected that the energy consumption will remain the same (two effects: more bandwidth, NGA)
- In mobile network different technologies (GSM and UMTS) applied lead to a higher energy demand.
- The spending for UMTS will increase, the one for GSM will decrease.

Slide 8

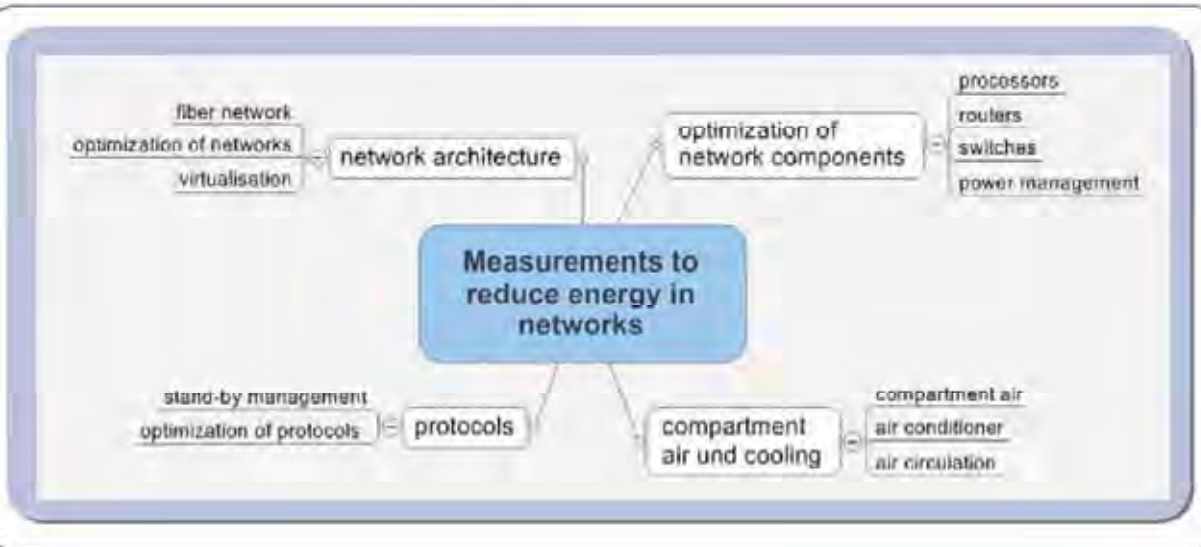
Austria's networks operations require 811 GWh per year



- In a preliminary rough estimate the total Austrian spending of electricity for networks sums up to 811 GWh in 2010
- One third of the spending is caused by the fixed networks
- In mobile networks the higher spending could be explained with the different technologies (GSM and UMTS) on the one hand
- On the other hand four operators with four own physical networks lead also to higher electricity spending

Slide 9

How to reduce energy demand in telecoms networks



Slide 10

Further Information

Contact information

Georg Serentschy
CEO Telecommunications
+43 1 58058 0
georg.serentschy@rtr.at
RTR-GmbH
Mariahilferstrasse 77
1060 Wien
Austria
www.rtr.at

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No 1 in lighting in Europe

- 1.2 bn € turn over
- 7.300 employees

Professional lighting

Lighting components

Lighting controls

LED solutions

Retrofit LED

ZUMTOBEL THORN TRIDONIC.ATCO LEDON

- **Lighting consumes 14% of all electricity consumption within the EU and 19% of global electricity consumption**

  International Energy Agency

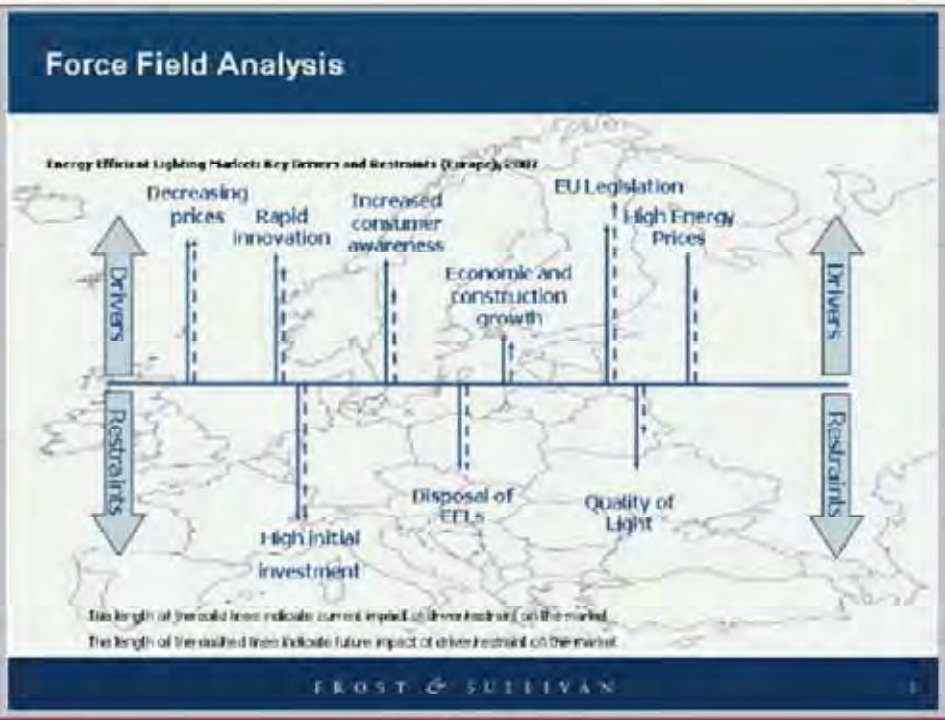
- **Lighting requires as much electricity as is produced by all gas-fired generation and 15% more than produced by either hydro or nuclear power.**

  Light's Labour's Lost – Policies for Energy-efficient Lighting. IEA

Commission President José Manuel **Barroso said, "Responding to the challenge of climate change is the ultimate political test for our generation.** Our mission, indeed our duty, is to provide the right policy framework for transformation to an environment friendly European economy and to continue to lead the international action to protect our planet. Our package not only responds to this challenge, but holds the right answer to the challenge of energy security and is an opportunity **that should create thousands of new businesses and millions of jobs** in Europe. We must grasp that opportunity".

Potential: biggest drivers for energy efficiency come from EU Legislation

Study: „Growth opportunity for European EEL market",
Frost and Sullivan, Feb 2008



Never forget: lighting is for people

In every day of the life.

Lighting is fulfilling the needs of the human: there are three basic functions of lighting

Visual function
Identifying, working without mistakes, safety, orientation

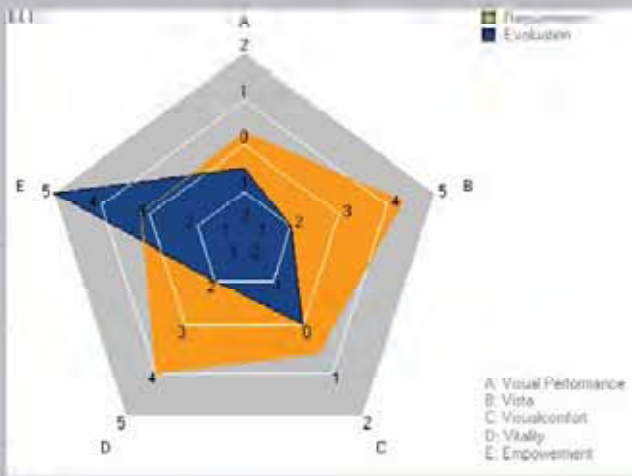
Emotional feelings
Pleasant environment, motivation, mood

Biological functions
Body clock, sense of wellbeing, health

Zumtobel has created tools to measure lighting quality and energy efficiency

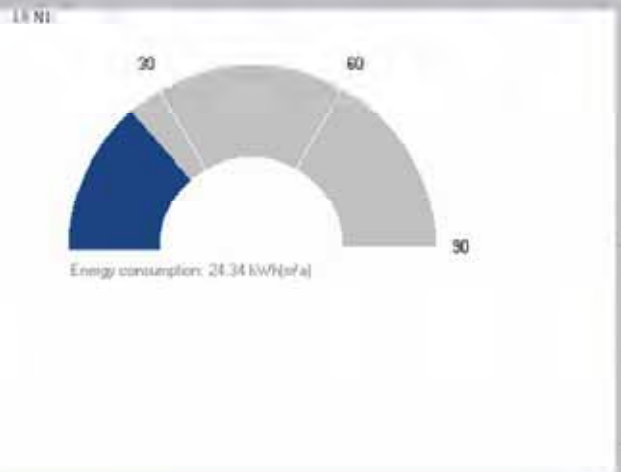
Quality

ELI: Ergonomic Lighting Indicator



Energy

LENI: Lighting Energy Numeric Indicator



The three brands of the Zumtobel group take the challenge serious

Humanergy Balance:
Lighting solutions between environment, energy and the human

ZUMTOBEL

PEC:
Performance, Efficiency & Comfort

THORN

Ecolution:
A corporate philosophy based on responsibility

ecolution
An initiative of TRIDONIC.ATCO

TRIDONIC.ATCO

New business: domestic retrofit

LED retrofit lamps:

5 W replaces 25 W

6 W replaces 40 W

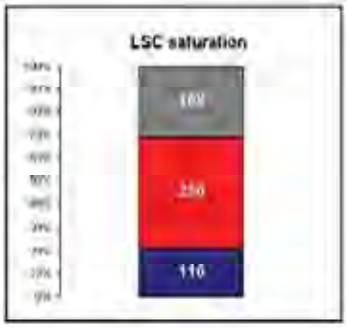
....

Trainings: education and networking of knowledge is the best preparation for future challenges

Zumtobel

Lighting Solution Consultants

3 year training
540 registered



THORN
Academy of Light

486 employees registered for training

→ 93 % achieved

academy
TRIDONIC.ATCO

139 sales persons from 22 countries registered

Education specific to personal needs

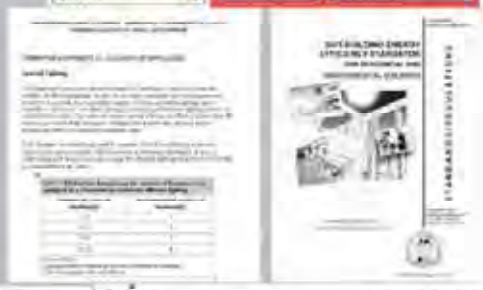
Total of 650 course man-days

Approaches in energy efficiency legislation

Product labelling

Building Codes

Efficiency standards



European legislation

Directives issued by the European commission will become national laws

ELLD on Lamps	EBD on Ballasts	EPBD on Buildings	EuPD on Products	ESD on Services
	A1 ... A3 B1, B2 C D			NEEAP: National Energy Efficiency Action Plans

European and national standards clarify and define procedures to apply the directives

Potential for the Zumtobel group

ELLD on Lamps	EBD on Ballasts	EPBD on Buildings	EuPD on Products	ESD on Services
	A1 ... A3 B1, B2 ~~C~~ ~~D~~			NEEAP: National Energy Efficiency Action Plans
ZLD uses mainly fluorescent and high pressure lamps, LED growing	TA supplies big range of electronic and dimmable ballasts	ZLD offers large range of efficient luminaires and intelligent controls	ZLD offers more than others efficient luminaires for indoor and outdoor lighting, incl dimmable, and one of the best photometric laboratories to guarantee data	ZLD is prepared for consultancy in refurbish-ment and efficient solutions

According to NEEAP: a proposal from the lighting industry in Europe offers 20 % increase in energy efficiency in lighting

CELMA and ELC Joint Position:

increase energy efficiency by **20 %**

EUROPEAN LAMP COMPANIES FEDERATION

CELMA

Product standards

CE marking

Limits for:

- Lamp efficacy
- Ballast
- Luminaire

Refurbishment

75% office and industry lighting inefficient

30% street lighting older than 20 years

Lighting system legislation

Performance criteria for lighting installations

- improve quality while achiving energy savings
- Building codes public procurment

One driver for energy efficiency is refurbishment

75 % of office lighting is inefficient

Modern lighting may save 50 %

Sophisticated lighting solution at KfW – Bank offices in Frankfurt: combination of light and acoustic, low energy use

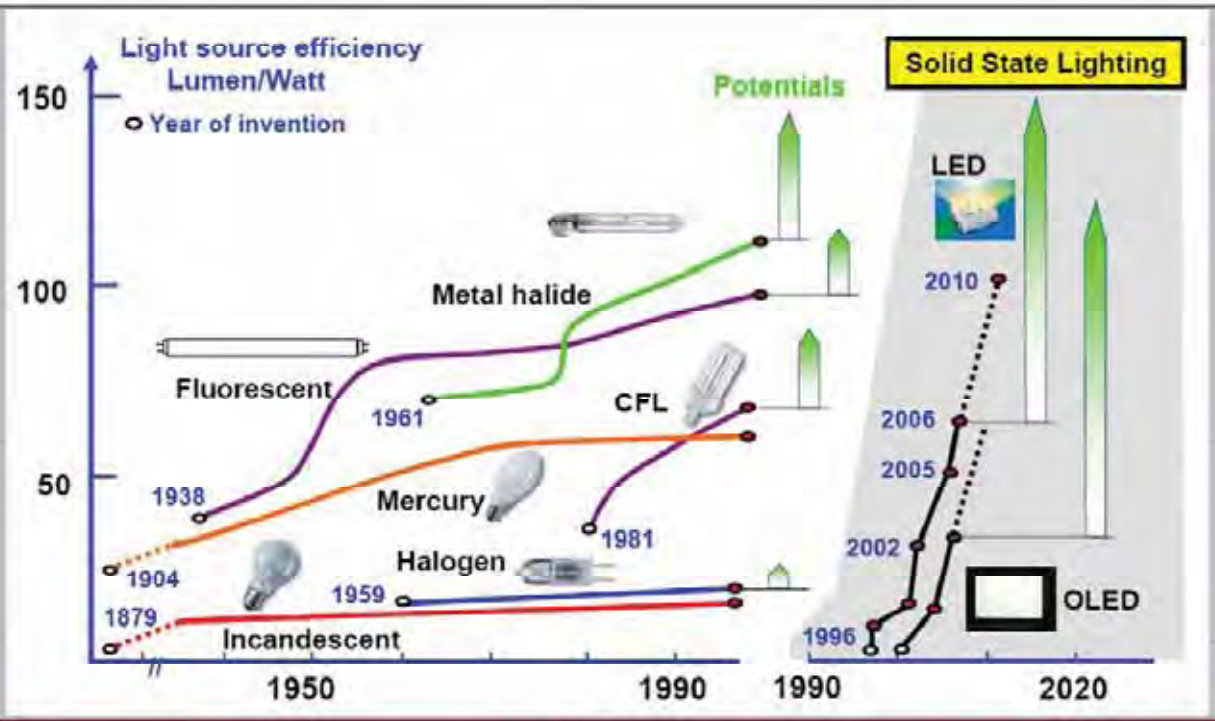
Quelle: RKW Architekten Frankfurt am Main und ip5 - ingenieurpartnerschaft

There are different levels for energy savings.

+ + +	+ + +	+ + +
Product standards	**Refurbishment**	**Lighting design legislation**
CE		
Efficient ballasts	Reduce old energy wasting installations.	Tools for lighting design
Efficient luminaires generally efficient while using fluorescent and high pressure lamps (> 90% portfolio)	Good access to installers and electrical planners needed	Well trained sales force

There is a significant improvement of Light Output Ratio (LOR) when applying innovative materials in products

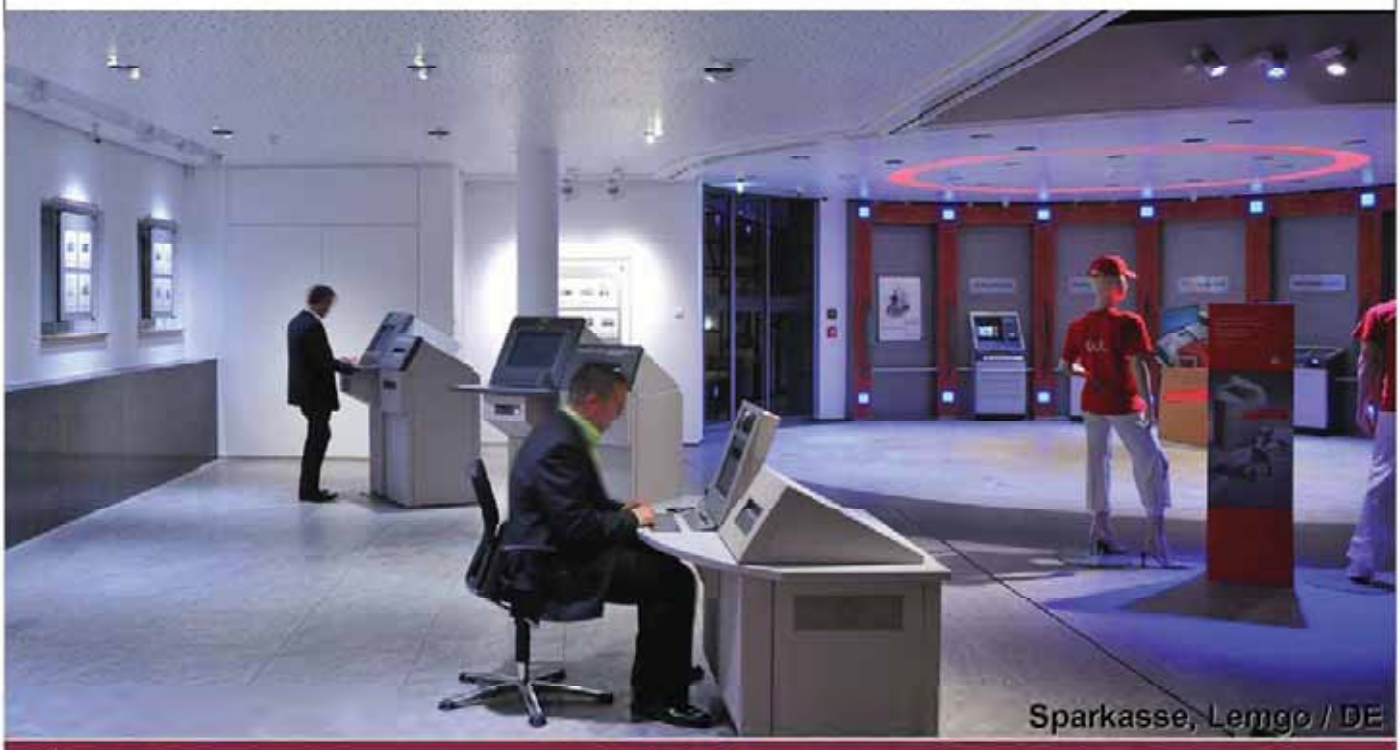
Fluorescent lamps are still most efficient. LED will close up. Lighting market and lighting solutions will change.



A closer look at some products exposed at Light and Building: LEDs replace halogen and is partly an alternative to compact fluorescent lamps

	2LIGHT MINI LED RGB	2LIGHT MINI LED	TEMPURA DL	PANOS LED 1000	PANOS LED 2000	Micros LED
Lumen(lm)	720	1000	700	1000	2000	330*
Power	21	18	44	18	51	8
Replaces	~ QT50	~ 1/18 CFL	Not available	~ 1/18 CFL	~ 2/18 CF	~ 20W QR-CBC
Colour temperature (K)	3000 / 4000 + RBG	3000 / 4000	2700 – 6500 + RGB	2700 – 6500 + RGB	3000 / 4000	3000* / 4700 / 5400
Control	DALI	ON/OFF	DALI, DMX	DALI, DMX	ON/OFF DALI	DALI

A bank with only LED lighting

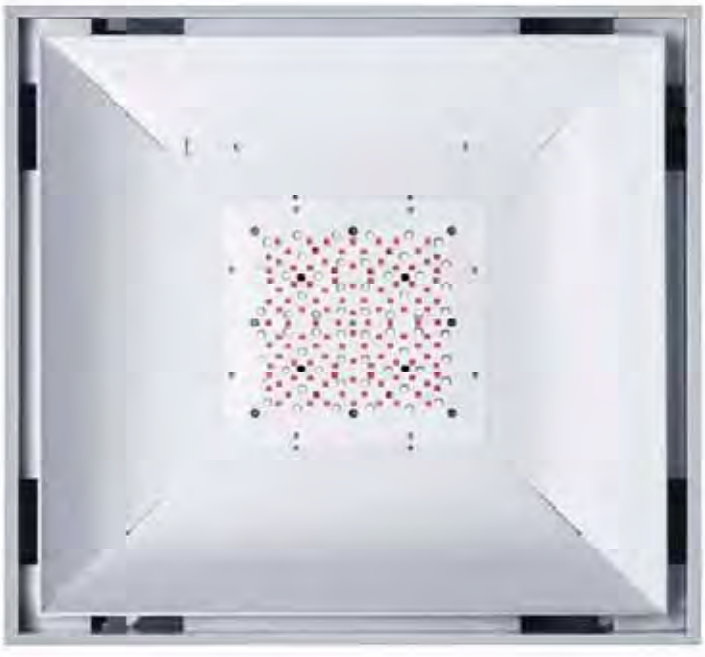


A shopping center with LED lighting

Stadion Center, Vienna / AT

Hybrid solution: LED and fluorescent

LED in controlled colour temperature and luminous output



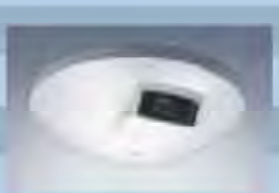
Controls are the basic for intelligent lighting solutions. They introduce simple management techniques for lighting.

Daylight Kit

- Control unit DIMLITE daylight
- Lightsensor LSD

Room Kit

- Control unit DIMLITE 4ch
- Lightsensor ED-EYE
- Presence detecor ED-SENS
- User interface Circle Cxx



zumtobel group

Lightmanagement is the key to intelligent solutions which offer the highest potential in savings

	Saving potential	
Permanent (on/off)	0%	No lighting controls
Daylight controls	40-60%	With lighting controls
Daylight-Harvesting blinds	20%	
Presence detection	15-30%	
Time managment	5-15%	
Maintenance Control	10-25%	

The market penetration of intelligent solutions is still poor: there is a big potential as it was for electronic ballasts

Market penetration in Europe:

Manual control (on/off): about 97 %

Daylight control: < 8%

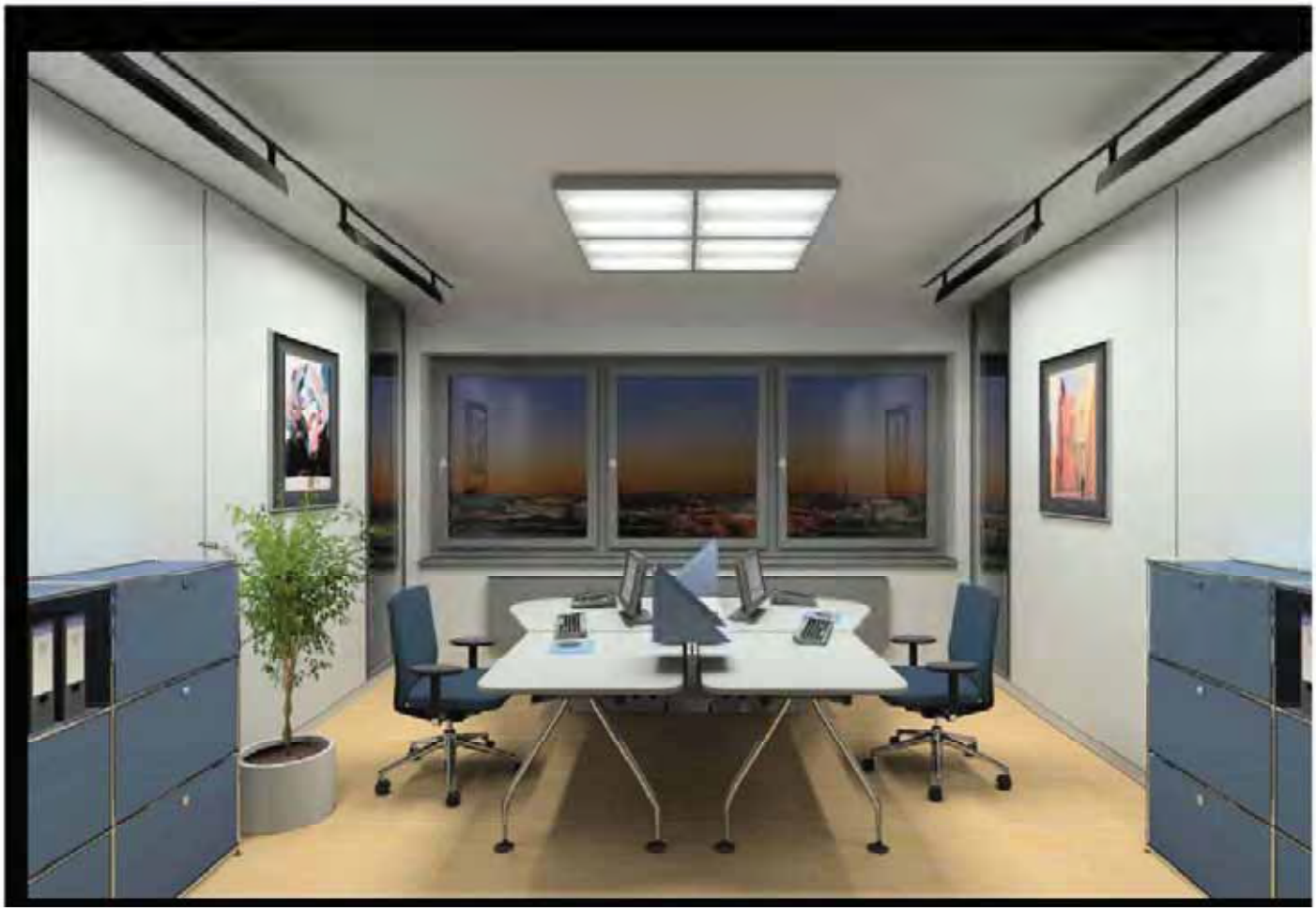
Presence detection: < 8%

Constant illuminance: < 3%

Timer switches: < 4%

Lighting control seems to be in the same condition as electronic ballast one decade ago.

(VITO: Belgian consultant to EU for energy using products)



Lighting design offers a potential by improving quality and efficiency ....

Higher Quality

New design appoach
Separate components
Visual – emotional - biological
Dynamic lighting

Quality corridor

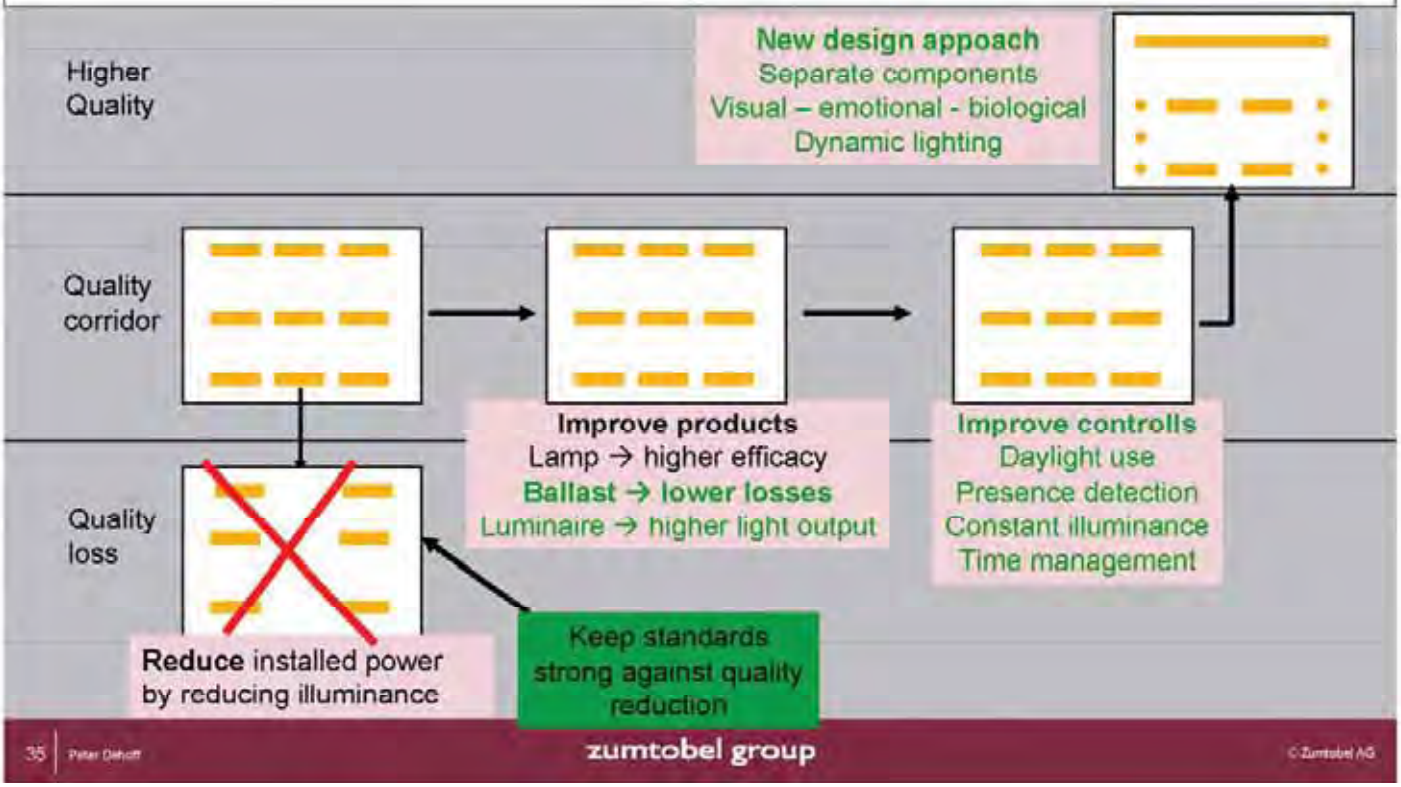
Improve products
Lamp → higher efficacy
Ballast → lower losses
Luminaire → higher light output

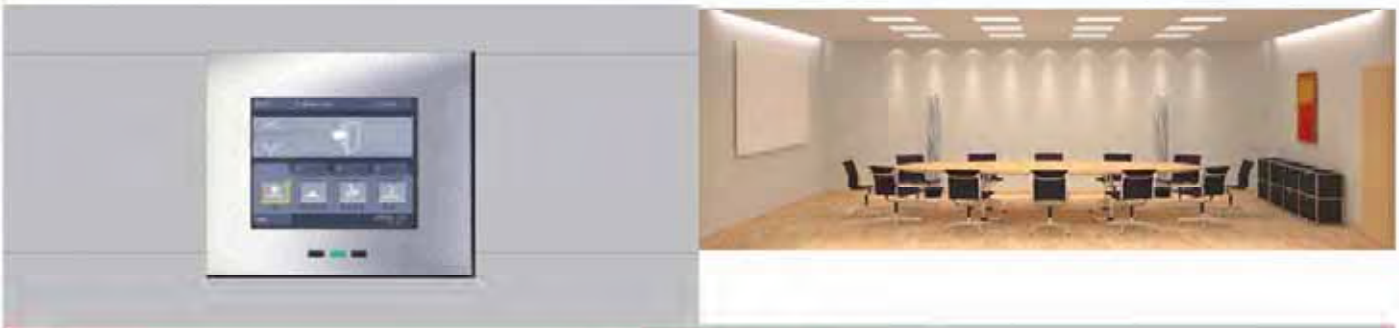
Improve controlls
Daylight use
Presence detection
Constant illuminance
Time management

Quality loss

Reduce installed power
by reducing illuminance

... and this is where Zumtobel is strong





The challange is to balance the requirement for energy efficiency and lighting quality.

Excellent technology
- full range of luminaires
- Lighting controls
- Ballasts
- LED solutions

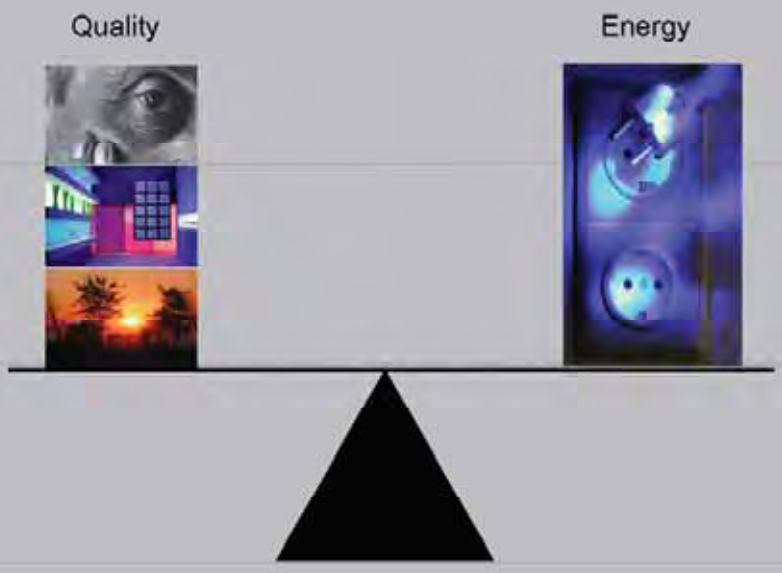
Lighting quality efforts

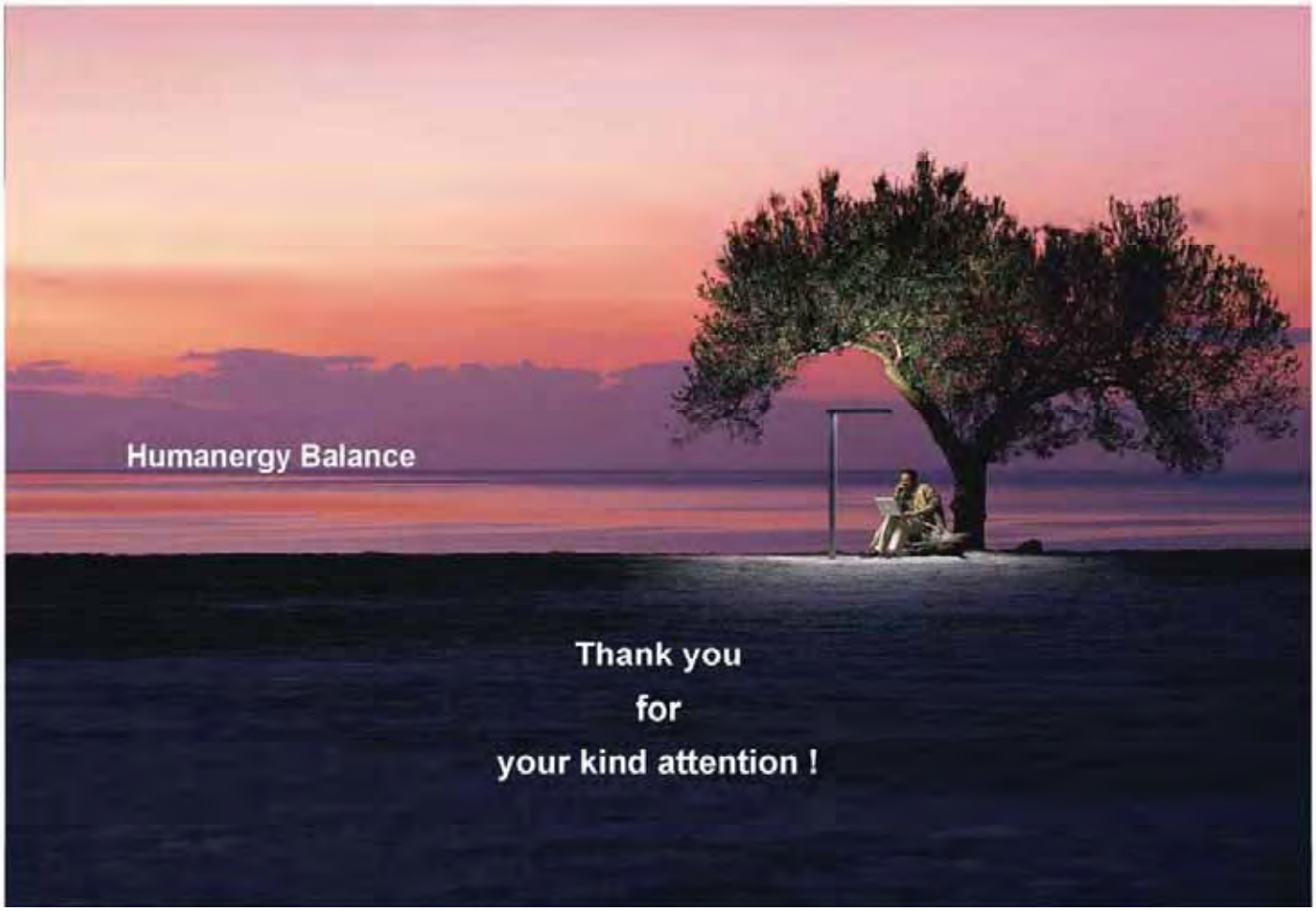
Perfect education of sales consultants

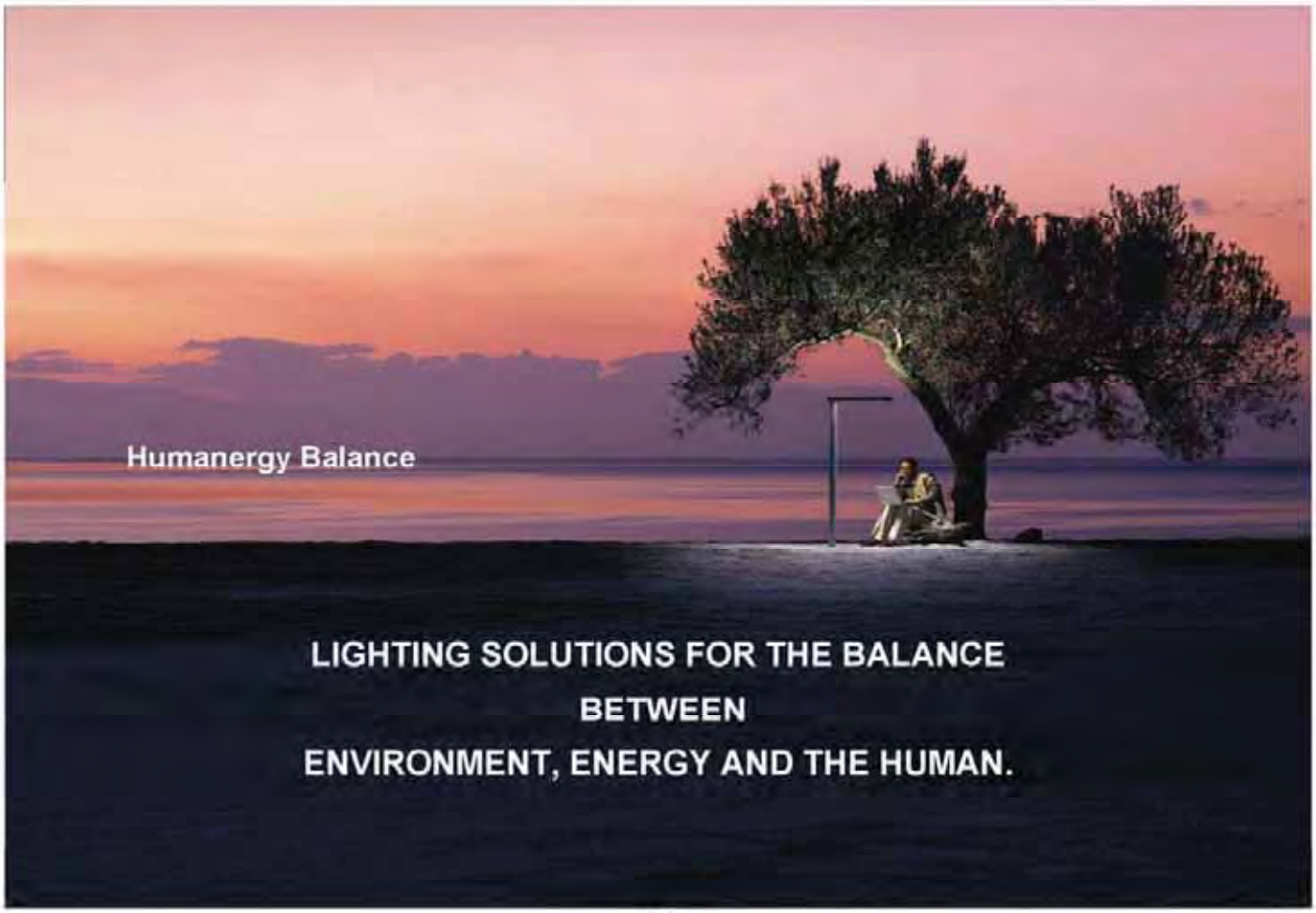
Energy saving targets

Well experienced lobbying to politics, associations and lighting community

The balance between energy efficiency and lighting quality.




Humanergy Balance
Thank you
for
your kind attention !


Humanergy Balance
LIGHTING SOLUTIONS FOR THE BALANCE
BETWEEN
ENVIRONMENT, ENERGY AND THE HUMAN.

Power Electronics
The Enabler for Energy Efficiency

Dr. Erich Prem
eutema Technology Management GmbH

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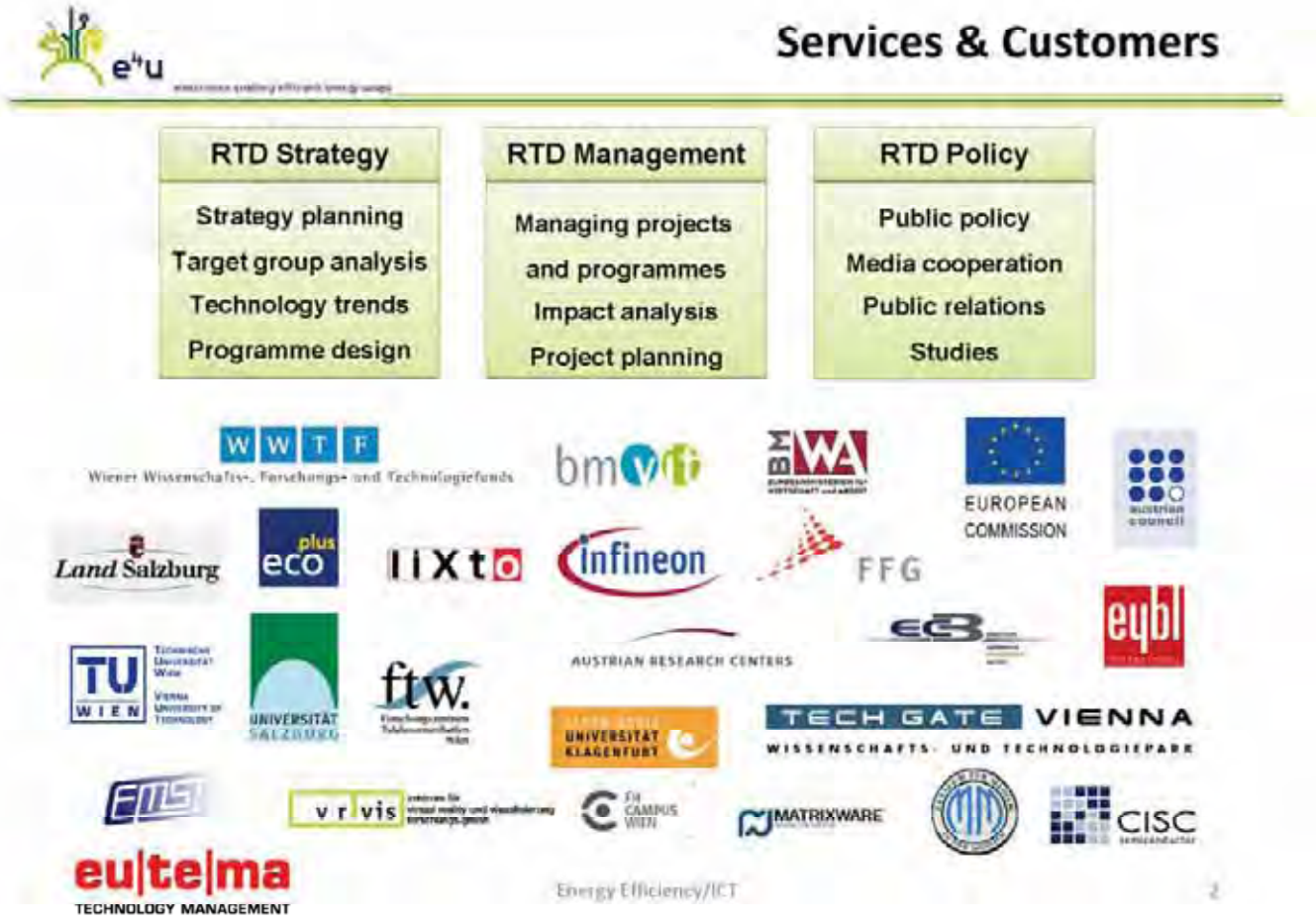
TECHNOLOGY MANAGEMENT



Overview

1. The ICT context
2. ICT potential
3. Success stories
4. The future

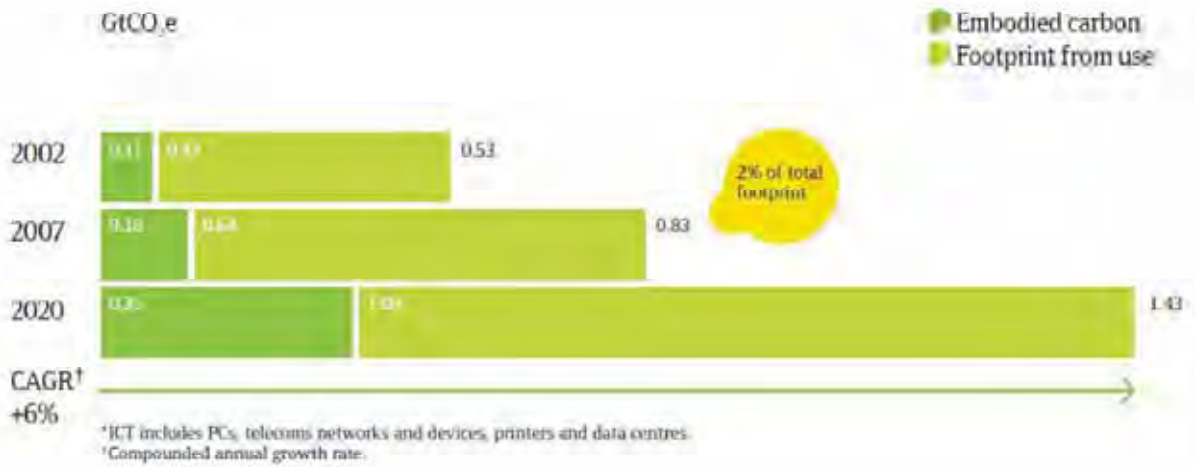
Cause...and effect

- Information
- Monitoring
- Control
- Optimization
- Innovation
- Transformation






ICT CO2 footprint

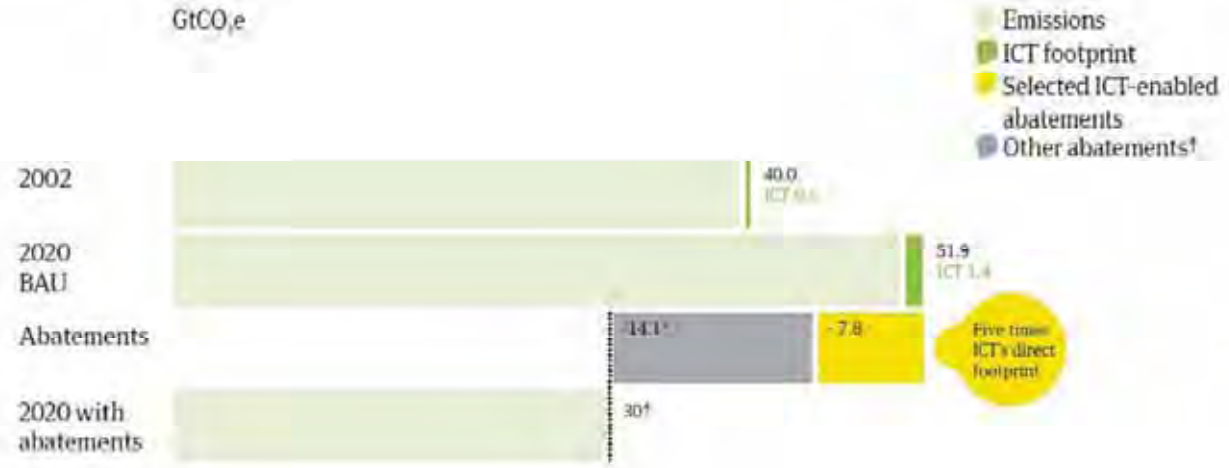


II. The Potential

7.8 $GtCO_2e$

Smart 2020 Report, The Climate Group, Analysis by McKinsey & Co., 2009.

ICT impact



* For example, avoided deforestation, wind power or biofuels.
† 21.9 GtCO2e abatements were identified in the McKinsey abatement cost curve and from estimates in this study. Source: Enkvist P., T. Naucler and J. Rosander (2007), 'A Cost Curve for Greenhouse Gas Reduction', The McKinsey Quarterly, Number 1.

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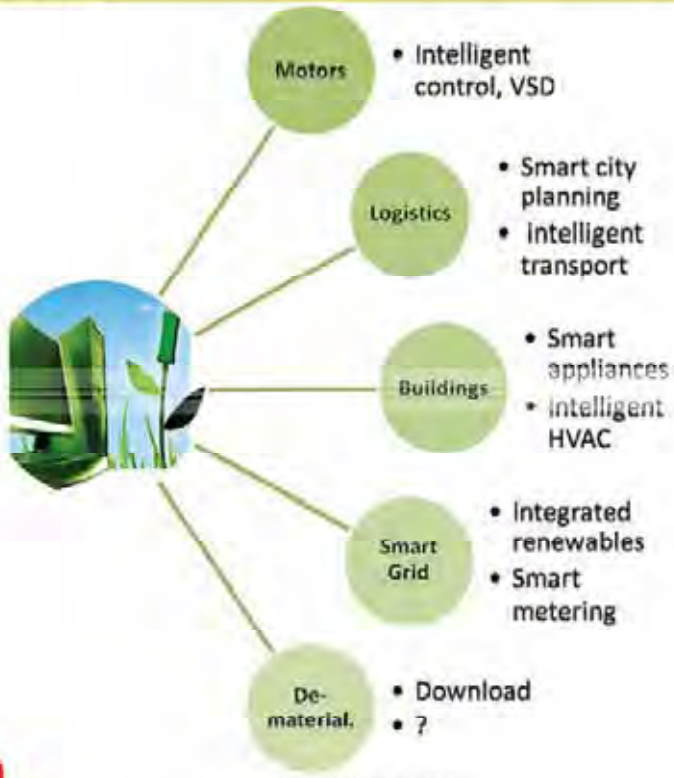
ICT saving potential in other sectors



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ICT: the enabling effect

III. Success Stories

Transport	• 60% of world oil consumption
Motors	• 65% of industrial electricity
Buildings	• 40% of energy use in developed countries
Telecom	• 90% of 3G network power costs due to base stations

Transport: opportunity & challenge

e-Mobility

- 60% of world oil consumed in transport
- Electric drive much more efficient than combustion engine
- Cost of electricity/km 3-4 times lower than petrol/km

Technological Challenge

- Battery technology
- Charging

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Electronics in electric vehicles

Solution: NRGspot – a Public Ultra-Fast Charging Infrastructure

- Based on Lithium-ion batteries and advanced power electronics
- Charging systems provided by Epyon (spin-off of TU Delft)
- Charge points located at strategic places (near shopping centres), supply 100% green electricity
- Access open to subscribers via intelligent interface
- Ultra-fast charging within 5-60 min.

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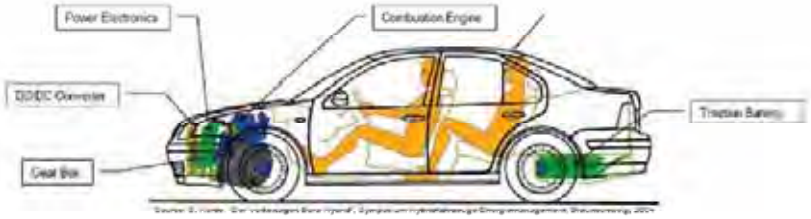
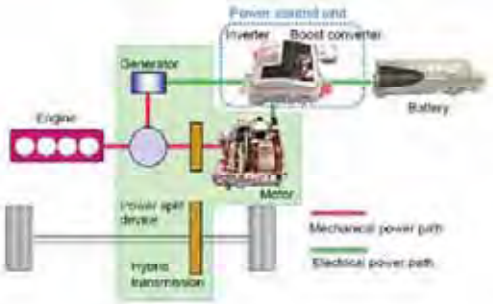
Electronics in hybrid electric vehicles





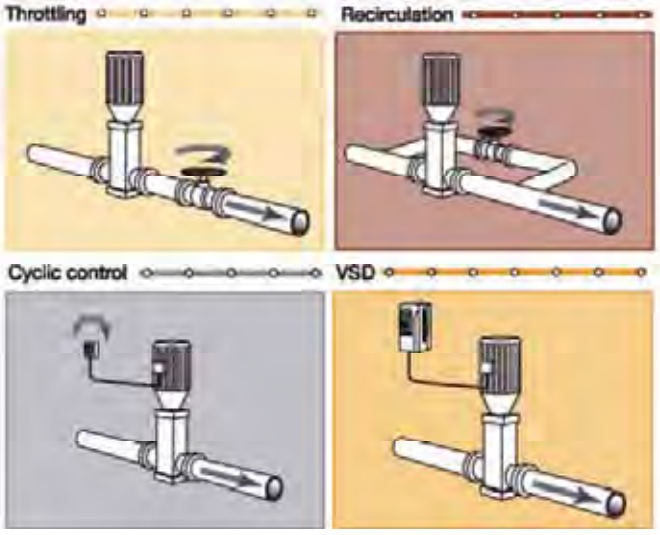
ICT in industry

Electric Drives

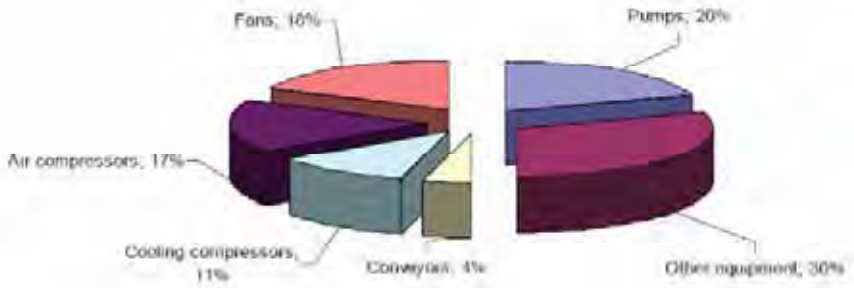
- Electric drives account for 65% of industrial electricity consumption
- Converting to variable speed drives permits almost 50% reduction
- Most important area of application: pumps and fans

Technological Challenge:

- Flow / pressure control



Smart motor systems potential



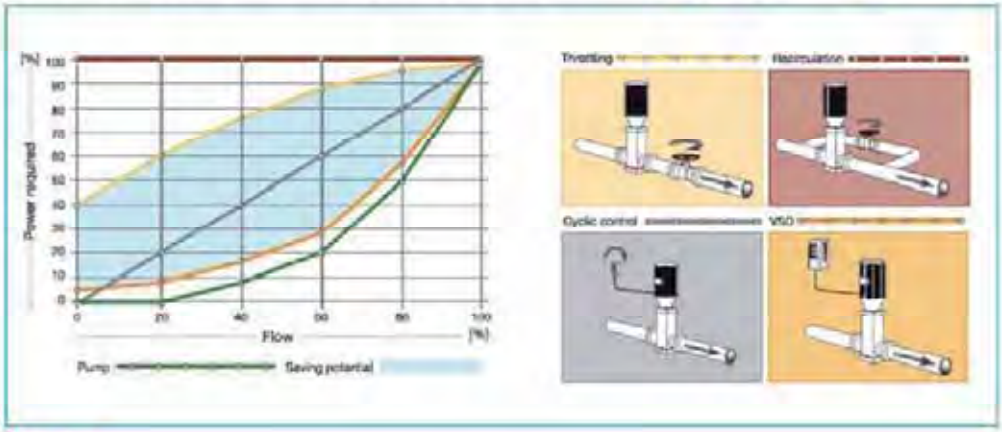
Motor drives industrial applications [Rein 08]

ICT in industry

Solution: Variable Speed Drives

Example: Pietarsaari's water supply

- 30% reduction of energy consumption
- Water pressure much more stable (reduces leaks, maintenance needs,...)



Source: ABB

Smart motor systems potential

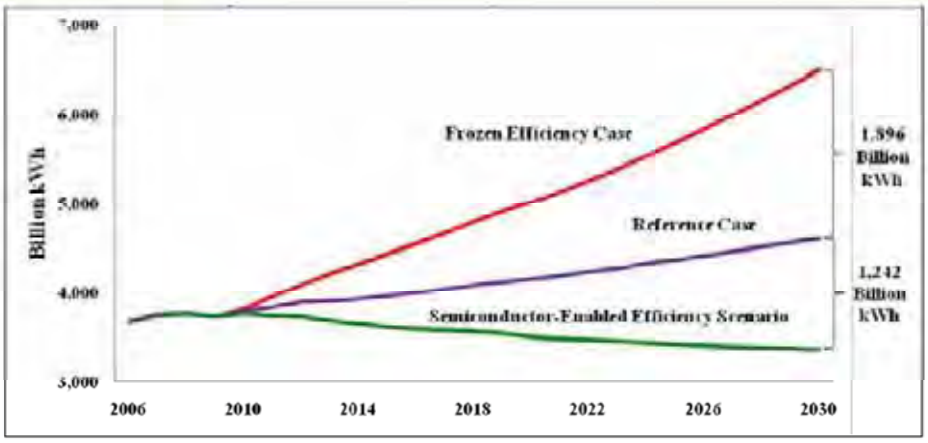
IV. Research into the Future

Society megatrends

Megatrends:	Consequences for Power Electronics
Mobility	E-car, hybrid car, fuel cell car urban transport, trains, more electric aircraft/ship
Information & communication society	PC, internet, server farm, digital control and system communication body area network (mobile human, mobile miniaturized system)
Energy saving; security, availability and reliability of energy supply; clean environment	Energy efficiency, power quality, electrification, system reliability, intelligent power management, digital control
Comfort; elder society	Electrification, self-learning systems
Urbanisation; basic infrastructure; transport	Electrification
Globalisation	Standardisation

Society megatrends with impact on (power) electronics

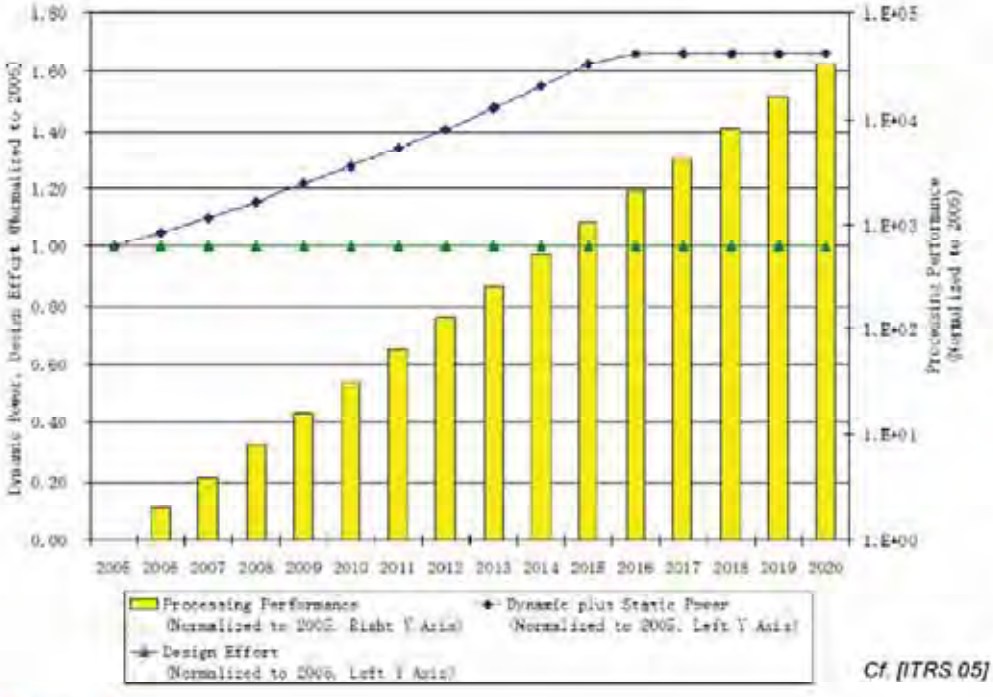
The Future



*"given the right mix of investment-led policies that drive what we call a **Semiconductor-Enabled Efficiency Scenario**, the market could facilitate productivity gains that **reduce electricity use below current levels** "*

Source: J. A Laitner, C. P Knight, V. L. McKinney, K. Ehrhardt-Martinez: Semiconductor Technologies: The Potential to Revolutionize U.S. Energy Productivity. American Council for an Energy-Efficient Economy, Washington, D.C., 2009.

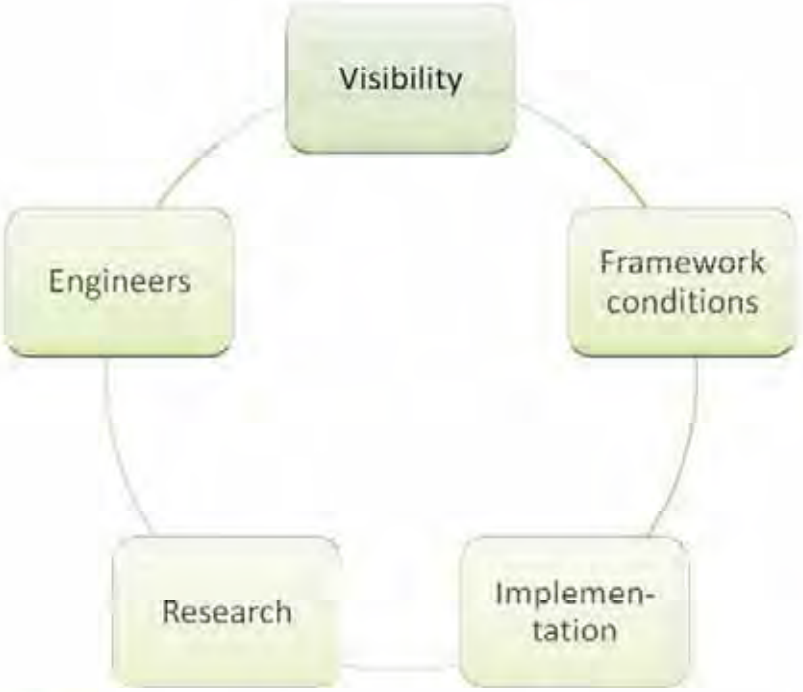
SOC efficiency trends



Cf. [ITRS 05]

Roll-out	Develop	Research
VSD	Smart grid	SiC PE
Intelligent lighting	Advanced lighting	0- power standby
Smart meters	Standardized solutions	energy-aware SW
Low-power stand-by	Business models	power density
...	...	...

Strategic Orientation for Energy RTD



Dr. Erich Prem
eutema Technology Management GmbH
www.eutema.com

E4U website
www.e4efficiency.eu

ECODESIGN company

ECODESIGN of Consumer Electronics

(on behalf of G. Podhradsky, Philips Speech Processing)

PHILIPS

www.ecodesign-company.com

ECODESIGN company

Spin-off: **ECODESIGN company engineering & management consultancy GmbH**

CONSULTING ENGINEERS

Vienna
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We help our clients develop and market eco-products successfully.

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ECODESIGN in 12 steps

Wimmer, Züst, Lee:
„ECODESIGN Implementation –
A systematic guidance on integrating environmental considerations into product development"

Explains in twelve steps how to improve products

www.ecodesign.at/12steps

Springer Verlag
ISBN 1-4020-3070-3

www.ecodesign-company.com

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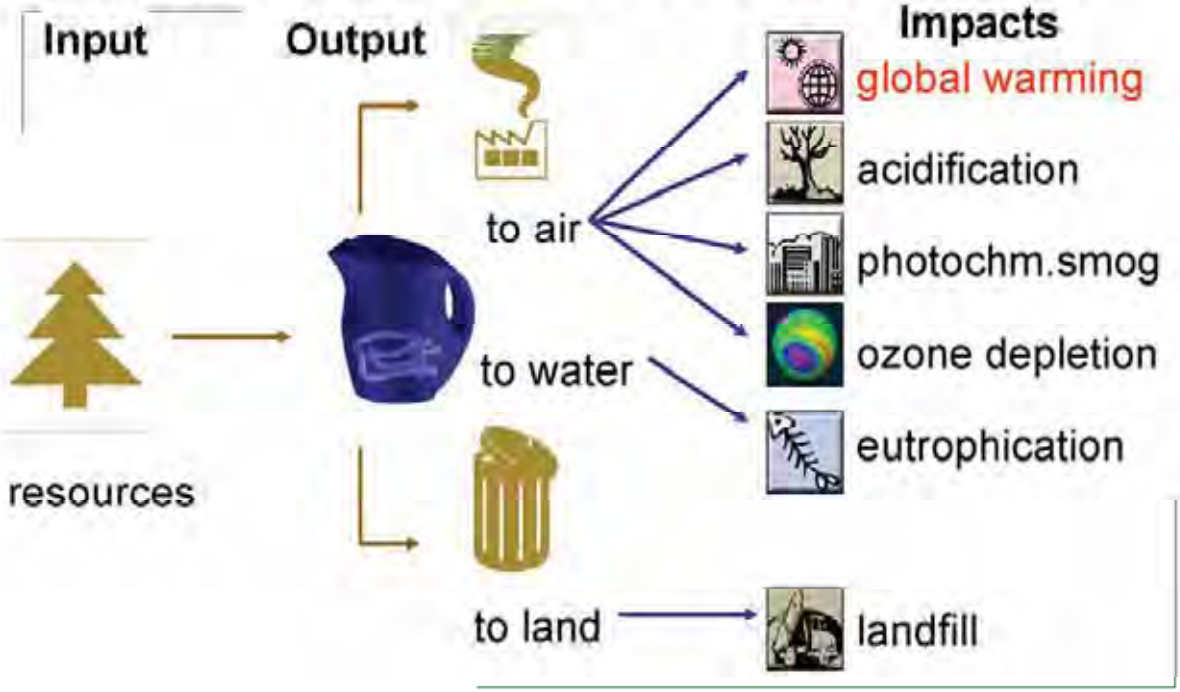
main questions in ECODESIGN

- What are the key environmental aspects to improve a product?
- What are the environmental stakeholder requirements (existing and new regulations, demands, laws, ...)?

ECODESIGN company

products and their environmental impacts



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EU - directives

- RoHS-directive: Restriction of certain Hazardous Substances
  forbids lead, mercury, cadmium – 2006
- WEEE-directive: Waste Electric and Electronic Equipment Requires reuse and recycling – 2005
- ELV-directive: End of Life Vehicles Directive
  Requires reuse and recycling – 2002
- ELD-directive: Energy Label Directive
  Requires information about energy consumption
- Energy using Product (EUP/ECODESIGN)
  Framework for eco-design requirements

ECODESIGN Roadmap

source: Wimmer, Züst, Lee, 2004

www.ecodesign-company

Case: Digital Pocket Memo

Development task

- A new model shall be designed.
- How can „environment be considered? How to improve the environmental performance?
- Collecting life cycle data.
- Applying ECODESIGN Toolbox.

Digital Pocket Memo

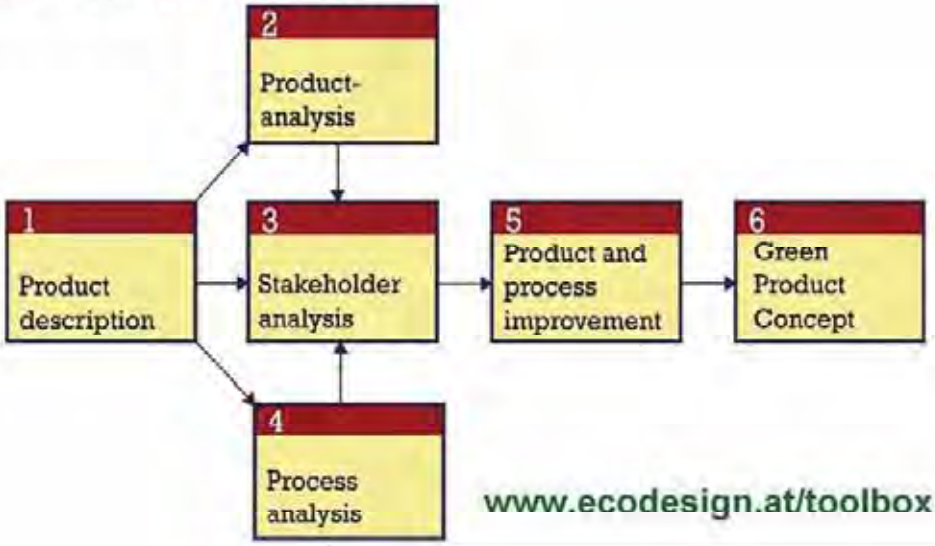
Product re-design

New Digital Pocket Memo

www.ecodesign-company

ECODESIGN Toolbox

Integrated approach in six steps for developing Green Product Concepts



www.ecodesign.at/toolbox

ECODESIGN company

Life Cycle Data from the reference product

- Each part was modelled with:
  - Material
  - Process
  - Surface
  - Transport

BG-Teil-Nr	Baugruppe-Teil	Material-Prozessname	Menge	Einheit
101-01	Gehäuse Oberteil	ABS	14,53	g
101-02		Spritzgießen	14,53	g
101-03		Lackieren und Bedrucken	19060	mm²
101-04		Transport, LKW < 3,5 t 590 km		
102-01	Gehäuse Unterteil	ABS		
102-02		Spritzgießen		
102-03		Lackieren		
102-04		Transport, LKW < 3,5 t 270 km		
103-01	Batteriedeckel	ABS		
103-02		Spritzgießen		
103-03		Lackieren		
103-04		Transport, LKW < 3,5 t 270 km		
104-01	Abdeckung	ABS	0,077	g
104-02		Spritzgießen	0,077	g
104-03		Lackieren	303	mm²
104-04		Transport, LKW < 3,5 t 270 km	0,02079	kgkm

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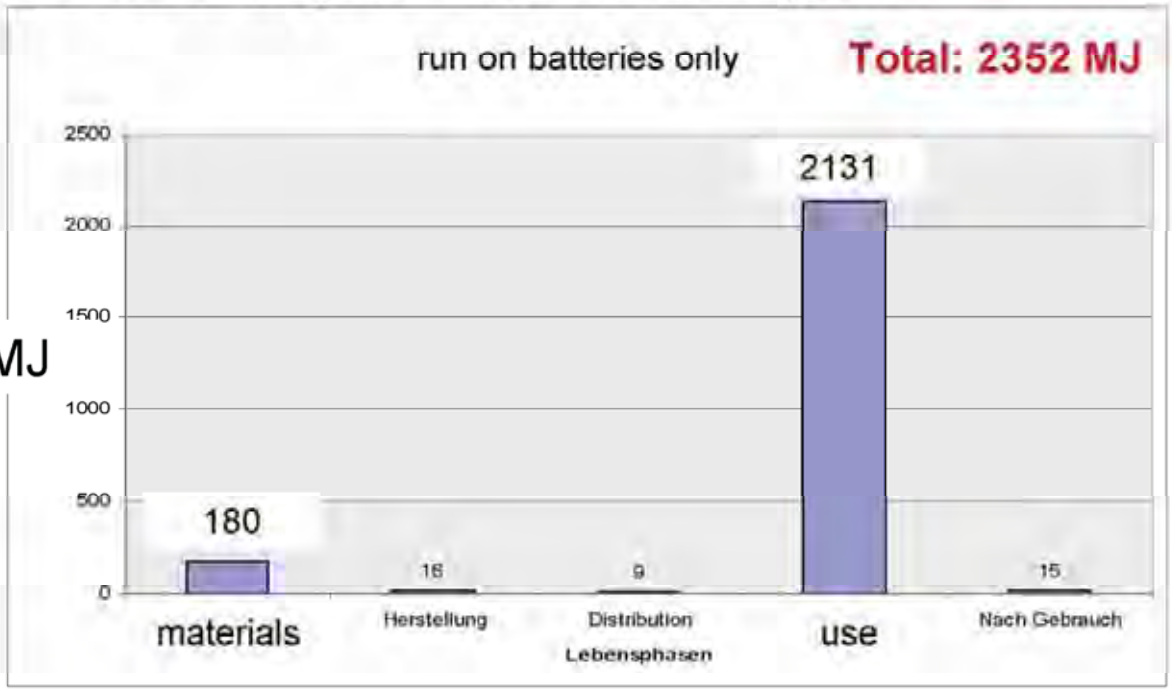
ECODESIGN company

Life Cycle Data

- Clients run device on batteries only (4 years lifetime)
- Clients buy ***additional external*** *charger* and run device on rechargeable batteries only

ECODESIGN company

Product analysis – environmental profile



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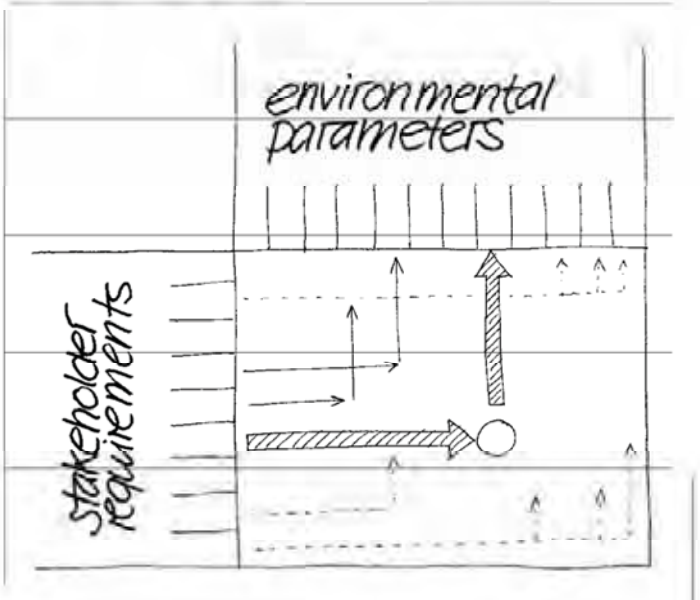
Stakeholder analysis with E-QFD

- Using QFD method
- Collect and transform requirements from directives (RoHS, WEEE, EuP), customers, competitors, etc. into design parameters
- Example: **Tender from German ministry**



ECODESIGN company

Product improvements – Digital Pocket Memo

- Focus on the use phase – reduce energy consumption (e.g. find new display light)
- Find smart energy management system for the device
- Identify possible reduction on energy consumption
- Improve product functionality
- Apply concept of function integration
- Reduce number of parts and components
- Apply lead free concept (RoHS compliance)

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Green Product Concept – Digital Pocket Memo

- Now 17 hours of dictation on one set of batteries
- Deliver with rechargeable batteries, table stand and external charger as well as USB charging function
- Up to 30% less parts and components in the device
- Smart charger, less stand-by consumption, one instead of four power cables
- Design for recycling (DfR) is realized

ECODESIGN company

Next steps: Environmental communication - EPD

- How does the market know the environmental benefits?
- Communicate performance using **Key Environmental Performance Indicators** e.g. within an EPD

Environmental Product Declaration—EPD

PHILIPS

Philips Digital Pocket Memo

This Environmental Product Declaration provides quantified environmental data using predetermined parameters and additional environmental information. The predetermined parameters are based on the ISO 14040 series of standards and the values of the parameters are form the critically reviewed Life Cycle Assessment results.

Information about Manufacturer

PHILIPS Speech Processing has more than 50 years of experience in the professional market for Dictation devices. The headquarter as well as the development and the production is located in the High Tech Campus Vienna. The production in Vienna is meeting the ISO 9001 and ISO 14001 standard. Dedicated sales clusters located in every continent ensure that the customer base get the best commercial and technical support.
PHILIPS is also the leader in the IVA (International Voice Association) who defined the well established DigitalSpeechStandard (DSS), which is an important element for the interoperability in modern professional and digital dictation

ECODESIGN company

Proving the environmental achievements

- Key Environmental Performance Indicators

  e.g. GWP, …

159 kg CO2-eq **22 kg CO2-eq**

Total: 38.000 ton CO_2-eq in 4 years!

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Characteristic of eco-products

- Life Cycle Thinking is applied in the early stage of product design and development
- **KEPI** and the environmental profile are known
- Design changes aim at improving environmental weak points
- Significant environmental improvements can be shown
- A shift of environmental impacts from on the other life cycle stage is avoided
- Environmental improvements are communicated to the market

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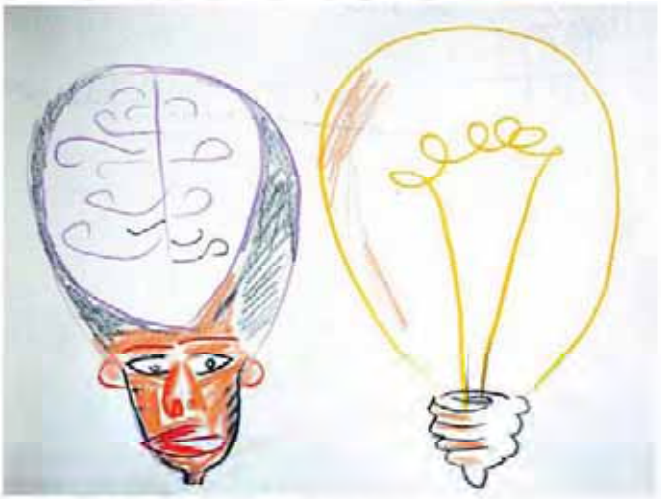
Thank you for your attention!



Prof. Dr. Wolfgang Wimmer
wimmer@ecodesign-company.com
+43 1 40 35 611 30

Discussion: Future technologies, R&D chances

- Green ICT – where are chances in a new (developing) market?
- Where do we see need for technology development and R&D?
- How can the administration support new chances through Green ICT?
- Where do you see the role of SMEs? Do they have a role?

Executive Summary

Mayor increase of energy consumption can be observed in **lighting and air-conditioning** as well as in **ICT and CE equipment**. Those product groups should get most attention.

Additionally the focus should be on **stand-by consumption** of popular or new electronic products. Especially important is stand-by consumption when introducing new technologies. One example: Network products such as smart metering in households should get more attention due to stand-by energy consumption.

Calculation for Austria: *If a smart meter technology is introduced that would cause stand-by consumption per meter in the order of 15W this would result in 3,5 million Austrian household in an additional consumption of 460GWh per year – this is around half on the annual production of the Danube water power plant Freudenau.*

The following key issues can be derived from the workshop for a recommended research and technology focus:

- Green ICT and future Zero Energy Appliances
- Energy efficient LED lighting
- Integration of eco-efficient space cooling in buildings
- Importance for regulators when assessing introduction of new technology – a mandatory selection criteria should be stand-by consumption

Subject	Energy Efficiency Chances of Green ICT and Electronics in Austria	
Date	05.03.2010	
Place	Hotel Wimberger, Vienna	
Reporter	M. Hofmann, Austrian Energy Agency	
Speakers	M. Chaloupek, IBM Austria	W. Pohl, Bartenbach Lichtlabor
	P. Dehoff, Zumtobel	E. Prem, Eutema
	M. Ellis, International Energy Agency (IEA), 4E Operating Agent.	G. Serentschy, Rundfunk und Telekom Regulierungs-GmbH
	M. Hübner, Austrian Federal Ministry of Transport, Innovations, and Technology (BMVIT)	H.P. Siderius, NL Agency-Climate and Energy, The Netherlands
	A. Meier, Berkeley National Laboratory, USA.	W. Wimmer, ECODESIGN company
	H. Pairitsch, Infineon Technologies.	

At the beginning of the workshop, the moderator welcomed the speakers and audience and gave the word to Michael Hübner, representative of the Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT).

Mr. Hübner provided some information on the areas of work of the Ministry and the overlapping regions where Power electronics can play a role for furthering their three largest programs on Smart Grids and infrastructure, Efficient End-Use, and Green ICT. Mr. Hübner raised the following questions as to frame the workshop discussions:

- Where are major potentials in the (Austrian) energy system?
- Where are chances for the (Austrian) industry?
- What measures can be taken to overcome the „valley of death“?
- What is the role of R&D (especially in Austria)?
- What is the role of the different players in Austrian Industry (e.g. SMEs)?

The moderator then introduced the speakers as they were listed in the program. A summary of their presentations follows.

Summary of the presentations:

The workshop was structured as to start with the input of international experts from The Netherlands, The USA, and Australia, to bring the context of the global situation concerning current energy consumption trends and energy efficiency opportunities. The speakers presented specific examples from their area of work and/or from activities in their countries.

First, Mr. Siderius from NL Agency – Energy and Climate in The Netherlands introduced the topic of Zero Energy Appliances (ZEAP) as an inspiring vision for manufacturers to think about the potential of appliances to change, for example the life cycle cost of energy using products. The ZEAP concept can open the door to innovation and design, by incorporating extreme power management measures, and by introducing “energy producing (positive) appliances” that function with alternative energy sources (e.g., body heat, mechanical or solar energy).

Second speaker was Mr. Ellis (MEA Consultants in Australia), who is working as Operating Agent for the 4E (Efficient Electrical End-Use Equipment) Implementation Agreement of the IEA. Mr. Ellis presented the results of his latest work, which has been documented in the book “Gadgets and Gigawatts – policies for energy efficient electronics” (2009). He discussed the global assessment of the changing pattern in residential electricity consumption over the past decade, and partly his analysis of the role played by electronic equipment. Mr. Ellis briefly touched on the influence that government policies have had on creating markets for more energy efficient appliances, and the new opportunities for creating smarter, more energy efficient homes.

Last in this block on international speakers Mr. Meier from Berkeley National Laboratory in California, USA, presented an overview of the trends in the use of products with electronics in the United States, and the different measures to improve their efficiency, e.g., minimum efficiency standards and the program “Energy Star”.

He touched on the important, often overlooked aspect of user behaviour and responsibility when it comes to reduce energy consumption. He showed specific examples of disclosure initiatives in the US that brought substantial gains beyond product efficiency gains alone.

After these inputs from the invited international speakers, the turn was for representatives from Austrian leading companies in different fields connected to electronics, to present their work and initiatives towards energy efficiency, not only for improved electronic components for different applications, but also for lighting concepts, management of data centres and telecommunication networks, to name a few. The technologies that are already available in the market and their potential impacts, as well as the areas where there are barriers for implementation, and more research is needed for the development of promising technologies were also presented. The floor was open for questions and discussion, some of which as included below.

Extract of the discussion:

Question from Mr. Wimmer to Mr. Siderius: When will we have the Zero Energy Appliance (ZEAP)?

Mr. Siderius: For a rapid further development and introduction to the market, government intervention is needed. The industry alone does not move fast enough to tackle the existing efficiency potential contained in different products. As indicated in the presentation, ZEAP is a vision towards the future. There are even measures foreseen for ZEAP, for example the European energy label in 2020 will have a class reserved for these Zero Energy Appliances.

Comment from Mr. Pairitsch: In order to achieve the full efficiency potential, we further have to come together and combine/consider the user, the application, and the whole supply chain. If we do that we can speed-up.

Question from Mrs.Diaz, ECODESIGN: To develop efficient products you often need different materials. Is there market security for these sophisticated materials which are needed for production of electronic products? Will these materials be available for the efficient ICT development? Do studies exist which address this question?

Answer from Mr. Prem, eutema technology management: For the realization of the enormous potential in the area of semiconductor technology for ICT and power electronics I am not aware of any supply problems concerning the materials.

Comment from Mr. Hübner: The issue of a secure material supply for the production of energy efficient appliances is of high interest for Austria. Where do these materials come from? We are planning to address this topic through a workshop in the near future.

Comment from audience (network operator in Austria): Concerning smart grid, we can only roll-out smart functions, not smart grids! To roll out smart functions we need a fully developed telecommunication network (ICT infrastructure). To achieve a smart grid, we have to have a telecommunication network first. So government support to this development is important, and it can be done by giving incentives (financial, tax etc.) to speed the investment for the construction of telecommunication networks.

Question from audience: One point which has not yet been discussed deeply is the consumer itself. We can develop the most energy efficient products, but we will have no savings if the user behavior is not following accordingly. Who is educating the consumer? Who is raising the awareness on the importance of energy efficiency to the end-user?

Comment from Mr. Dehoff: I would like to challenge on this question: is information to the end-user really helping to change behavior? For example, if I know how much energy is used when I switch on the lights. Does that information really concern me? Does this information really influence me? I might not be the person paying for the electricity cost of using the light, so I might not react even if I know.

Answer from Mr. Siderius: There were some studies made on this issue of awareness and their impact on energy efficiency. In general, figures show that savings range from 2 % up to 15 % when you provide that kind of information to end-consumers.

Comment from audience (power supplier in Austria): For our customer there is only one concern: “Give me the application which is barely conforming to the legislation and which has the cheapest price” And when you explain that you have something more efficient but a little bit more expensive, the answer is almost always: “Who cares?” So we need government driven support to accelerate the process of market transformation. Yet another problem is when you look at this issue globally. I can produce an efficient product, but can I ship it to another country? Can I sell it there? The same thing in the case of other less efficient but cheaper products that come into the national market from other countries. How do we deal with that?

Answer from Mr. Shane Holt, Department of Environment, Water Heritage and the Arts: In Australia we had a different approach. We do not spend a lot of time talking to the people, we just banned the bad appliances through legislation. In this case everybody wins. The manufacturer, because he has to produce the efficient products, and the consumer because he saves energy.

Comment from audience: Consumer awareness is a relevant problem for the household sector. Who knows the energy consumption of his/her own TV?

Answer from Mr. Meier: The question is also, what is required for the regulations. In my opinion we already made this transformation to awareness for energy efficiency in society.

Question from Mr. Balaz(IBM Austria): Is that not exactly what has happened for the refrigerators through the energy efficiency label? This is a good example for consumer awareness.When you also do that for other products it would lead to more awareness and energy efficiency.

Answer from Mr. Siderius: There will be labels for other products in the future, for example, labels for TV and PC in the European Union. This will be done in the next one or one and a half years. But it is not enough to look only at consumer electronics. These products consist of lots of small parts. Compared to other sectors, the energy consumption is marginal. It is confusing to tell the consumer that you have an efficient TV,when he/she could save a lot more energy through an efficient water boiler. It is also very important that we have labels on those large energy consuming products.

Answer from Mr. Ellis,: Today you have a lot of converging technologies in one product, for example a toaster with mp3 player. That makes it difficult to set minimum standards because for what kind of product do you set the standard? (Toaster only, or mp3 player only, or toaster with mp3 player). But on the other hand, you have horizontal technologies like the display. You have a display in TVs, in PCs and in many other products. We need to label those horizontal technologies too.

Question from Mr. Wimmer:
To sum up, what does this mean? Do we need just more money and no regulations? Or is technology and R&D also important?

Answer from audience: I think R&D can never stand alone. You need the end consumer. You need to combine R&D and raising the awareness of the end consumer.

Comment from P. Dehoff,: Another issue is, who will spend the money for this evolution. People do not invest in things they do not have to pay for.

Comment from Mr. Wimmer:
So we can say that it is important not to only focus on efficient technologies but also raise the awareness of the end consumer for the necessity of those products.

Question from Mr.Wimmer: in this context, what are the chances for Austria?

Answer from Mr.Meier,: Identify the energy consumption that is for no use, combine different technologies to avoid this wasted energy consumption.

Question from Mr. Wimmer: Do we have the technology for that?

Answer from Mr. Holt: Yes you have this capacity. It takes a creative solution by combining existing technologies.

Answer from audience: The Austrian government needs to look at the photovoltaic industry in Germany as an example. Invest money for developing the network market. This results in supporting the network companies. I think this is a very successful model.

Question from Mr. Wimmer: So you propose a subsidy?

Answer audience: Subsidies for more energy efficient products. You can realize it as a tax advantage for such „eco-products".

Answer audience: Austria has a lot of small and medium enterprises. Supporting them and telling them that they can participate in this development is important. That would be a good chance for those companies to contribute to this development of „eco-products". It will open up new markets.

The workshop concluded with the invitation of Mr. Hübner to the Austrian companies to participate in the Miocrosoft Innovation Award "ICT for Green" of BMVIT, call for tender 11th April 2010. More information under following link:
http://www.microsoft.com/austria/innovation/award/news.aspx

Mr. Hübner thanked the participation and engagement of speakers and audience alike and formally closed the event.

IEA 4E
Open Forum, Friday, 5th March 2010

Participants

Surname	First Name	Institution
Chaloupek	**Martin**	**IBM Austria**
Dehoff	**Peter**	**Zumtobel Staff GmbH**
Ellis	**Mark**	**IEA Implementing Agreement**
Hübner	**Michael**	**BMVIT**
Meier	**Alan**	**EPA, Lawrence Berkeley National Labatory**
Pairitsch	**Herbert**	**Infineon Technologies Austria AG**
Pohl	**Wilfried**	**Bartenbach LichtLabor GmbH**
Prem	**Erich**	**eutema Technology Management GmbH**
Serentschy	**Georg**	**Rundfunk und Telekom Regulierungs-GmbH**
Siderius	**Hans-Paul**	**Senter Novem**
Wimmer	**Wolfgang**	**Ecodesign Company**
Aicher	Ferdinand	AICO EDV-Beratung GmbH
Balaz	Martin	IBM Austria
Bauhofer	Peter	A&B - Ausgleichsenergie & Bilanzgruppen-Management AG
Benkwitz	Marita	Wiener Wissenschafts-, Forschungs- und Technologiefonds
Bergauer-Culver	Bettina	Federal Ministry of Economy, Family and Youth
Bernhardt	Klaus	FEEI - Fachverband der Elektro- und Elektronikindustrie
Bieser	Hemma	Klima- und Energiefonds
Bredenkamp	Barry	CEF (Pty) Ltd
Charnley	Maggie	Defra
Derler	Karl	Linz Strom Netz GmbH
Diaz	Adriana	"ECODESIGN company"
Fechner	Hubert	FH Technikum Wien
Fischer	Klaus	Journalist
Fröhlich	Josef	AIT Austrian Institute of Technology GmbH
Fuchs	Susanne	BRIMATECH Services GmbH
Fuchs	Karl	Industriellenvereinigung Wien
Fürnkranz	Christina	Industriellenvereinigung Wien
Grimm		IBM Austria
Hammar	Ture	Danish Energy Agency
Harjung	Margit	Federal Ministry for Transport, Innovation and Technology
Hartmann	Paul	LEDON Lighting Jennersdorf GmbH
Hofmann	Marcus	Austrian Energy Agency

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Participants

Surname	First Name	Institution
Holt	Shane	Department of Environment, Water Heritage and the Arts
Jung	Sabine	Brimatech Services GmbH
Kachelmaier	Reinhard	Unternehmensberatung KACHELMAIER
Kohlhauser	Andrea	ALLPLAN GmbH
Kopacek	Bernd	Austrian Society for Systems Engineering and Automation
Kührer	Susanne	Telekom Austria TA AG
Litzellachner	Andreas	ALLPLAN GmbH
Malleck	Helmut	Keine Angabe
Minotti	Davide	Defra
Missen	Robert	DG Energy, European Commission
Moser	Simon	Energieinstitut an der Johannes Kepler Universität Linz
Niedermair	Markus	WWF Österreich
Obritzhauser	Markus	EGSTON System Electronics Eggenburg GmbH
Ozaki	Norihiko	Institute of Applied Energy
Pammer	Gernot	EGSTON System Electronics Eggenburg GmbH
Park	Jungwook	IEA
Pirker	Harald	Bundeskanzleramt
Riedl	Gerhard	Alcatel-Lucent
Schimany	Helmut - Klaus	ÖBB - Holding AG
Schinnerl	Daniel	Grazer ENERGIEAgentur
Sidanitsch	Hans	Freier Journalist
Spindelbalker	Christian	Wirtschaftskammer Österreich
Szabados	Gabor	Keine Angabe
Unterer	Ulrike	Federal Ministry of Economy, Family and Youth
Weiss	Bertram	Verbund (Österreichische Elektrizitätswirtschafts AG)
Wiesmayer		IBM Austria
Wysoudil	Christian	Ennovatis
Zimmermann	Kerstin	Bundesministerium für Verkehr, Innovation und Technologie
Zisler	Martina	Fachhochschule JOANNEUM GmbH

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ENERGIE 2050 - An Initiative by the BMVIT

Austrian Ministry for Transport, Innovation and Technology BMVIT
Division of Energy- and Environmental Technologies
A-1010 Vienna, Austria, Renngasse 5
Head of Division: DI Michael Paula

www.e2050.at ***www.energytech.at/iea***

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