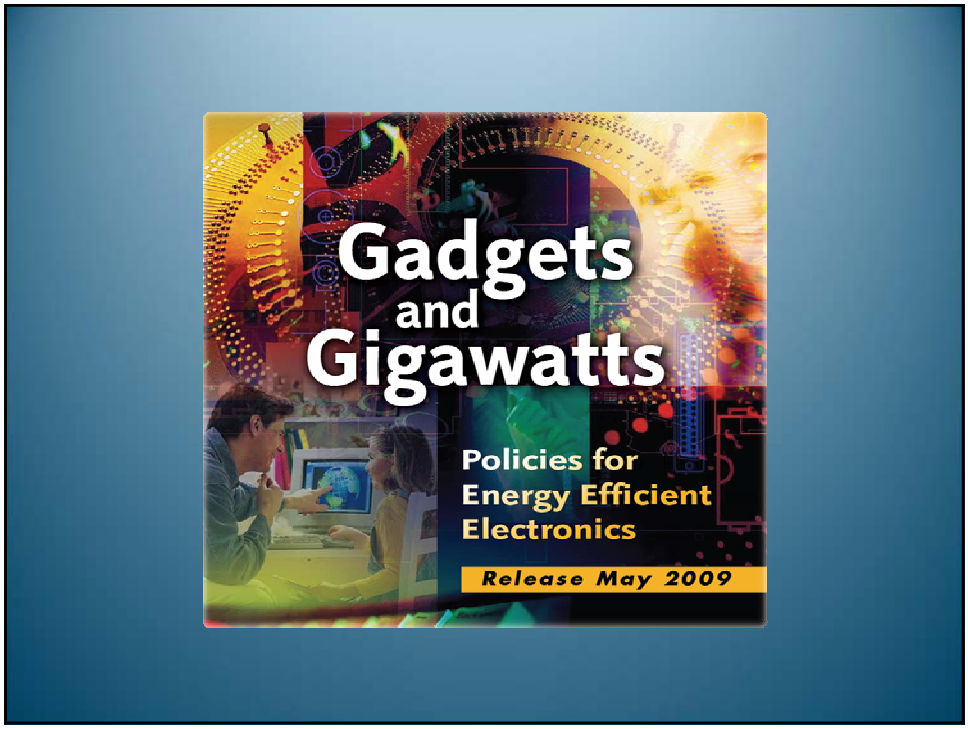
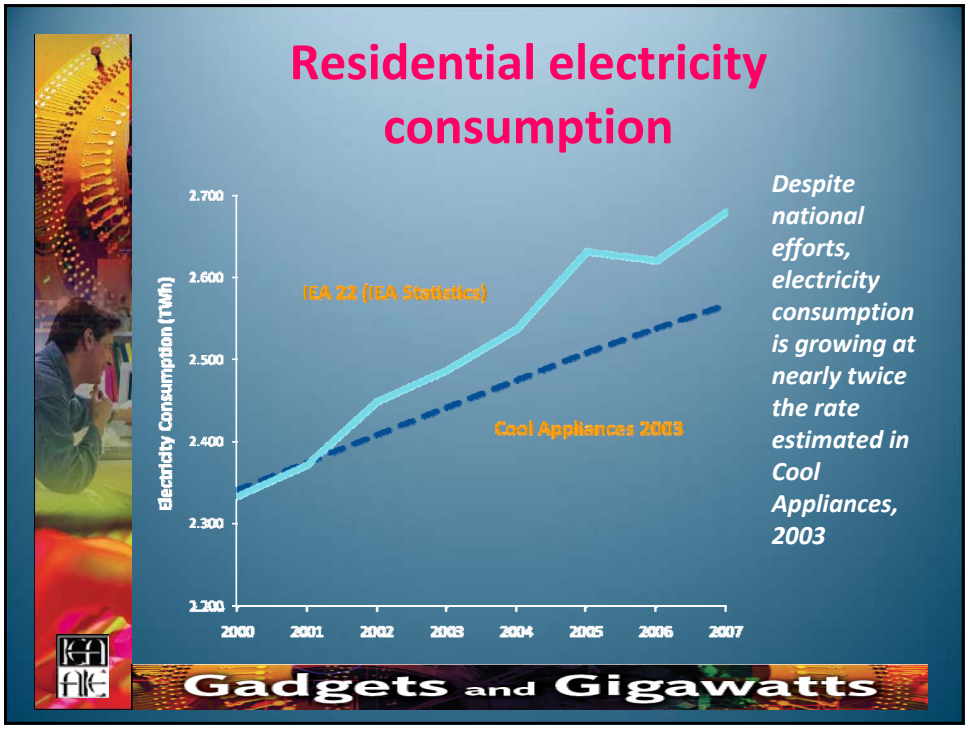
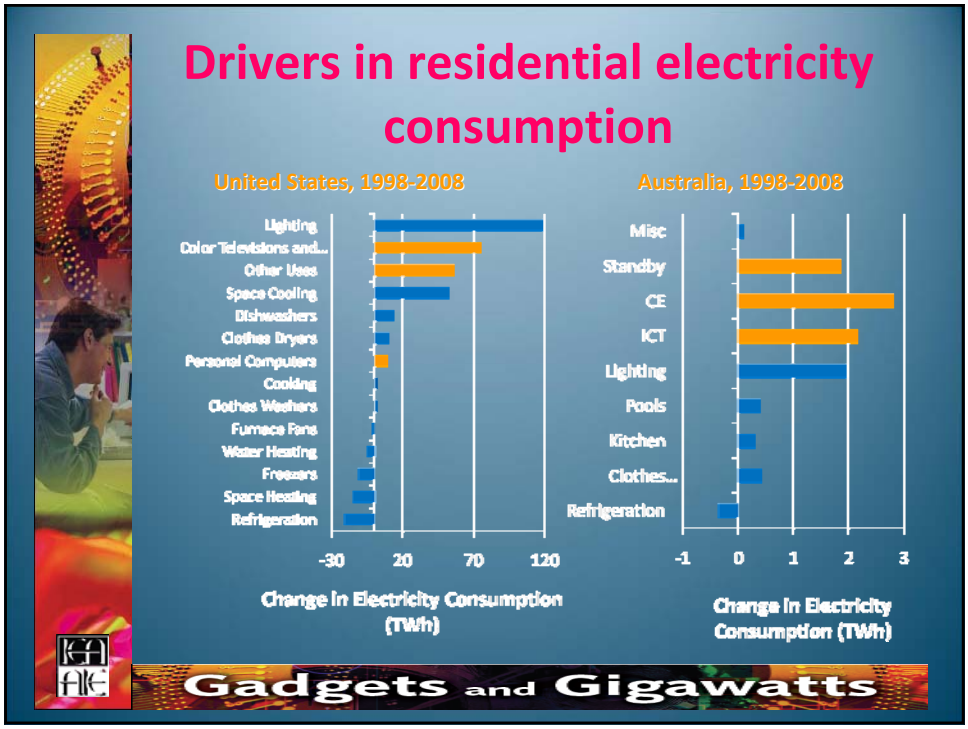

Gadgets
and
Gigawatts
Policies for
Energy Efficient
Electronics
Release May 2009


Residential electricity consumption
Electricity Consumption (TWh)
2.700
2.600
2.500
2.400
2.300
2.200
2000
2001
2002
2003
2004
2005
2006
2007
IEA 22 (IEA Statistics)
Cool Appliances 2003
Despite national efforts, electricity consumption is growing at nearly twice the rate estimated in Cool Appliances, 2003
Gadgets and Gigawatts


Drivers in residential electricity consumption
United States, 1998-2008
Lighting
Color Televisions and...
Other Uses
Space Cooling
Dishwashers
Clothes Dryers
Personal Computers
Cooking
Clothes Washers
Furnace Fans
Water Heating
Freezers
Space Heating
Refrigeration
-30
20
70
120
Change in Electricity Consumption (TWh)
Australia, 1998-2008
Misc
Standby
CE
ICT
Lighting
Pools
Kitchen
Clothes...
Refrigeration
-1
0
1
2
3
Change in Electricity Consumption (TWh)
Gadgets and Gigawatts

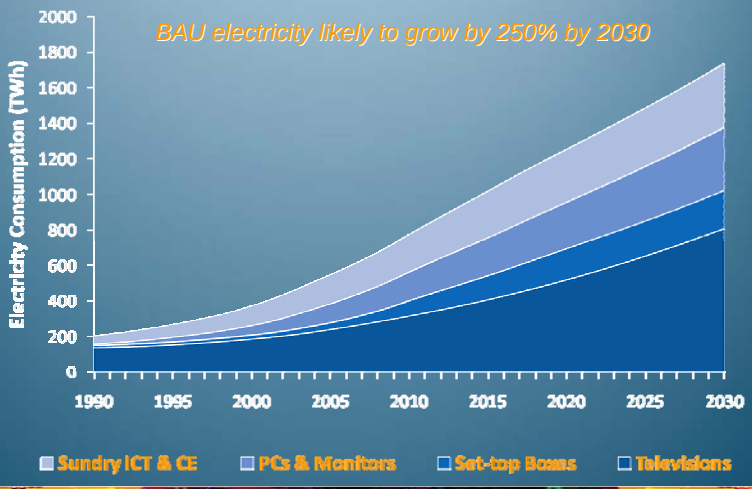

Trends over past five years
• The share of electricity consumed by larger household appliances, such refrigerators, freezers and clothes washers, has declined in OECD
– Due to impact of efficiency programs & near 100% saturation
• The share of lighting and air-conditioning has seen major increases in 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

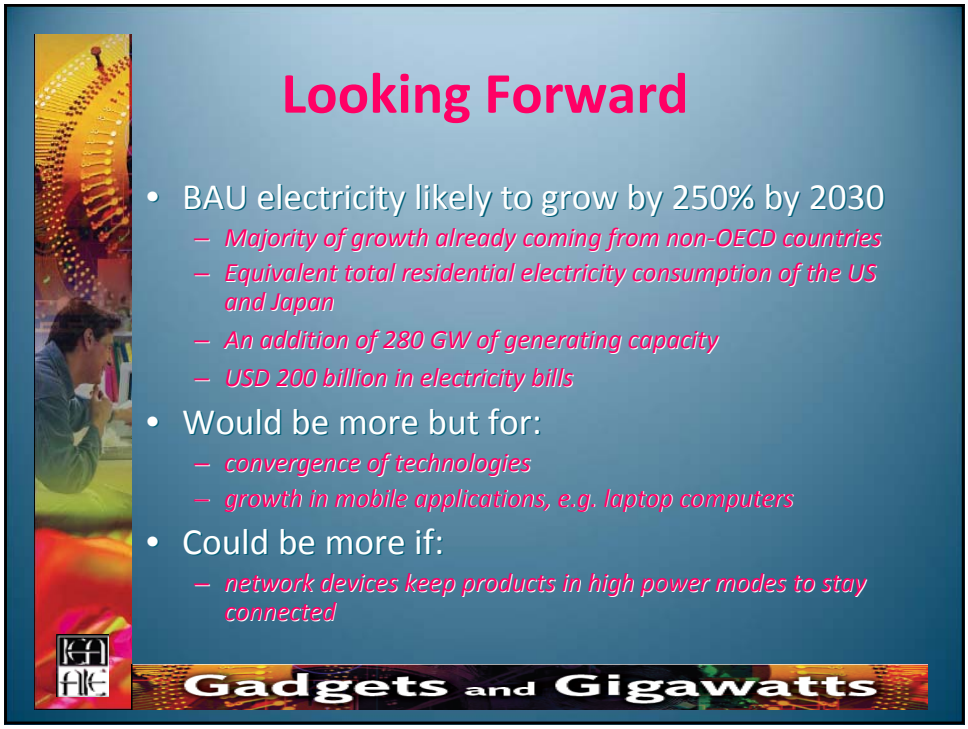
- Electricity consumption by 'electronics' grew by nearly 7% each year from 1990-2008
- In 2008:
- 700 TWh of electricity each year
- 100 GW of generating capacity
- USD 80 billion in annual electricity bill

Gadgets and Gigawatts

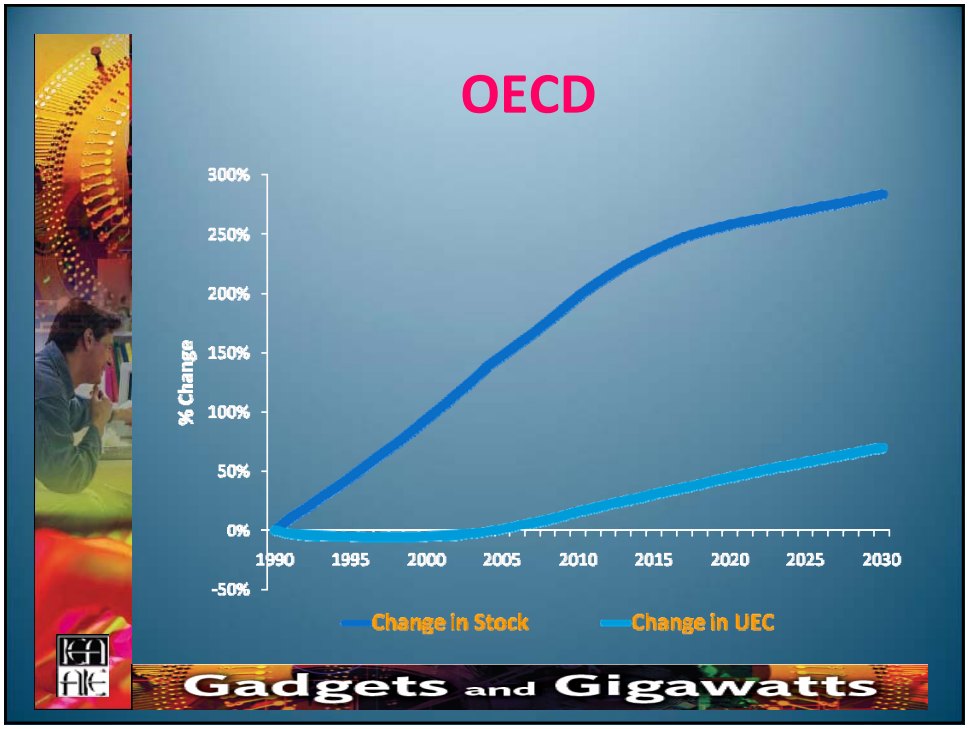
Looking Forward

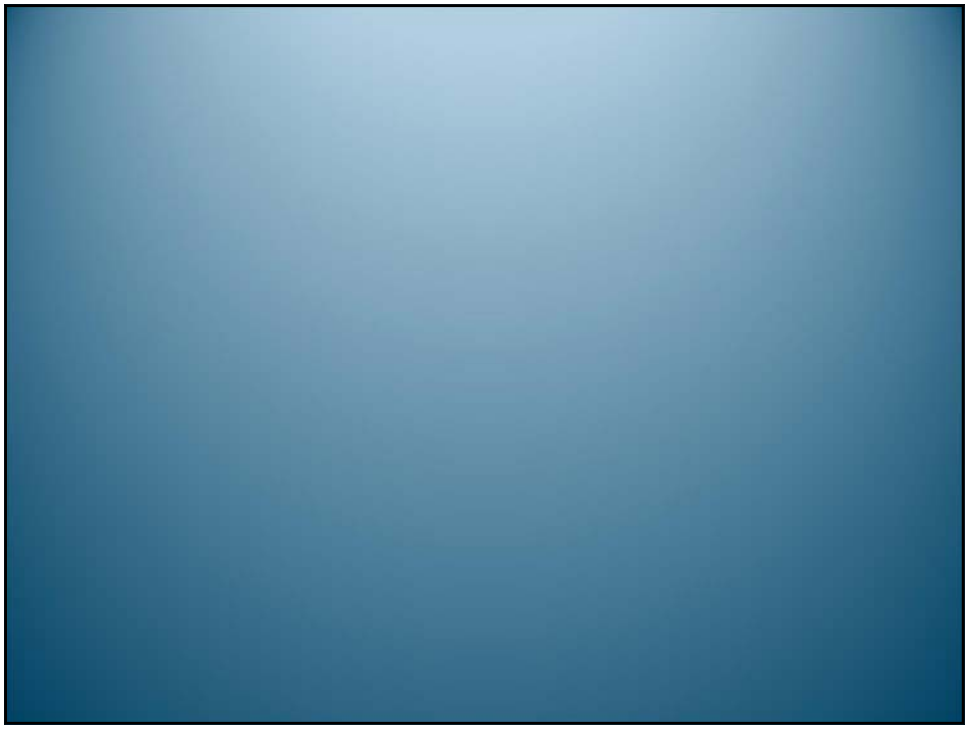


Gadgets and Gigawatts

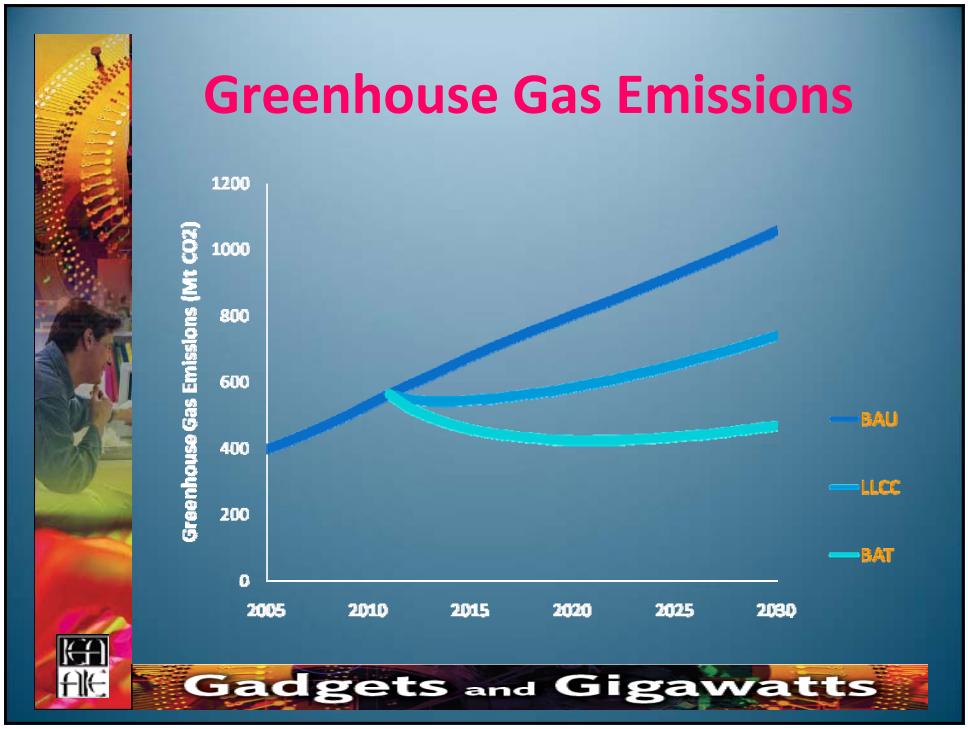

Looking Forward
• BAU electricity likely to grow by 250% by 2030
– Majority of growth already coming from non-OECD countries
– Equivalent total residential electricity consumption of the US and Japan
– An addition of 280 GW of generating capacity
– USD 200 billion in electricity bills
• Would be more 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
Gadgets and Gigawatts


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
Gadgets and Gigawatts

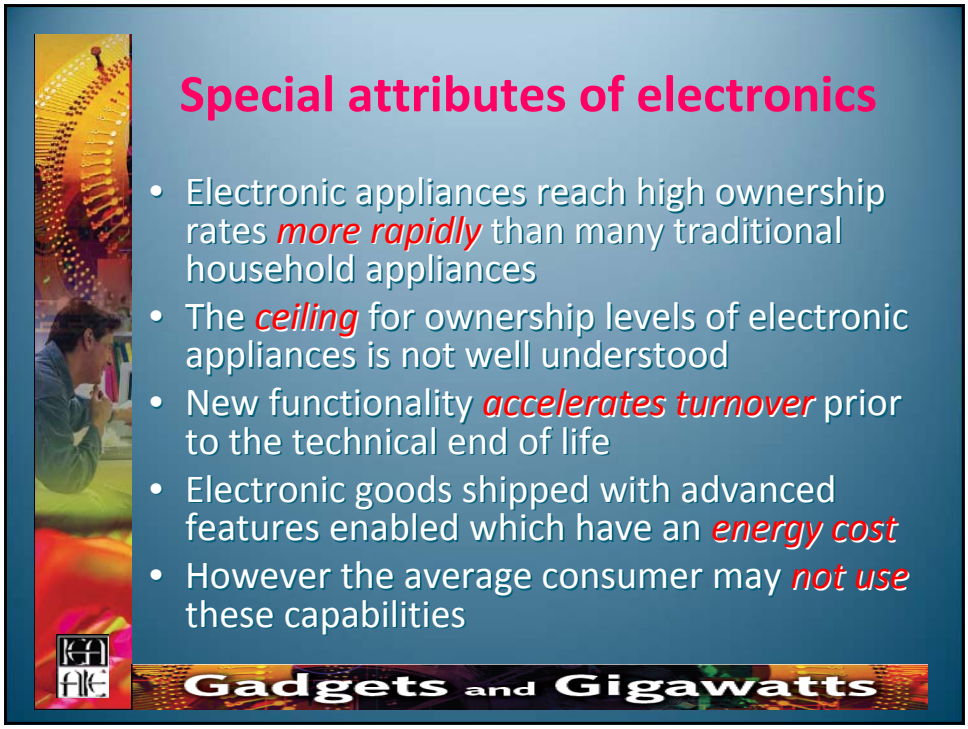

OECD
300%
250%
200%
150%
100%
50%
0%
-50%
% Change
1990
1995
2000
2005
2010
2015
2020
2025
2030
Change in Stock
Change in UEC
Gadgets and Gigawatts

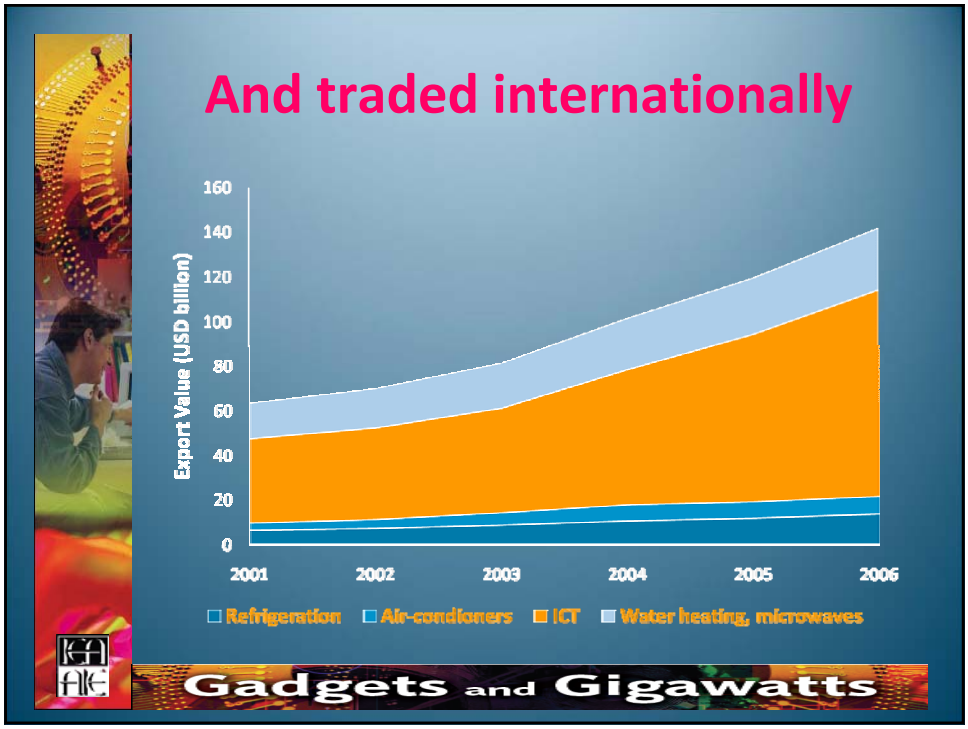


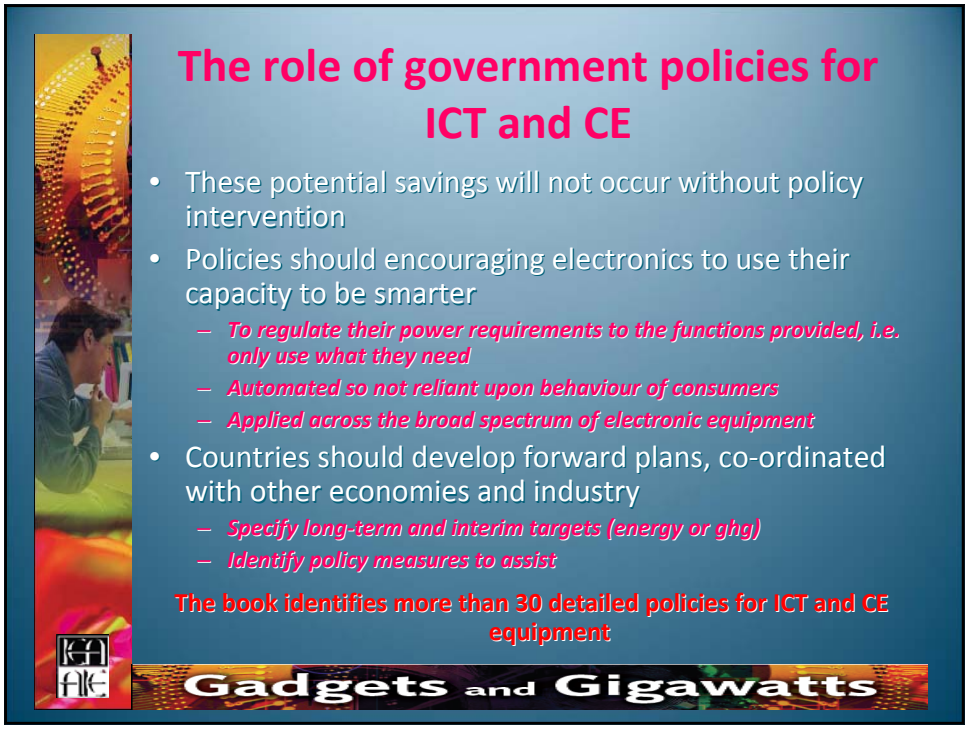

An alternative future
• Large savings potential though current technologies and power management:
– 30% + savings available for no additional lifetime costs;
– 50% + savings available using current technologies at small cost (may be zero with a cost of carbon)
– Additional savings through commercialisation 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
Greenhouse Gas Emissions (Mt CO2)
1200
1000
800
600
400
200
0
2005
2010
2015
2020
2025
2030
BAU
LLCC
BAT
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
Export Value (USD billion)
160
140
120
100
80
60
40
20
0
2001
2002
2003
2004
2005
2006
Refrigeration
Air-conditioners
ICT
Water heating, microwaves
Gadgets and Gigawatts

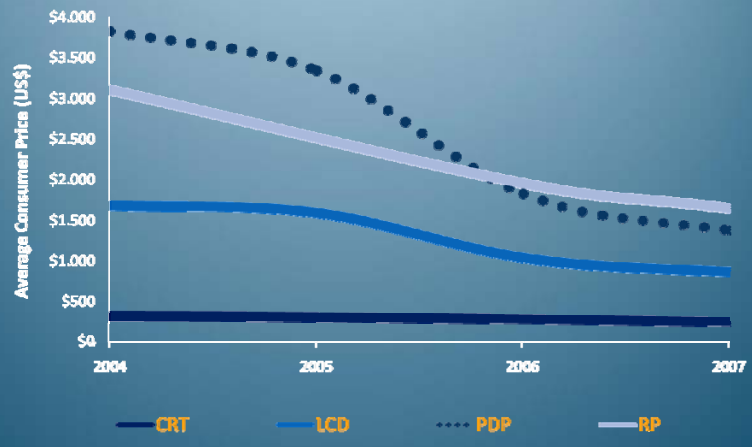

The role of government policies for ICT and CE
• These potential savings will not occur without policy intervention
• Policies should encouraging electronics to use their capacity to be smarter
– To regulate their power requirements to the functions provided, i.e. only use what they need
– Automated 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

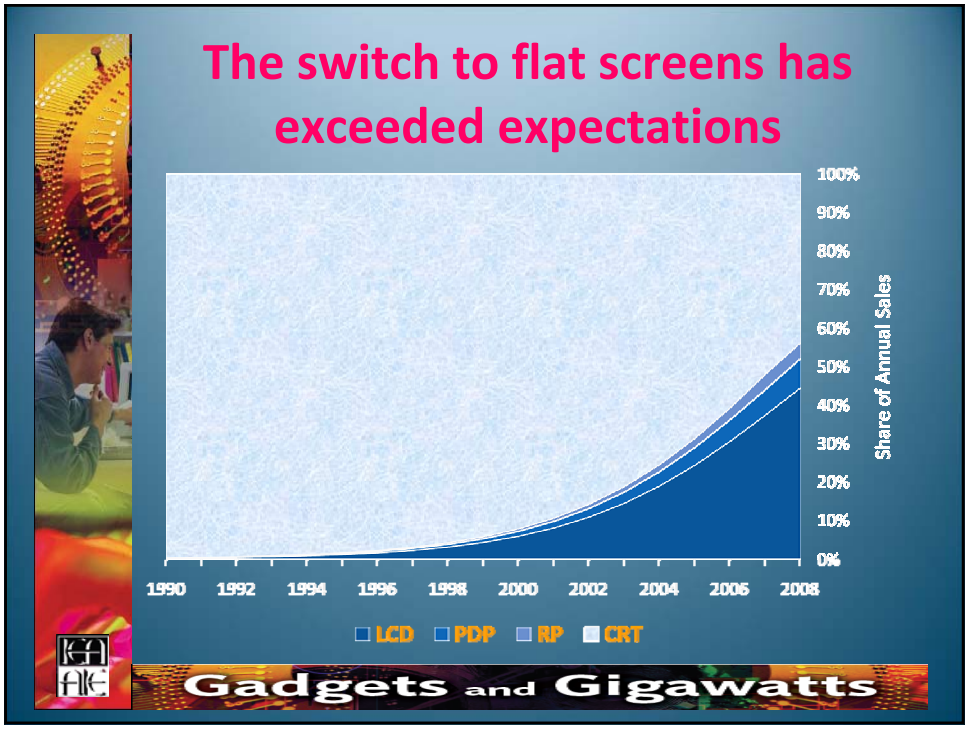
- A global stock of about 1.9 billion in 2005
- Over 1.3 sets per electricifed home
- TV market has experienced rapid change over past decade due to:
  - *New display technologies, more access to TV delivery platforms and the switchover to digital broadcasting*
  - *DVD players and digital recording 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*

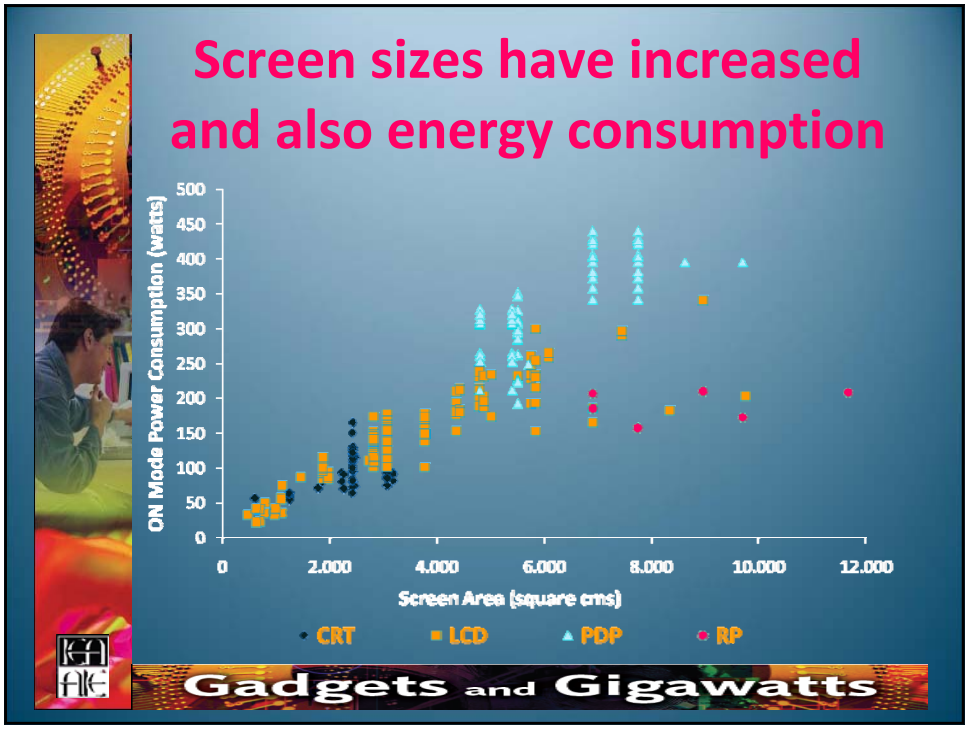
Gadgets and Gigawatts

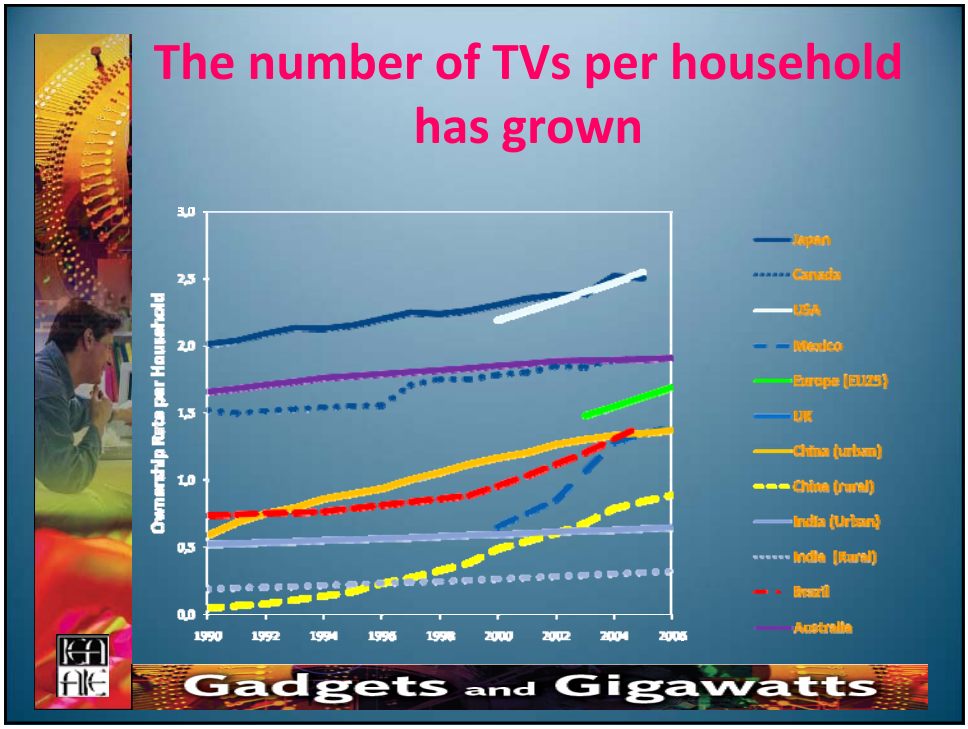
The cost of screens have fallen

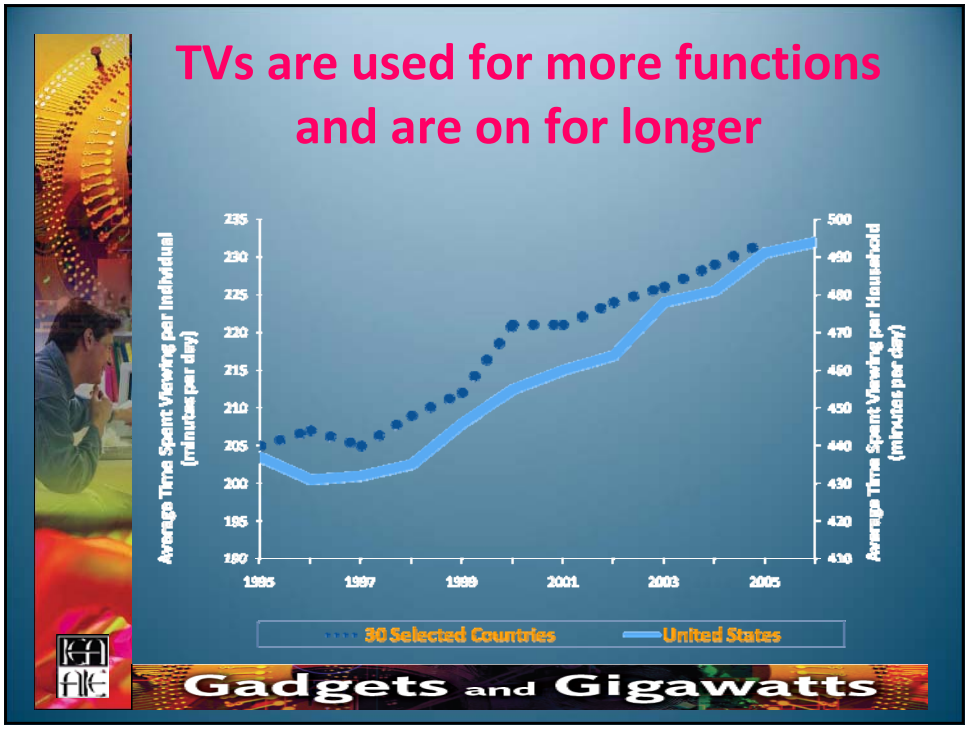


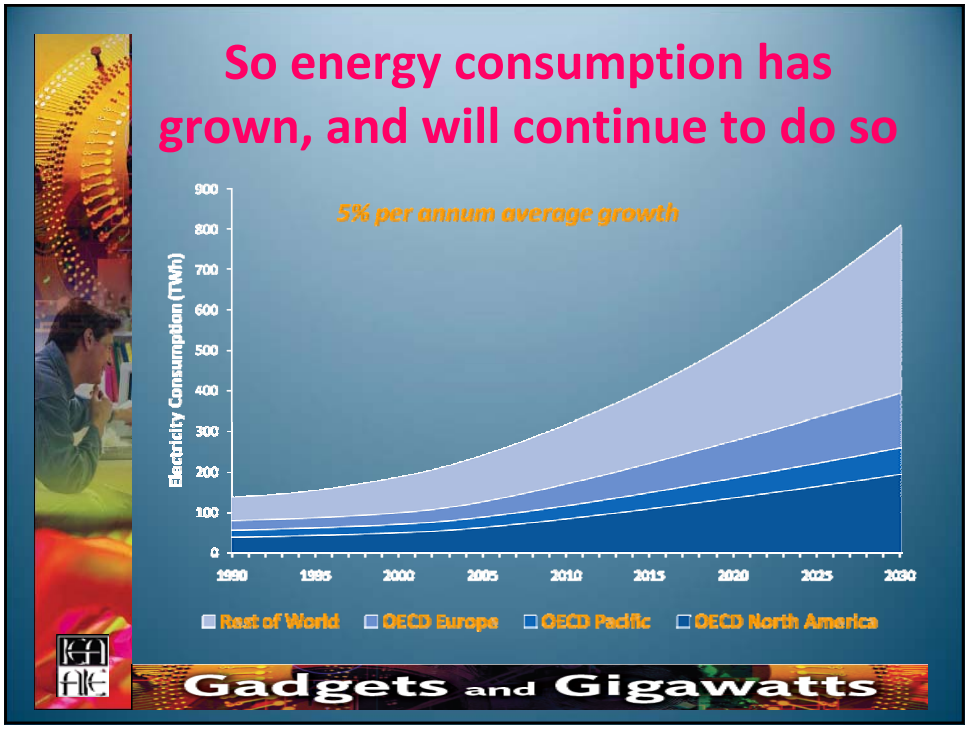
Gadgets and Gigawatts

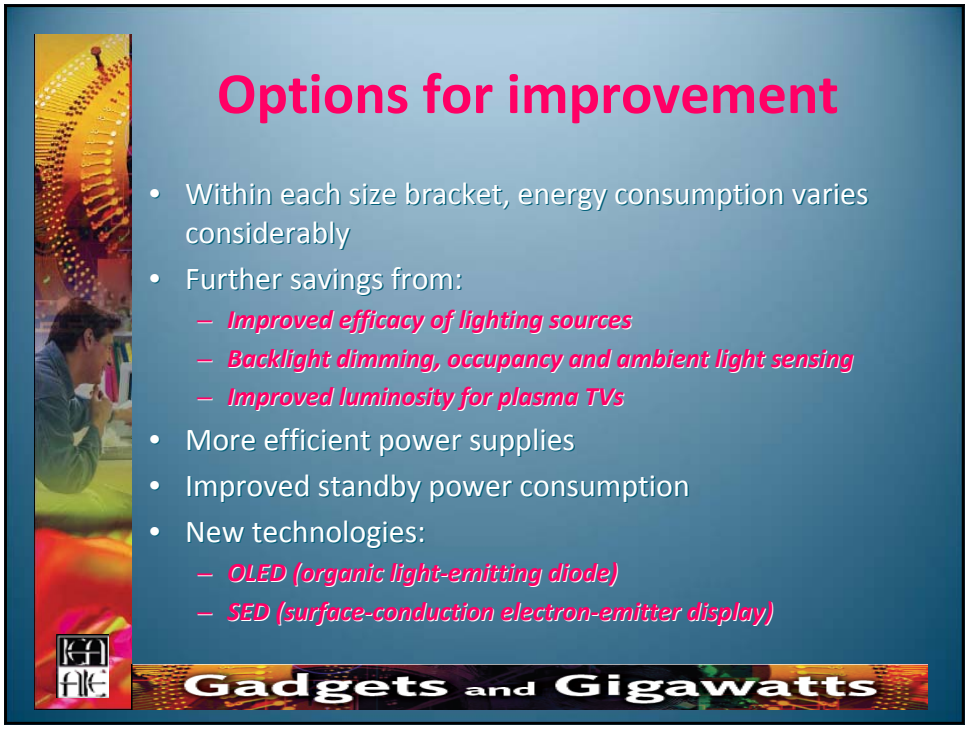

The switch to flat screens has exceeded expectations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Share of Annual Sales
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
LCD
PDP
RP
CRT
Gadgets and Gigawatts


Screen sizes have increased and also energy consumption
ON Mode Power Consumption (watts)
500
450
400
350
300
250
200
150
100
50
0
0
2.000
4.000
6.000
8.000
10.000
12.000
Screen Area (square cms)
CRT
LCD
PDP
RP
Gadgets and Gigawatts


The number of TVs per household has grown
Ownership Rate per Household
3,0
2,5
2,0
1,5
1,0
0,5
0,0
1990
1992
1994
1996
1998
2000
2002
2004
2006
Japan
Canada
USA
Mexico
Europe (EU25)
UK
China (urban)
China (rural)
India (Urban)
India (Rural)
Brazil
Australia
Gadgets and Gigawatts

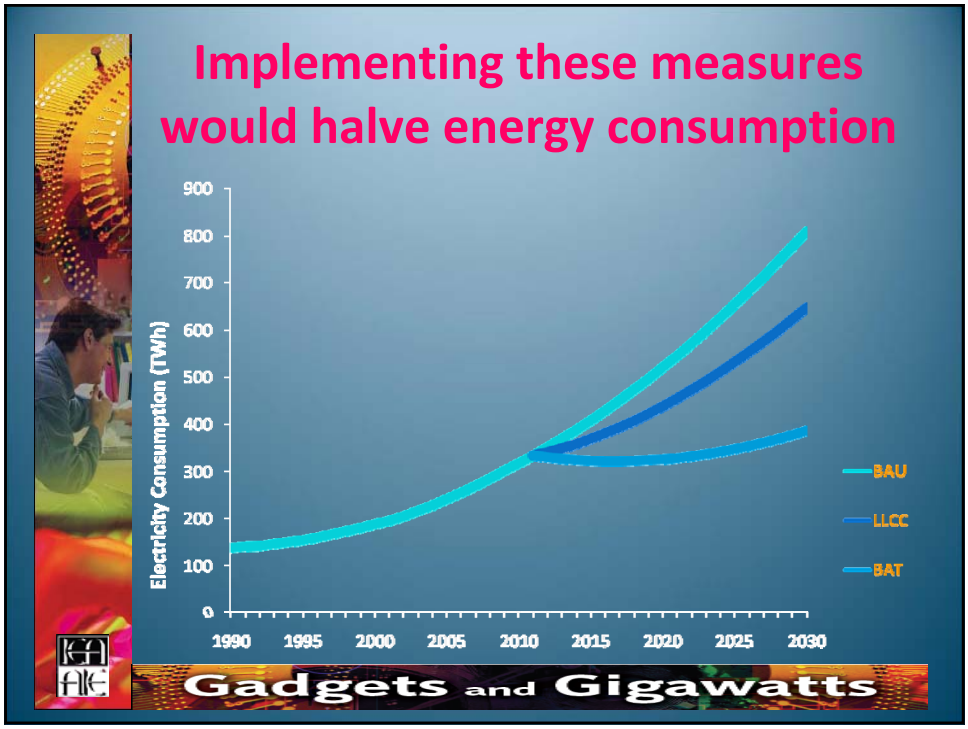

TVs are used for more functions and are on for longer
Average Time Spent Viewing per Individual (minutes per day)
235
230
225
220
215
210
205
200
195
190
Average Time Spent Viewing per Household (minutes per day)
500
490
480
470
460
450
440
430
420
410
1995
1997
1999
2001
2003
2005
30 Selected Countries
United States
Gadgets and Gigawatts


So energy consumption has grown, and will continue to do so
5% per annum average growth
Electricity Consumption (TWh)
900
800
700
600
500
400
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
2025
2030
Rest of World
OECD Europe
OECD Pacific
OECD North America
Gadgets and Gigawatts

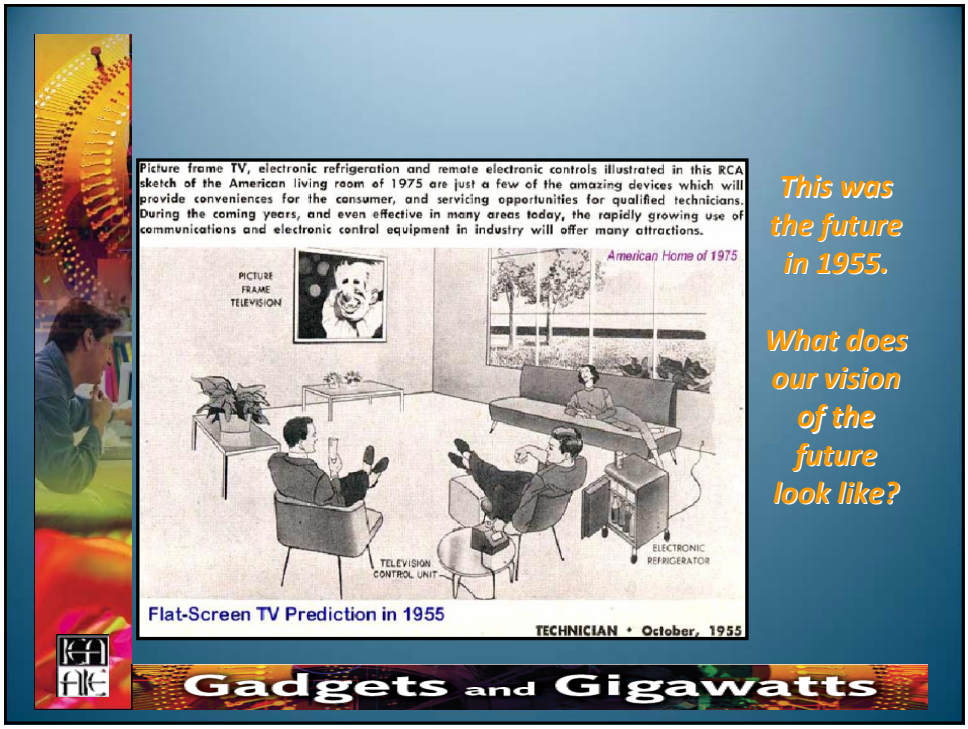

Options for improvement
• Within each size bracket, energy consumption varies considerably
• Further savings from:
– Improved efficacy of lighting sources
– Backlight dimming, occupancy and ambient light sensing
– Improved luminosity for plasma TVs
• More efficient power supplies
• Improved standby power 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
Electricity Consumption (TWh)
900
800
700
600
500
400
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
2025
2030
BAU
LLCC
BAT
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


Picture frame TV, electronic refrigeration and remote electronic controls illustrated in this RCA sketch of the American living room of 1975 are just a few of the amazing devices which will provide conveniences for the consumer, and servicing opportunities for qualified technicians. During the coming years, and even effective in many areas today, the rapidly growing use of communications and electronic control equipment in industry will offer many attractions.
American Home of 1975
PICTURE FRAME TELEVISION
TELEVISION CONTROL UNIT
ELECTRONIC REFRIGERATOR
Flat-Screen TV Prediction in 1955
TECHNICIAN • October, 1955
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
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