The Impact of Consumer Electronics on Home Electricity Use

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Energy Consumption of Major Household Appliances has Decreased Dramatically

Slide from Ecos Consulting/Data from AHAM
While Energy Use of Consumer Electronics and Other Plug Loads Poised to Increase

Miscellaneous contains smaller electronics such as chargers, home audio equipment, game consoles, etc. Also contain non-electronics such as portable fans, irons, etc.

Source: *Annual Energy Outlook*, 2010. Intensity is based on projected electricity usage per dwelling unit.
Electronics in Perspective: Worldwide

- Global retail CE sales estimated at $680 billion annually.
- Nearly 700 TWh/yr, requiring 180 GW of capacity.
- Requires about 360 medium size (500 MW) power plants.
- Estimated 600 megatonnes of CO₂ emissions per year today and could surpass 1000 megatonnes by 2030 without policy intervention.

TV Ecosystem – It’s Not Just the TV that Matters
TV Trends – ESTAR helping drive improved efficiency
## TV Power and Annual Energy Levels

<table>
<thead>
<tr>
<th></th>
<th>32”</th>
<th>42”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Star 3</td>
<td>120W (226 kWh/yr)</td>
<td>208W (387 kWh/yr)</td>
</tr>
<tr>
<td>Energy Star 4</td>
<td>78W (149 kWh/yr)</td>
<td>115W (215 kWh/yr)</td>
</tr>
<tr>
<td>Energy Star 5</td>
<td>55W (107 kWh/yr)</td>
<td>81W (155 kWh/yr)</td>
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Computers in Transition
Comparison with Tablets Indicates Large Margin for Efficiency Improvements in Desktops and Notebooks

Typical Annual Energy Use (1)

- Large differences in energy use reflect more than performance differences: desktops use less efficient components and system architectures.
- Tablets demonstrate that computing devices of similar capabilities and prices can have radically lower power use.

(1) iPad2, Energy Star 5 Category B desktop and notebook, 50% with Energy Star duty cycle, 50% with no power management, desktop includes 20-inch monitor, notebook includes monitor energy.

Based on product samples, not necessarily exact representation of market average.
Large Spread in Power Use Between Similar Models

Today’s Computers

![Graph of ENERGY STAR Desktop PCs](image)

Includes Category A&B ENERGY STAR PCs as of March 1, 2011.

Today’s Monitors

![Graph of Monitor On Mode Power Consumption](image)

Includes ENERGY STAR and CNET data as of March 1, 2011.
The Computer Ecosystem

• Most homes now have high speed internet and wireless, not an insignificant incremental load ➔
  – Modem : 5W @ 24/7
  – Router :  5 – 10 W @24/7
  • Total = 88 to 131 kWh/yr

• Need to make sure computer, monitors and printers go to low power sleep/standby mode when not in use.

• Computer USB port used to charge stuff, make sure doesn’t prevent device from going to sleep.
Set Top Boxes (STBs)

- > 80% of US households subscribe to pay TV
- 160 million STBs installed
- Little to no difference in power use when “turned off”
- Category energy use increasing due to growth of DVRs
- DVR STB may use more electricity/yr than the big screen TV it’s connected to
- DVR STB + regular STB = Annual electricity use of new refrigerator
STB Data Logging Example

Motorola DCX3400 with Comcast Digital Cable

- **On**: 29 Watts
- **Sleep**: 28 Watts

Source: Ecos/NRDC 2010
Nearly Two-Thirds of Annual U.S. Set-Top Box Energy Use Occurs When Viewers are Not Watching or Recording Content

RESULTS IN...
Electricity Consumption:
3 Power Plants (500 MW each)

Emissions:
5 Million Metric Tons CO$_2$/year

Cost to Consumers:
$1 Billion/year

RESULTS IN...
Electricity Consumption:
6 Power Plants (500 MW each)

Emissions:
11 Million Metric Tons CO$_2$/year

Cost to Consumers:
$2 Billion/year

In Use = watching or recording a show
Not In Use = not watching or recording a show

NRDC
Energy Use of Set-Top Boxes and Other Appliances

- Typical Household Set-Top Box Configuration (1 HD-DVR, 1 HD Set-Top Box): 446 kWh/year
- New ENERGY STAR Refrigerator (21 cubic feet, top freezer): 415 kWh/year
- Recent Model HD-DVR Set-Top Box: 275 kWh/year
- ENERGY STAR Version 4.1 42" LCD TV Model: 180.5 kWh/year
- Recent Model HD Set-Top Box: 171 kWh/year
- Compact Fluorescent Light Bulb (CFL): 17 kWh/year

Average Energy Use (kWh/year)
Recent Progress

• ESTAR Version 3 now live and making a difference. Around 40 complying models on the market.

• Seeing energy savings of around 30% compared to 2010 base case.

• Best DVRs are now around 22W as opposed to 30-35W.

• Standby power use remains high – typically only
Video Game Consoles

• > 40% of homes have a video game console (XBox 360, Play Station 2 or 3, or Wii)

• Each new generation of device results in dramatic increase in functionality and power use. (what will “PS4”, XBox “720”, or Wii U look like?)

• Current XBox 360 and PS3 have cut their on mode power use by roughly 50% (Now 80 – 90W, from 150-200W when first introduced).
Remaining Opptys/Concerns

• Most consoles today still ship with auto power down disabled. As such new XBox 360/PS3 that is left on will consume around 80W continuously, rather than < 1W. (IF ON 24/7 ➔ 700 kWh/yr)

• Many internet connected Wii consoles stay in network standby which is 10W rather than 1W.

• Bring down power use needed to stream/play back video content (movies, TV shows, etc.)
XBox 360 and PS3 Require A Lot More Power to Play a Movie than Regular DVD Player

With increasing use of consoles to play movies (both disk-based and streaming), efficiency of console playback is becoming more critical.
Beware of Network Standby! When Activated, it Can Be Responsible for 80% of Console Energy Use

- When activated, Nintendo Wii goes into Network Standby at 10W, rather than Off at 1W. This translates into 74 kWh of annual energy use when NOT using the console.

- Better efficiency in networked standby mode is critical to game console energy savings.

(1) With CEA 2010 Study duty cycle.
Other Trends to Track/Address

• Microsoft just announced that they will soon stream video content from 50 providers to Xbox 360.

• CONCERN – unless consoles made more EE, will take around 70W to play this content (on top of the energy used by the existing STBs in the home.)

• Sales of internet connected TVs growing – requires much less power to stream content.
Standby Stuff

• With exception of STBs, most CE products have a standby power level of around 1W.
• The key is making sure the device actually goes into standby when not in use (computer, video game console, surround sound system, etc.)
• What impact will increased networking of devices in the home have on standby energy use?:
  • Smart grid connected appliances
  • Home media server and wireless content transfer
  • Ability to program/access content remotely from smartphone
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