Internet sustainability or Internet for sustainability: what really matters?

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Outline

- How ICT could contribute to tackle climate change
- How ICT energy consumption could be lowered
- Yet another bubble?
ITU-T Rec. L.1400

- L.1400 covers definitions and general principles for the evaluation of ICT environmental impacts

Source: ITU-T Rec. L.1400 from Question 18/5 ITU-T SG5 WP3 ICT & Climate Change
Examples of using ICT to tackle climate change

• Using ICTs to monitor the global environment/ecosystem
• Using ICTs to address food security, water transportation and supply (e.g., use of Internet to distribute information to farmers and consumers)
• Using ICTs to monitor deforestation and forest degradation (e.g., through satellite imaging)
• Waste management with smart ICT (e.g., websites for places to recycle ICT equipment)
• Using ICTs to increase energy supply efficiency and maximize the use of renewable sources (e.g., smart grid and smart infrastructure for electric vehicles)
• Using ICTs in education and to raise awareness on climate change (e.g., teleconference and teleteaching)
• Using ICTs in healthcare (e.g., telemedicine, remote health monitoring that remove the need for the patient to travel to the doctor’s office and reduce GHG emission)

Energy Efficient Light Bulbs and Passive Optical Networks

Energy Efficient Light bulb (Compact fluorescent bulb) ~20 W
(100 W traditional light bulb tungsten filament lamps)
6 hours/day → 120 Wh/day

Gigabit Ethernet Optical Network Unit (ONU) ~10 W
24 hours/day → 240 Wh/day
Energy Consumption in Communications Networks

Research Efforts in reducing communications networks energy consumption

• Physical approach
  – Lower consumption of device components
  – Lower consumption of utilized modulation formats for data transmission

• MAC and Routing approaches
  – Adapt network utilization to traffic
  – Sleep mode

• Joint approaches
  – Upper layer approaches are boosted by improvements at the physical layer
  – Faster clock and data recovery to allow faster wake up after sleep

• Greentouch Consortium (led by Alcatel Lucent Bellabs)
  – Global Vision: “Dedicated to creating a sustainable Internet through innovation and collaboration — increasing ICT energy efficiency by a factor of 1000 to fundamentally transform global communications and data networks”

Power saving techniques in core networks Interfaces in sleep mode
Efforts from the standard bodies to reduce communications networks energy consumption

- **Effort from the standards**
  - ITU-T G.Sup45: XG-PON (G-PON, NG-PON1, NG-PON2)
  - IEEE 802.3az “Energy Efficient Ethernet”

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Power saving techniques in Passive Optical Access Networks ITU-T G.Sup45
CAUTION!
Jevons Paradox

• The More We Save, The More We Burn

Source:
http://www.greglindsay.org/blog/2010/12/the_jevons_paradox_the_more_we_save_the_more_we_burn
Waste Management

- How much energy will we need to recycle/get rid of devices?
  - Sensors
  - Solar panels
  - Etc.
Which kind of energy supply

• Exploit locality to minimize energy waste

• Distributed small producers for local consumers

• Producer federation
Will Green ICT become the next telecom bubble?

… something useful survived even the dot-com bubble！！!
Thank you!

Questions?

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Back-up
ITU-T SG5 Recommendations to come

- L.1410 Environmental impact of ICT goods, networks and services
  - Covers negative and positive impacts of ICT
  - Expected mid-2011
- L.1420 Environmental impact of ICT in organisations
  - Includes 3 scopes of ISO 14064-1
  - Expected mid-2011
- L.1430 Environmental impact of ICT projects
- L.1440 Environmental impact of ICT in cities
- L.1450 Environmental impact of ICT in countries and group of countries

Source: www.itu.int/dms_pub/itu-t/oth/06/0F/T060F00601700503PPTE.ppt
Energy Consumption by ICT and Carbon Footprint

• However the increased utilization of ICT would imply an increase in ICT energy consumption

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<thead>
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<th>2005</th>
<th>2020 BAU</th>
<th>2020 ECO</th>
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<tbody>
<tr>
<td></td>
<td>TWh/a</td>
<td>Mt CO2e</td>
<td>TWh/a</td>
</tr>
<tr>
<td>Total ICT sector electricity use in EU 25</td>
<td>214.5</td>
<td>98.2839</td>
<td>409.7</td>
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<tr>
<td>ICT sector without consumer electronics in EU-25</td>
<td>118.6</td>
<td>54.3425</td>
<td>245.1</td>
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<tr>
<td>Share of the ICT sector electricity use over total EU-25 electricity use (%)</td>
<td>8</td>
<td>1.9</td>
<td>10.5</td>
</tr>
<tr>
<td>Share of the ICT sector electricity use (without consumer electronics) over total EU25 electricity use (%)</td>
<td>4.4</td>
<td>1.1</td>
<td>6.3</td>
</tr>
</tbody>
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Carbon Emission Factor (kg CO2e/kWh)=0.4582

BAU-scenario until 2020 – ICT sector total electricity use (EU-25)

ECO-scenario until 2020 – ICT sector total electricity use (EU-25)

Approaches for implementing energy efficiency in PONs
