Estimate of energy wasted by network-connected equipment

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Focus of Report	The objective of this study is to estimate the energy wasted by network-connected equipment due to excess connectivity on a global and regional level. The report looks at the amount of savings possible through better power management policies. The report includes an estimate for 2008 (the baseline) and projected estimates for 2015 and 2020.
Description of Research	The researchers used a 3 step approach to determine the estimate of energy waste. The report contains extensive detail of this process which is summarised below: **Step 1. Calculating energy used** This first step provides an estimation of energy consumed by network connected equipment by region and country. With incomplete data for all OCED countries, available data is extrapolated; assumptions are made and clarified in the report. The starting point for this estimation is electricity consumption by country in TWh as published by the IEA. To calculate the percentage of consumption by network-connected equipment the share of buildings in electricity consumption is applied and finally the share of network-connected equipment within buildings, electricity consumption is estimated. **Step 2. Calculating energy wasted** The difference between the best available technology and the average product on the market provides the estimate of energy wasted by network-connected equipment. The scope is domestically and professionally used network-connected equipment, connected to external or internal networks. The authors note that not all energy consumed during standby and idle modes can be described as wasted energy as in some circumstances the modes are considered part of the products functionality. The report considers the results of three studies Lot 26 [1], BIO[2], and Energy Efficient Strategies (EES)[3] that calculate the potential energy savings of 20.08%, 33% and 65% respectively if a variety of advanced power management and technical improvement options were adopted. **Step 3. Projections of energy use and waste** Projections of the energy wasted by network-connected equipment are provide for 2015 and 2020 comparing two cases business-as-usual with current on and idle modes and an improved case with a high penetration of more advanced power management systems. Using a number of expert judgments and assumptions (that are outlined) a table of results of projected energy consumption and waste by network-connected equipment worldwide for 2015 and 2020 is provided. They utilise the percentages of energy saving potential (20.08%, 33% and 65%) expected due to advanced power management and technical improvement options, from the previous step.

[1] Fraunhofer IZM and BIO (2011) Preparatory study Lot 26 for Ecodesign of Networked Standby, European Commission (DG ENER), in the framework of the Ecodesign Directive(2005/32/EC), available at www.ecostandby.org

[2] BIO (2008) Impacts of ICT on energy efficiency, European Commission DG INFSO, Brussels.

[3] Energy Efficient Strategies (2006) 2005 Intrusive Residential Standby Survey Report, report for E3.

Key Findings

Energy wasted by network-connected equipment worldwide, 2008

	Energy wasted, 2008 (TWh)		
	20.08% savings potential	33% savings potential	65% savings potential
Africa	1.08	1.78	3.49
Asia excluding Japan and Korea	9.23	15.22	29.87
Europe	21.15	34.87	68.44
Former USSR	3.87	6.38	12.53
Latin America	3.05	5.02	9.86
Middle East	3.08	5.07	9.96
North America	34.02	56.08	110.08
Australia, Japan, Korea, New Zealand	9.62	15.86	31.13
World	85.11	140.29	275.36

Projected energy consumption and waste by network-connected equipment worldwide

	Energy wasted, 2015 (TWh)			Energy wasted, 2020 (TWh)		
Country/Region	20.08% savings potential	33% savings potential	65% savings potential	20.08% savings potential	33% savings potential	65% savings potential
Africa	1.78	2.93	5.75	2.45	4.04	7.94
Asia excl. Japan and Korea	14.27	23.53	46.18	18.90	31.16	61.15
Europe	32.34	53.31	104.64	42.52	70.08	137.57
Former USSR	6.08	10.02	19.66	8.13	13.39	26.29
Latin America	4.94	8.15	16.00	6.76	11.14	21.86
Middle East	5.07	8.36	16.40	6.99	11.53	22.63
North America	50.86	83.83	164.56	65.90	108.62	213.21
Australia, Japan, Korea, NZ	14.44	23.79	46.71	18.75	30.91	60.66
World	**129.78**	**213.92**	**419.90**	**170.40**	**280.87**	**551.31**

Conclusions

This report estimates the worldwide energy wasted by network-connected equipment is between 85TWh and 275TWh in 2008, and is likely to increase to between 130TWh and 420 TWh in 2015 and between 170 TWh and 551 TWh in 2020.

The report also estimated the potential savings through improved power management policies. The lower-end estimate of wasted energy is 20% due to excess connectivity and/or the use of suboptimal technologies. This level of saving could be achieved through the implementation of power management and power-level reduction policies. The maximum estimate of around 65% of energy assumes a low-power state of 1W for all network-connected equipment. This 65% energy savings would require both technical improvements of the products and their components and the implementation of effective power management policies.

Standby power policy Implications

The study for the first time identifies the scale of the network standby issue highlighting the need for policy makers to invest effort in tackling the energy wasted by networked products. It demonstrates that with the implementation of effective energy efficiency and power management policy substantial energy wastage could be prevented.