WORKING DOCUMENT ON

Potential Ecodesign requirements for servers and data storage products

EXPLANATORY NOTES

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1. CONTEXT OF THE PROPOSAL

1.1. Legal framework

The Ecodesign Directive 2009/125/EC establishes a framework for laying down ecodesign requirements for energy-related products. It is a key instrument of EU policy for improving the energy efficiency and other aspects of the environmental performance of products in the internal market. As part of the Ecodesign Working Plan 2012-14[1], computer servers and data storage products are under analysis for potential legislative proposals, among which an Ecodesign regulation, concerning their environmental impact.

Improved energy efficiency of servers and data storage products would be in the framework of the initiatives which contribute to reach the 27 % energy savings potential by the year 2030[2]. Promotion of market uptake of energy efficient servers and data storage products complies with the Lisbon and renewed Sustainable Development Strategy[3] as it would encourage investment in R&D and provide for a level playing field in the EU internal market.

The European Commission has adopted a Circular Economy Package[4], which includes revised legislative proposals on waste to stimulate Europe's transition towards a circular economy. The proposed ecodesign requirements on (among others) material efficiency will contribute to the targets proposed in the package.

1.2. Grounds for and objectives of the proposal

Servers and data storage products are very large energy consumers and the energy consumption of these devices is steadily increasing, because more services need to be delivered, as more and more computing work is shifted from personal devices and smaller organisational servers to larger datacentres including cloud services.

The scope of the proposed working document on potential Ecodesign requirements for servers and data storage products includes the following types of products:

1) Servers with up to 4 processor sockets
2) Online 2, 3 and 4 data storage products

The products covered by the working document were analysed in the preparatory study for Lot9[5], together with the networking equipment[6]. Typically, slightly more than 50% of the electricity consumption related to datacentres is due to direct energy consumption of critical ICT equipment: servers, data storage products and networking equipment, while the rest is mainly due to cooling and UPS (uninterruptible power supply) demand associated.

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[1] SWD(2012) 434 final

[2] http://ec.europa.eu/clima/policies/strategies/2030/index_en.htm

[3] OJ L 242, 10.9.2002, and Council document 109 17/06 of 26.6.2006

[4] http://ec.europa.eu/environment/circular-economy/index_en.htm

[5] Ecodesign preparatory study on enterprise servers and data equipment Lot9, available at http://bookshop.europa.eu/en/ecodesign-preparatory-study-on-enterprise-servers-and-data-equipment-pbET0415685/;pgid=GSPefJMEtXBSR0dT6jbGakZD0000pzPbSA2k;sid=DrBWSbchLItWTODDM2LI7tUECWNQmrDyCGM=?CatalogCategoryID=CXoKABst5TsAAAEjepEY4e5L

[6] The preparatory study concluded that the complexity of network equipment made it unfeasible to be studied together with already complex product groups such as servers and storage, it was therefore decided not to include network equipment in the scope of this working document.

For the products covered by the working document, the preparatory study has shown that:

- The quantities of servers and data storage products placed on the internal market are significant enough for EU action
- Energy consumption in the use phase constitutes about 90 % of the total environmental impact of servers and data storage products
- Considerable saving potential exist for servers and data storage products and could be achieved with cost-effective solutions
- Room for improvements in material efficiency exists for servers and data storage products.

1.3. General context

On the basis of the data presented in the preparatory study and in the draft impact assessment, it has been estimated that the total electricity consumption of servers and data storage products amounts to 53 TWh in 2015, corresponding to 2 % of the total electricity consumption in the EU. The total energy consumption including infrastructure (i.e. due to the cooling demand) amounts to 105 TWh in 2015. The associated CO2 emissions including infrastructure are estimated 38 Mt per year in 2015. If no specific measures are taken, the annual energy consumption including infrastructure is predicted to be 122 TWh in 2030.

Analysis showed market failures which prevent the full realisation of the identified energy savings and material efficiency potential include:

- Lack of functional information: there is a lack of reliable parameters for measuring the energy efficiency of servers and data storage products. Currently there are many different types of information and performance tests available, but they cannot offer objective comparison since there is no standardisation in the methods.
- "Myopic behaviour" of the buyers: energy efficient products are already available on the EU market today, but many customers (who are mainly professional customers) do not purchase energy efficient products as the majority of them prioritise low purchasing cost, to low electricity costs and environmental savings.
- Lack of incentives for reuse and recycling: reuse of servers and data storage products is environmentally beneficial if the reused server is at least 80% as efficient as an average new server on the market. As servers and data storage products are expensive B2B (business to business) product, the total recovery (reused and recycled) rate for the products on the market is quite high (it is assumed around 85%). However the reuse rate of servers and data storage products collected via less organised channels is relatively low, because data deletion is not standardised and firmware updates are not available for servers and storage products' second life. Servers and data storage products often contain a significant amount of critical raw materials, but due to difficult dismantling of the casings and lack of information of contained materials, the incentive for recycling these products to their full potential is low.

The first two market failures for realising energy saving potential (i.e. the lack of functional information and the "myopic behaviour" of the buyers) are mutually supportive and feed each other, in the sense that the absence of interest from large sectors of customers allows for a continued lack of functional information which together result in an environment that does not stimulate investments and efforts towards designing more energy efficient products.

2. MARKET SIGNIFICANCE

The use of servers and data storage products has been increasing rapidly in the EU. In 2010, the EU stock of servers amounted to nearly 20 million units, and the annual sales peaked around in 2010 with approx. 3.6 million units, and then gradually declined in the years after until 2015, mainly due to the trend of virtualisation[7]. It is estimated that the sales will increase again from 2016 and onwards. The stock for data storage products amounted to 2.7 million units in 2010 and annual sales also peaked around 2010 with some 530 thousand units. As the capacity of each data storage product increases, the demand for the number of storage product declines and therefore this trend is seen until 2015, it is estimated that the sales will increase again from 2016 onwards, due to the demand for storage will surpass the improvement in capacity per product.

Table 1 Sales of products within scope

Annual sales of severs, units					
Type	**2010**	**2015**	**2020**	**2025**	**2030**
Tower 1 socket	258,148	231,269	198,599	170,544	146,452
Rack 1 socket	559,471	543,057	570,758	599,872	630,472
Rack 2 socket	1,836,718	1,633,409	1,987,291	2,417,844	2,941,677
Rack 4 socket	103,122	85,773	104,357	126,966	154,473
Rack 2 socket resilient	30,474	27,513	33,474	40,726	49,549
Rack 4 socket resilient	1,673	1,511	1,838	2,236	2,721
Blade 1 socket	179,844	169,704	178,361	187,459	197,021
Blade 2 socket	595,715	511,811	622,696	757,605	921,743
Blade 4 socket	33,061	27,418	33,358	40,586	49,378
Total	3,562,232	3,231,465	3,730,732	4,343,837	5,093,486
Annual sales of data storage products, units					
Type	**2010**	**2015**	**2020**	**2025**	**2030**
Online 2 storage	305,314	282,603	308,957	341,114	376,617
Online 3 storage	190,289	135,778	148,440	163,890	180,948
Online 4 storage	39,083	35,419	38,722	42,753	47,202
Total	534,687	453,800	496,120	547,757	604,767

Table 2 EU stock of products within scope

EU stock of servers, units					
Type	**2010**	**2015**	**2020**	**2025**	**2030**
Tower 1 socket	1,221,844	1,299,250	1,173,436	1,008,941	866,412
Rack 1 socket	3,077,090	3,059,884	3,068,257	3,223,567	3,388,001
Rack 2 socket	10,101,948	9,422,302	10,004,073	12,155,464	14,788,981
Rack 4 socket	567,170	507,183	525,339	638,307	776,598
Rack 2 socket resilient	167,607	158,101	168,509	204,747	249,105
Rack 4 socket resilient	9,203	8,681	9,253	11,243	13,678
Blade 1 socket	989,141	963,702	958,826	1,007,357	1,058,742
Blade 2 socket	3,276,433	2,976,130	3,134,694	3,808,800	4,633,988
Blade 4 socket	181,837	161,603	167,928	204,040	248,245
Total	19,592,276	18,556,897	19,210,375	22,262,519	26,023,818
EU stock of data storage products, units					
Type	**2010**	**2015**	**2020**	**2025**	**2030**
Online 2 storage	1,546,870	2,018,778	2,179,988	2,390,988	2,639,844

[7] i.e. by having many virtualised servers running on one hardware server

Online 3 storage	979,636	1,151,388	1,059,698	1,148,765	1,268,329
Online 4 storage	202,467	259,817	275,060	299,669	330,859
Total	2,728,973	3,429,983	3,514,746	3,839,422	4,239,032

The estimated sales and stock of servers and data storage products in scope of the working document are shown in the tables above, and they demonstrate that the quantities of servers and data storage products placed on the internal market are significant enough for EU action. Servers with more than 4 processor sockets are excluded from the scope as they cover a small and highly specialised part of the market. Online 1 storage products were omitted from the scope since these are consumer products whereas current initiative has a focus on enterprise products, and they cover a small market. Online 5 and 6, usually high-end and mainframe products, only have limited sales due to the large size and more specialist roles. These systems have also a limited number of manufacturers in the EU.

3. ECONOMIC SIGNIFICANCE

The total revenue of servers and storage industry is estimated 55 billion euros in 2015, out of which 13 billion euros from servers Original Equipment Manufacturers (OEMs) and 9 billion euros from the server Original Design Manufacturers (ODMs), and 19 billion from storage OEMs and 13 billion euros from storage ODMs. The total expenditure for the servers and data storage product combined is some 50 billion euro in 2015, of which the running costs make up for some 18 billion euro (some 36 % of the total).

4. ENVIRONMENTAL SIGNIFICANCE

The preparatory study has shown that slightly more than 50% of the electricity consumption related to datacentres is due to direct energy consumption of critical ICT equipment such as servers, data storage products and networking equipment. The energy efficiency of servers and data storage products are crucial to overall reduction of energy consumption in data centres.

The draft impact assessment has shown the electricity consumption of only servers without cooling demand accounts for 38 TWh in 2015 and data storage products account for 15 TWh in 2015, and they are expected to increase to 48 and 30 TWh respectively by 2030. The products in scope account for approx. 2 % of the total EU electricity consumption currently. The total electricity consumption of servers and storage including infrastructure is estimated ca. 105 TWh in 2015 and this is estimated to increase to 122 TWh in 2030. As already highlighted, out of the total consumption including infrastructure, approximately half is the cooling demand associated with the servers and data storage products; however as the efficiency of servers and storage products is expected to gradually improve, the share of the associated cooling demand would reduce over time, and it is estimated that by 2030 the cooling demand will account for about one third of the total energy consumption. Nevertheless, the energy efficiency of servers and data storage products could converge faster to today's benchmarks – and in a sustainable way for the market - with the help of the proposed measure.

The primary energy consumption of products in scope of the working document and their associated cooling demand account for 944 PJ in 2015 (approx. 1.2% of EU total primary energy consumption) and will increase up to ca. 1099 PJ in 2030. The greenhouse gases (GHG) of this consumption amounts to 42 Mt CO2-equivalent in 2015, and as the CO2 conversion factor is expected to reduce due to the increasing share of renewable energy in the electricity grid, the GHG emission is estimated to remain 42 Mt CO2-equivalent in 2030.

Table 3 Total energy consumption and GHG emissions from enterprise servers and storage devices in EU

	2010	2015	2020	2025	2030
Energy consumption servers and storage, TWh	56.8	52.6	55.4	65.7	77.8
Energy consumption including infrastructure, TWh	122.9	104.9	102.6	112.4	122.1
Total primary energy including infrastructure, PJ	1106.4	944.4	923.8	1012.0	1098.7
GHG, including infrastructure, Mt CO2-eq	50.4	41.5	39.0	40.5	41.5

5. EXISTING LEGISLATION

Concerning the already existing legislation at EU level, servers and data storage products are partly covered by computer and computer servers' regulation[8], which regulate only power supply efficiency for the servers and storage products. There is no requirement on Minimum Energy Performance Standards (MEPS) or information requirement about the server efficiency or the server operating temperature, which has a large impact on product and infrastructure energy consumption. In addition, in the current computer regulation, there is no material efficiency requirement which will contribute also to the targets in WEEE Directive. The current computer regulation has also an exemption for blade server systems and components (due to the lack of evidence base and data), which means that potentially excludes ca. 800,000 blade servers a year, equivalent to approx. 18% of the total server market. Other product groups are also exempted: server appliances, multi-nodes servers and computer servers with more than four processor sockets (these are still exempted in the proposed working document due to small market share).

A number of directives and regulations address other aspects of servers and data storage products, and a number of voluntary agreements exist both inside and outside the EU. The Low Voltage Directive (LVD)[9] regulates health and safety aspects including e.g. mechanical, chemical, noise related or ergonomic aspects. Server and storage devices are covered by the scope of the LVD, but there is no overlapping in terms of the type of requirements proposed in the working document. The WEEE Directive[10] set requirements on recovery and recycling of Waste of Electrical and Electronic Equipment to reduce the negative environmental effects resulting from the generation and management of WEEE and from resource use. Ecodesign implementing measures can complement the WEEE directive by including measures for material efficiency. The RoHS Directive[11] restricts the use of six specific hazardous materials and four different phthalates found in electrical and electronic equipment. Server and storage devices are directly covered by the RoHS Directive, but there is no overlapping requirement proposed in the working document. The REACH Directive[12] restricts the use of Substances of Very High Concern (SVHC) to improve protection of human health and the environment, this applies to server and storage devices but does not overlap with the working document. The EMC Directive[13] sets requirements for the Electro-Magnetic Compatibility performance of electrical equipment to ensure that electrical devices will function without causing or being

8 Commission Regulation (EU) No 617/2013 of 26 June 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for computers and computer servers, L 175/13.

9 Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits. OJ L 374, 27.12.2006

10 Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE). OJ L 197, 24.7.2012

11 Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. OJ L 174, 1.7.2011, p. 88.

12 Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

13 Directive 2004/108/EC relating to electromagnetic compatibility and repealing Directive 89/336/EEC. OJ L 390, 31.12.2004

affected by interference to or from other devices. The provisions of the EMC Directive apply to servers and storage devices but do not overlap with the working document.

The EU Code of Conduct (CoC) on Data Centre Energy Efficiency[14] targets companies owning or operating data centres to support reduction of energy consumption by applying best practices for energy efficiency and cost savings, which e.g. includes purchasing products not less efficient than specified in the ENERGY STAR specifications. However its impact at product level, i.e. on server design efficiency is considered very limited. The Energy Star programme sets a range of energy efficiency specifications for enterprise servers and data centre storage. However, in the EU the application of Energy Star is voluntary, and it is only mandatory for public sectors such as the national governments and international institutions to purchase products which comply with Energy Star requirements. By 2015, the penetration of the Energy Star rules for servers and data storage product is much lower than other products covered by this programme.

The Technical Assistance Study for Enterprise Servers and Data Storage[15] was initiated to investigate standardised server and storage test methods in support of the regulatory process related to the Ecodesign. Based on SERT[16], a draft server metric was developed to enable the objective assessment and comparison of server efficiency, taking into account the varied power and performance levels as a result of different configurations. A finalised metric should be used for declaring the server efficiency and the server performance, as in the proposed working document (information requirement).

At global level, the 80 PLUS certification programme[17] promotes the energy efficiency of power supply units, and differentiates them through different levels. The working document has drawn requirements from the 80 PLUS specifications to set efficiency requirements on power supply units of servers and data storage products.

The International Environmental Leadership Standard for Servers[18] is currently being developed by NSF[19], and the finished standard can be used within an established system for the identification of environmentally preferable products by purchasers and to provide market recognition for conforming products and brand manufacturers.

Other relevant programmes outside the EU affecting servers and data storage devices are the Top Runner Program in Japan, the Good Environmental Choice Australia Standard and the CQC certification in China. These also have limited impact in the EU.

Finally, there are a number of relevant national programmes for servers and data storage products at member state level such as the Blue Angel[20], the Future Thinking Initiative on data centres in Germany, the Triple E in Ireland and the Certified Energy Efficient Data Centre in the UK. None of these are seen as having a major impact on the EU market.

[14] http://iet.jrc.ec.europa.eu/energyefficiency/ict-codes-conduct/data-centres-energy-efficiency
[15] http://www.server-standards.eu/
[16] Server Efficiency Rating Tool, https://www.spec.org/sert/docs/designdocument.pdf
[17] http://www.plugloadsolutions.com/80PlusPowerSupplies.aspx
[18] http://standards.nsf.org/apps/group_public/documents.php?view
[19] The US organisation formerly known as National Sanitation Foundation, which now expanded its standardisation services beyond sanitation while keeping an acronym in line with the traditional name
[20] www.blauer-engel.de

6. IMPROVEMENT POTENTIAL

The preparatory study has identified various improvement options that would result in lower overall energy consumption and related emissions realisable at no excessive life cycle costs for the products within scope, as well as material efficiency requirements, which were analysed in parallel in the JRC report on an analysis of material efficiency requirements of enterprise servers[21].

The proposed ecodesign requirements presented in this document combined the improvement options of energy efficiency from the preparatory study and the material efficiency options from the JRC report and the analysis of the most likely policy scenario in the draft impact assessment.

Implementation of the requirements proposed in the working document would result in the following savings:

- For servers only, ca. 2.4 TWh energy saving in 2030, for servers and associated cooling demand, about 6.1 TWh (36 PJ primary energy) energy savings in 2030 can be achieved.
- For data storage products only, ca. 1 TWh energy in 2030, for data storage products and associated cooling demand, about 2.8 TWh (25 PJ primary energy) energy savings in 2030 can be achieved.
- Servers and data storage products together and associated cooling demand would result in 8.9 TWh (3Mt CO2-eq) energy savings in 2030.
- For only 2 socket rack servers, material efficiency requirements would result in increased the reuse and recycling rate, hence saving some 1500 TJ primary energy in 2030 and ca. 112 kt CO2-eq.
- For online data storage products in scope, material efficiency requirements would result in higher reuse and recycling rate, hence saving ca. 107 kt CO2-eq in 2030.
- Material efficiency requirement for data storage products and 2 socket rack servers are expected to result in at least additional 7% savings (on top of 3Mt CO2-eq from energy requirements) in GHG.

See table below for estimated energy, CO2 and cost savings of the proposed measure in 2030.

Table 4 Annual impacts in 2030 of proposed measured for servers and data storage products (savings from material efficiency aspects not included)

Savings in 2030 compared to BAU	Energy savings			GHG	End-user expenditure		
	Electricity excl. infra	Electricity incl. infra	Primary	CO2eq reduction	Extra purchase cost	Energy cost savings	Net cost savings
	TWh	TWh	PJ	Mt	mln.€	mln.€	mln.€
Servers	2.38	6.1	55	2.1	-28	1458	1431
Data storage products	0.81	2.8	25	0.9	-38	358	321
Total	3.19	8.9	80	3	-66	1816	1752

7. PROPOSED MEASURES

The working document on potential ecodesign requirements for servers and data storage products proposes the following energy efficiency requirements:

[21] JRC (2015), Environmental Footprint and Material Efficiency Support for product policy- Analysis of material efficiency requirements of enterprise servers.

- Minimum power supplies efficiency and power factor for both servers and data storage products
- Maximum idle mode power consumption for servers
- Material efficiency requirements (see below).

Information requirements proposed include:

- Server efficiency, server performance and power demand in active state
- Idle state power and max power demand for servers
- Declared operating conditions, i.e. temperature, humidity for both servers and data storage products
- Idle state power at higher boundary temperature of the declared operating condition for servers

Material efficiency requirements proposed for both servers and data storage product in the working document include:

- Total weight per product of critical raw materials, i.e. Cobalt, Neodymium, Palladium
- Latest firmware version to be made available
- Use of reversible joining techniques (i.e.not welding and firm gluing) for components to be accessed, such as motherboards, memories, storage devices, etc..
- Information on the disassembly operations needed to access the targeted components (as from the point above)
- Data deletion tool(s) to be compulsorily available with the product at the moment of its placing on the market.

Given that these provisions oblige manufacturers to disclose detailed information on the architecture of their products, it is proposed to only make available this information for professional recyclers.

See table below for the overview of parameters covered by product type in the working document.

Table 5 Table overview of parameters covered per product type

Parameter	Servers	Data storage products
Product information	✓	✓
Declared operating conditions	✓	✓
PSU minimum efficiency	✓	✓
Maximum idle power	✓	
Server efficiency and performance	✓	
Material efficiency	✓	✓

The working document on potential Ecodesign requirements for servers and data storage products is one of the first ones to be proposed after the Circular Economy package was adopted. As such, it envisages a number of requirements related to material efficiency, over and above those related to energy efficiency, whose nature is somewhat different. The benefit of most of these material efficiency requirements is typically realised at the end-of-life stage of the product lifecycle, as opposed to energy savings taking place during the use phase. Additionally, material efficiency requirements tend to be more society-centric than user-centric and techno-economic analyses on this aspect is still scarce. The proposed material efficiency requirements could represent the most suitable and balanced approach based on the currently available data. The perspective of the Consultation Forum on these matters would be quite valuable.

7.1. Staged implementation and ecodesign requirements

There are three gradual stages of implementation for the PSU minimum efficiency requirement, but other requirements will be applicable already at the first stage of implementation, which comes into effect on 1st January 2019.

7.1.1. Minimum efficiency and power factor for PSU

PSUs for both servers and data storage products would need to comply with the efficiency requirements shown in the table below. The efficiency and power factor requirement is tightened by each stage, see table below. PSU efficiency for servers have been covered by the computer regulation, however as Regulation 617/2013 focuses more on personal computers, and the current initiative on enterprise or B2B server and storage products, it is reasonable to remove the requirements from the computer regulation.

Table 6 Minimum requirements for power supplies unit efficiency and power factor

	Minimum PSU efficiency				**Minimum power factor**
	From 1 January 2019				
% of rated load	10%	20%	50%	100%	50%
Non redundant	-	90%	92%	89%	0.90
Redundant	-	88%	92%	88%	0.90
	From 1 January 2023				
% of rated load	10%	20%	50%	100%	50%
Non redundant	-	92%	94%	90%	0.90
Redundant	-	90%	94%	91%	0.95
	From 1 January 2026				
% of rated load	10%	20%	50%	100%	20%
Non redundant	90%	94%	96%	94%	0.95
Redundant	90%	94%	96%	91%	0.95

7.1.2. Maximum idle state power

From 1st January 2019, servers have to comply with the maximum idle state power requirement which is based on the newest draft of the Energy Star specification for computer servers. The maximum allowed idle state power is determined using the following equation:

$$P_{idle} = P_{base} + P_{add\_i}$$

where P_{base} is the basic idle state power allowance in Table 7, and P_{add_i} is the idle state power allowance for additional components, as determined per Table 8.

Table 7 Base idle state power allowances

Product type	**Base idle state power allowance, P_{base} (W)**
1-socket servers	37
1-socket resilient servers	130
2-socket servers	85
2-socket resilient servers	297
Blade or multi-node servers	105

Table 8 Additional Idle Power Allowances for Extra Components

System characteristics	Applies to	Additional idle power allowance

Additional power supplies	Power supplies installed explicitly for power redundancy	10 W per power supply
Drives (HDD or SSD)	Per installed HDD and SSD	4.0 W per HDD and SSD
Additional memory	Installed memory greater than 4 GB	0.25 W per GB
Additional buffered DDR channel	Installed buffered DDR channels greater than 8 channels	4.0 W per buffered DDR channel
Additional I/O devices	Installed devices greater than two ports of ≥ 1 Gbit, onboard Ethernet	< 1 Gbit: No Allowance
		= 1 Gbit: 2.0 W / Active Port
		> 1 Gbit and < 10 Gbit: 4.0 W/ Active Port
		≥ 10 Gbit: 8.0 W/Active Port

7.1.3. Server efficiency requirements

From 1st January 2019, servers in scope of the working document shall declare the server efficiency, server performance and server power calculated according to the calculation method and test described in the Commission communication on standards and draft transitional methods.

The working document requires suppliers to declare server efficiency, performance and power instead of setting minimum requirements on these parameters, because there is a lack of testing data, in particular for blade and resilient servers (bearing in mind that the formulation of the metric has been finalised in the second half of 2016). This requirement can ensure there will be enough data for the revision of the working document to consider a meaningful minimum requirement on server efficiency, performance and power. Information requirement also addresses directly the market failure of lack of functional information and provides buyers enough useful information to better match servers with the purpose and to avoid the "myopic behaviour".

7.1.4. Declared operating conditions

From 1st January 2019, servers and data storage products in scope shall declare the operating condition class according to the table below. It is also required that idle state power shall be declared at the higher boundary temperature of the declared operating condition class. The preparatory study has shown that higher operating temperature can potentially yield the significant savings and it has an impact on the energy efficiency of the data centres.

Many servers on the market have already information on the maximum operating temperature which shows that they can operate at A2 condition, however without a declaration from the manufactures or information on energy consumption at higher temperatures, data centres cannot operate with confidence at these conditions. This requirement aims to provide uniform information on operating conditions that would enable the data centres and server room to reduce cooling demand by only offering cooling if the boundary conditions of the declared class are reached. It also aims to provide data centre operators the confidence to operate at higher temperature, by having a standardised declaration from manufacturers and making sure that the increase (if there is an increase) in energy consumption occurring at product level (i.e. the server or the data storage product) at higher temperature does not offset the saving from cooling demand (which is realised at system level, i.e. the data center).

Table 9 Operating condition classes

Operating condition class	Dry bulb temp °C	Humidity range, non-condensing	Max dew point (°C)	Maximum rate of change (°C/hr)
A1	15- 32	–12°C DP and 8% RH to 17°C DP and 80% RH	17	5/20
A2	10-35	20% - 80% RH	21	5/20
A3	5-40	-12°C DP and 8% RH to 85% RH	24	5/20
A4	5-45	–12°C DP and 8% RH to 24°C DP and 90% RH	24	5/20

7.1.5. Material efficiency requirements

From 1st January 2019, there are a set of requirements on accessing and dismantling of servers and data storage products, the manufacturers shall ensure that HDD and SSD, memory, processor (CPUs), motherboard, chassis, expansion cards, graphics cards and power supplies, when present, can be accessed and removed. The sequence of dismantling shall be documented including type of dismantling operating, number of fastening techniques to be unlocked and tools required, and irreversible fastening techniques such as gluing or welding should be avoided to enable easy dismantling. This requirement aims to address the barrier for recycling components due to the difficulty in dismantling and separation of products.

It is required in the working document that from the 1st January 2019, data deletion of potentially reusable data storage devices such as HDD and SSD shall be made possible by securing built-in software-based data deletion tools. This requirement aims to eliminate the barrier for reuse and recycling of servers and data storage products which is linked to the data protection issue (with the risk that sensitive data could be restored, a significant share of data storage devices are destructed).

It is also required that the latest version of firmware necessary for upgrading and to test functionality and compatibility of different components in the servers and data storage products shall be made available. Another barrier to the reuse of servers and data storage products is that the firmware necessary is often not available for the second life, and hence the chances of reuse are reduced. Therefore, this requirement aims to remove this barrier and to to encourage higher reuse rates.

As servers and data storage products typically contain some critical raw materials, the working document requires suppliers to provide product information on the total weight per product of Cobalt, Neodymium and Palladium. This requirement aims to provide enough information on the contained critical raw materials and hence to act as an incentive for recyclers to carry out extraction.

7.1.6. Product information requirements

Apart from the information requirements for above mentioned parameters, there are product information requirements on suppliers' websites from 1st January 2019:

- For both servers and data storage products, internal power supply efficiency at 10 %, 20 %, 50 % and 100 % of rated output power and power factor at 50% and 20% of rated load level
- Idle state power and the list of components, if present
- Maximum power demand.

Product information should enable buyers to compare and purchase energy efficient products as the type of information available to them is now consistent.

The second purpose of information requirement is to facilitate compliance checks, as manufacturers are requested to provide information in the technical documentation referred to in the conformity assessment procedures.

8. MEASUREMENTS AND CALCULATIONS

Measurements and calculations of the relevant product parameters should be performed taking into account the generally recognised state-of-the-art calculation and measurement methods. In this context, manufacturers may apply reliable, accurate and reproducible measurement and calculation methods and harmonised standards set up in accordance with Article 10 of Directive 2009/125/EC, as soon as they are made available and published for that purpose in the Official Journal of the European Union. Requirements for calculation and measurement methods are specified in Annex III of the working document.

Concerning the material efficiency aspects, there is already a standardisation request for developing standards with regards to ecodesign requirements on material efficiency aspects of energy-related products[22]. Proposed material efficiency requirements for servers and storage could be supported by the developed standards.

9. BENCHMARKS

Based on the currently available technologies, benchmarks for idle state power, server efficiency, operating condition class and PSU efficiency and power factor are provided for the best performing products in Annex V of the working document. For blade and resilient servers, there is no available data on server efficiency, therefore no benchmark could be provided.

10. CONFORMITY ASSESSMENT

As required in Article 8 of Directive 2009/125/EC the working document specifies the applicable conformity assessment procedures, which should be based on an internal design control or a management system as described in Annexes IV and V of Directive 2009/125/EC. Other conformity assessment procedures of those described in Annex II of Decision 768/2008/EC[23] are considered not duly justified and proportionate to the risk. For the purposes of conformity assessment, the technical documentation shall contain the product information set out in point 3.1 or 3.2 and 3.3 of Annex II and the results of the measurements and calculations set out in Annex III.

[22] http://ec.europa.eu/growth/tools-databases/mandates/index.cfm?fuseaction=search.detail&id=564#
[23] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:218:0082:0128:en:PDF

11. VERIFICATION PROCEDURE FOR MARKET SURVEILLANCE PURPOSES

When performing the market surveillance checks referred to in Article 3 (2) of Directive 2009/125/EC, the authorities of the Member States shall apply the verification procedure for the requirements set out in Annex II. To this extent, the authorities of the Member States shall follow the procedure laid down in Annex IV of the working document. Annex IV also specifies the verification tolerances, which relate only to the verification of the measured parameters by Member State authorities and shall not be used by the manufacturer or importer as an allowed tolerance to establish the values in the technical documentation. The tolerance for PSU efficiency is no more than 2 % deviation from the declared value, 10% for the power factor of PSU, 10% for the idle state power of servers and 10% for the server efficiency.

12. DATE FOR EVALUATION AND POSSIBLE REVISION

The main issues for a possible revision of the proposed working document are:

- the appropriateness to set specific ecodesign requirements on server efficiency, performance and power demand;
- the need to update the definitions or the scope;
- the appropriateness to set specific ecodesign requirements on operating condition class;
- the appropriateness to set specific ecodesign requirements on the efficiency, performance and power demand of data storage products.

Taking into account that the technological advancement in this sector is rather rapid (as well as that time is needed to collect and analyse and complement the data to be gathered), a review can be presented to the Consultation Forum three years after entry into force.