Appendix 1: Standards and other documents identified by ESOs as relevant to mandate M462, with specific relevance to servers and storage (2011).

Topic	ESO	Standard	Title	Status
ESO standards				
Power	ETSI EE2	EN 300 132-3	Power supply interface at the input to telecommunications equipment: Operated by rectified current source, alternating current source or direct current source up to 400 V.	Published Undergoing revision
Operation and Test	ETSI EE	EN 300 019-1 series	Environmental conditions and environmental tests for telecommunications equipment: Classification of environmental conditions. This standard also contains objectives for extended temperature range for equipment to be used in data centres (servers, storage, etc.)	Published
Operation, KPI	CLC TC108	EN 62075	Audio/video, information and communication technology equipment - Environmentally conscious design. (Corresponds with IEC 62075)	Published
Test	CLC TC108	EN 62018	Power consumption of information technology equipment, measurement method (Corresponds with IEC 62018)	Published
Operation	CLC TC 215	Series EN 50600	Data centres facilities and infrastructures. The series of standards supports effective design, installation and operation of the data processing, storage and transport equipment in data centres. They specify measurement methodologies to measure the characteristics of the power supplied to the various facilities enabling the calculation of energy efficiency.	In development
Other initiatives				
Operation, Test	ITU-T SG5	L.1300 L.1310	Energy efficiency metrics for telecommunication equipment, Energy efficiency measurement for telecom equipment.	Published
Test	ANSI ATIS	060015.01.2014	Energy efficiency for telecommunication equipment: Methodology for measurement and reporting - Server requirements. This standard references SPEC	Published
Test	SPEC	SPECpower_ssj2008	SPEC benchmark: power and performance characteristics of volume server class computers. The initial benchmark addresses the performance of server-side Java, and additional workloads are planned.	Published
KPI	EU (voluntary)	2015 Best Practices for the EU Code of Conduct on Data Centres	The CoC contains no specific targets for servers. The CoC indicates a demand that IT equipment, by 2012, to comply to extended temperature ranges (similar to those used in Central Offices). This would enable great savings both on OPEX and CAPEX on the cooling sector.	Published V6.1.1
Test, KPIs	EPA	ENERGY STAR® rating for data centre storage	"SPEC benchmark: power and performance characteristics of volume server class computers. The initial benchmark addresses the performance of server-side Java, and additional workloads are planned.	

Table 6 - Standards and other documents identified by ESOs as relevant to mandate M462, with specific relevance to servers and storage (2011).

Appendix 2: Coverage and status of key standards / initiatives for enterprise servers and data storage

Table 7 – Coverage and status of key standards / initiatives for enterprise servers (ES) and data storage (DS)

Body	Standard	Topic	Relevant parameters addressed	Status	Ecodesign suitability	Relevant products
European standardisation deliverables (EN)						
ETSI EE2	EN 300 132-3	Power supply interface	None identified	Published. Undergoing revision.	Not suitable	N/A
ETSI EE	EN 300 019-1 series	Environmental conditions for telecoms	Operating temperature	Published.	Not data centre appropriate. ASHRAE more suited to data centres	ES, DS
CENELEC TC108	EN 62075 (IEC 62075)	Environmentally conscious design	Acoustic noise Removability of external enclosures, PCBs, processors, data storage devices and batteries. Ease of dismantling, reuse and recycling at the end-of-life. Data sanitisation	Published.	General concepts. Insufficient detail for product specific purposes, except possibly data deletion.	ES, DS
CENELEC TC108	EN 62018 (IEC 62018)	Power consumption of ICT	Energy proportional operation (dynamic range) Lower power modes (other than off mode)	Published	Defines power modes, but insufficient detail for product-specific purposes.	ES, DS
CENELEC TC 215	EN 50600 Series	Data centre design & operation	Overall energy performance (TEC type approach)	In draft (estimated 2016)	May be suitable, but depends on level of detail delivered in EN.	ES, DS
International standardisation deliverables (ISO / IEC)						
ISO/IEC JTC 1/SC 39	ISO/IEC 30134-4	IT energy efficiency and energy utilisation	Active State (power demand / rating)	In draft (estimated early 2017)	May be suitable – depends on level of detail and appropriateness of performance levels addressed. Current focus on efficiency at max load (not common use of servers)	ES
IEC	IEC TR 62635:2012	Guidelines for end-of-life information and recyclability rate calculation.	Removability of external enclosures, PCBs, processors, data storage devices and batteries with common tools Ease of dismantling, reuse and recycling at the end-of-life.	Published	Yes. Whilst a technical report rather than a full standard, this provides adequate approach to be applicable to the product groups.	ES, DS
ISO	ISO 7779:2010	Measurement of airborne noise emitted by	Acoustic noise	Published	Yes. Established standard in use by industry addressing many aspects	ES, DS

		information technology and telecommunications equipment				
National standards / initiatives						
United Kingdom BSI ZZ/1	PAS 141:2011	Reuse of used and waste electrical and electronic equipment (process management).	Removability of external enclosures, PCBs, processors, data storage devices and batteries with common tools Ease of dismantling, reuse and recycling at the end-of-life. Data sanitisation	Published	Likely to be suitable as reference material.	ES, DS
EU European Commission (voluntary)	2010 Best Practices for the EU Code of Conduct on Data Centres	Energy efficient best practice and voluntary targets	None identified	Published	Not suitable. Data centre not product-specific focus.	N/A
United States, IEEE/ANSI	IEEE 1680.4	Environmental impacts of servers	Same as NSF 426	Unpublished (unclear if completion likely)	Applicability unclear as access to standard not possible unless within working group. May be merged with the NSF 426 standard	ES
United States EPA	ENERGY STAR® Program Requirements for Computer Servers v2.0/v3.0	Energy efficiency of servers	Active State (power demand / rating) Idle State (power demand/ rating) Overall energy performance (TEC type approach)	Published. Under revision (estimated 2016).	Established standard in use by industry addressing most aspects	ES
United States EPA	ENERGY STAR® specification for data centre storage v1.0	Energy efficiency of data centre storage	Capacity Optimizing Methods (COMs)	Published. Under revision (estimated 2017).	Suitable to address COMs but not other energy efficiency aspects as yet.	DS
United States NSF/ANSI	New Standard - NSF/ANSI 426, Draft 1, Issue 1	Environmental impacts of servers	Removability of external enclosures, PCBs, processors, data storage devices and batteries with common tools Ease of dismantling, reuse and recycling at the end-of-life. Critical raw material (CRM) content Postconsumer recycled content of CRM Replacement components availability Reduction of surplus parts by default	In draft (estimated 2016).	Likely to be suitable.	ES

			Hardware functionality testing software tools			
United States, ANSI ATIS	060015.01.2014	Measurement and reporting - Server network energy efficiency: telecommunications Energy Efficiency Ratio (TEER)	None identified	Published.	Network efficiency (i.e. data throughput per unit power) was not identified as a key parameter. Approach does not cover server efficiency in general	ES
United States NIST	NIST Special Publication 800-88 Revision 1	Guidelines for Media Sanitization	Data sanitisation	Published	Yes. Established standard in use by industry addressing most aspects.	ES, DS
United Kingdom CESG	CPA Security Characteristics for Data Sanitisation - Flash Based Storage	Data sanitisation	Data sanitisation	Published	Yes. Established standard in use by industry addressing most aspects, although NIST may provide a more succinct source.	ES, DS
	CAS Sanitisation Requirements Version 2.0 Nov 2014					ES, DS
	HMG IA Standard No. 5 - Secure Sanitisation Version 5.0					ES, DS
Industry standards / International initiatives						
SPEC	SPECpower_ssj2008	Energy efficiency rating for servers	Active State (power demand / rating)	Published	Superseded by SERT, this tool addressed some aspects, especially idle state and CPU-RAM active power demand.	ES
			Idle State (power demand/ rating)			
			Energy proportional operation (dynamic range)			
			Overall energy performance (TEC type approach)			
SPEC	SERT V1.1.0	Energy efficiency rating for servers	Active State (power demand / rating)	Published. (Next revision estimated 2017 or later)	Yes. Established standard in use by industry addressing most aspects.	ES
			Idle State (power demand/ rating)			
			Energy proportional operation (dynamic range)			
			Overall energy performance (TEC type approach)			

SNIA	SNIA Emerald™ Power Efficiency Measurement Specification	Power demand of storage equipment	Active State (power demand / rating) Idle State (power demand/ rating) Energy proportional operation (dynamic range) Overall energy performance (TEC type approach) COMs	Published.	Yes. Established standard in use by industry addressing most aspects.	DS
EPRI & Ecova	Generalized Test Protocol Revision 6.7	Energy efficiency of internal power supplies	Power Supply Efficiency Power Supply Power factor	Published	Yes. Established standard in use by industry.	ES, DS
ASHRAE	Thermal Guidelines 3rd Edition, in Table 2.3	Thermal Guidelines for Data Processing Environments	Operating temperature	Published	Yes. Established standard in use by industry.	ES, DS
ECMA	ECMA-74 13th edition (June 2015)	Noise emissions	Acoustic noise	Published	Yes. Established standard in use by industry. Based on ISO 3741, ISO 3744, ISO 3745, ISO 11201.	ES, DS
ITU-T SG5 Q17		Recommendations for energy efficiency metrics, best practice and measurement for telecommunication equipment	None identified	In draft (Expected 2016)	ITU is working to identify gaps and assist standardisation and harmonisation of existing efforts.	ES, DS

Appendix 3: Background to discounted standards / initatives

Less-relevant European standards (EN) highlighted in M/462 ESO response

ETSI (EE): EN 300 132-3

Whilst the ESO response to mandate M/462 identified this currently published ETSI standard as relevant to servers and data centre storage, it focuses upon the standardisation of interfaces and voltages for telecoms equipment to ensure compatibility and reliable operation. As such, it does not appear to take into account any parameters that might be relevant to development of an ecodesign transitional methods document. It is discounted from further analysis.

ETSI (EE): EN 300 019-1 series

The ETSI EN 300 019-1 series is already published, addresses “Environmental conditions and environmental tests for telecommunications equipment: Classification of environmental conditions”. This standard also contains objectives for extended temperature range for equipment to be used in data centres (servers, storage, etc.). The specific aspects that are relevant to servers and data centre storage include temperature and humidity range EN 3.1 for normal conditions. This is defined as 5-40degC, 5-85RH and temperature rate of change 0.5degC/min. This range is very wide to accommodate telecommunications equipment which operate in very minimally controlled environmental conditions. As a result ASHRAE is more commonly used for IT server equipment in data centres.

CENELEC (CLC TC108): EN 62075

EN 62075 is a published standard that corresponds with IEC 62075, and addresses “Audio/video, information and communication technology equipment - Environmentally conscious design”. The specific aspects that are relevant to servers and data centre storage include:

- life cycle thinking aspects,
- material efficiency,
- energy efficiency,
- consumables and batteries,
- chemical and noise emissions,
- end of life,
- hazardous substances/preparations,
- and product packaging.

These are general guidelines to help define and explain general concepts which can be applied to a wide range of electronic products such as servers and storage. It does not provide sufficient detail to help quantitative evaluation and comparison of product specific parameters and develop product specific standards.

CENELEC (CLC TC108): EN 62018

EN 62018 is a published standard that corresponds with IEC 62018, and addresses “Power consumption of information technology equipment, measurement method”. The specific aspects that are relevant to servers and data centre storage include:

- Defining power modes
- Establishing the need for energy management and power to modulate as utilisation reduces.
- Requirements for stable power consumption before measurements are taken

While it is more in depth than En 62075 , these are still general aspects that do not address the product specific issues which need to be covered by this project.

Other European Standardisation Organisation activities

Additional ESO activities of possible relevance (but not addressed in more detail at this point) include:

- Technical Committee 111 (TC111): Environmental standardisation of electrical and electronic products and systems
- CENELEC Database of environmental aspects
- ACEA: Advisory Committee on Environmental Aspects
- TC100X
- TC59X
- Other TCs addressing technical aspects that are relevant to these products and may have environmental implications

Less relevant industry initiatives

ITU-T SG5 Q17[13]:

This working group is trying to assist standardisation of ICT and climate change efforts including test methods and metrics. It is assessing current activities, identifying gaps in standardisation and creating recommendations to complement and harmonise existing work. It is not specifically developing test methods and metrics itself.

(ITU L.1300 and L.1310)

Anetwork efficiency test method, this standard is currently in development to address energy efficiency metrics and measurement for telecommunication equipment. ITU L.1300 covers best practices for operation and is heavily based on the EU Code of Conduct for Data Centres.

ITU L.1310 includes test metrics for network efficiency but does not address servers and is based on TEER.

ECR Energy Consumption Rating Specification v3.0.1

This network efficiency metric is targeted at telecom equipment rather than general use servers or data storage. The ECR specification defines rules for classifying network and telecom equipment into classes and a methodology for measuring energy efficiency within each class. The final "performance-per-energy unit" rating can be reported as a peak (scalar) or synthetic (weighted) metric that takes dynamic power management capabilities into account. This rating can be further utilised to optimise energy consumption for telecom and network equipment.

ECR aims to define a framework for first-order approximation of energy efficiency for packet-based network and telecom equipment. Various aspects of operation are covered, including peak efficiency, variable-load efficiency and idle (statically configurable) energy efficiency.

Network efficiency is most relevant to medium to large-scale network and telecom systems. It is less relevant to small office, home office and consumer grade multipurpose communication devices, where throughput is less relevant and energy efficiency metrics can be based on allowances per units of functionality, such as described in [METI 2008[14]] and [EC CoC Broadband[15]] documents.

[13] http://www.itu.int/ITU-T/studygroups/com05/sg5-q17.html

[14] http://www.eccj.or.jp/top_runner/pdf/tr_small_routers-apr_2008.pdf

Appendix 4: References

Organisation	Programme	URL(s)
American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE)	American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) Thermal Guidelines for Data Processing Environments, 3rd Edition, in Table 2.3	https://www.ashrae.org/resources--publications/bookstore/datacom-series
British Standards Institute (BSI)	PAS 141:2011 - Reuse of used and waste electrical and electronic equipment (UEEE and WEEE) – Process management – Specification	http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030245346
Communications-Electronics Security Group (CESG)	CPA Security Characteristics for Data Sanitisation - Flash Based Storage	https://www.cesg.gov.uk/publications/Documents/data_sanitisation_flash_based_storage.pdf
Communications-Electronics Security Group (CESG)	CAS Sanitisation Requirements Version 2.0 Nov 2014	https://www.cesg.gov.uk/publications/Documents/cas_sanitisation_service_requirement.pdf
Communications-Electronics Security Group (CESG)	HMG IA Standard No. 5 - Secure Sanitisation Version 5.0	http://www.cesg.gov.uk/aboutus/contactus/Pages/index.aspx
ECMA	Standard ECMA-74 Measurement of Airborne Noise emitted by Information Technology and Telecommunications Equipment 13th edition (June 2015)	http://www.ecma-international.org/publications/standards/Ecma-074.htm
Ecova	Generalized Test Protocol for Calculating the Energy Efficiency of Internal Ac-Dc and Dc-Dc Power Supplies Revision 6.7	http://www.plugloadsolutions.com/80PlusPowerSupplies.aspx
European Commission (EC)	ENERGY STAR Enterprise Servers Specification Version 2.0	http://www.eu-energystar.org/specifications.htm

[15] http://iet.jrc.ec.europa.eu/energyefficiency/sites/energyefficiency/files/files/COC_Energy-Consumption/code_of_conduct_broadband_equipment_v4_1_final.pdf

		http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.114.01.0068.01.ENG
European Commission (EC)	Waste Electrical and Electronic Equipment Directive (WEEE)	http://ec.europa.eu/environment/waste/weee/index_en.htm
European Commission (EC)	European Rare Earths Competency Network (ERECON)	http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/erecon/index_en.htm
European Commission (EC)	Raw Materials Initiative	http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0297
International Electrotechnical Committee (IEC)	IEC 62075:2012 Audio/video, information and communication technology equipment - Environmentally conscious design	https://webstore.iec.ch/publication/6441
International Standards Organisation (ISO)	ISO/IEC JTC 1/SC 39 - Sustainability for and by Information Technology	http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=654019&development=on
International Standards Organisation (ISO)	ISO 7779:2010 Acoustics -- Measurement of airborne noise emitted by information technology and telecommunications equipment	http://www.iso.org/iso/catalogue_detail.htm?csnumber=54363
Korea Energy Management Corporation (KEMCO)	e-Standby Program	http://www.kemco.or.kr/new_eng/pg02/pg02100300_2.asp http://www.kemco.or.kr/nd_file/kemco_eng/MKE_Notice_%202011-23_e-standby_Program.pdf
National Institute of Standards and Technology (NIST)	NIST Special Publication 800-88 Revision 1: Guidelines for Media Sanitization	http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-88r1.pdf
Standard Performance Evaluation Corporation (SPEC)	Server Efficiency Rating Tool (SERT)	https://www.spec.org/sert/

Storage Networking Industry Association (SNIA)	SNIA Emerald™ Power Efficiency Measurement Specification Version 2.0.2: Section 7.3 General Requirements and Definitions, Section 7.4.4: Ready Idle Test and Section 8.3.1 Ready Idle Test	http://www.snia.org/emerald/download
US Environmental Protection Agency (EPA)	ENERGY STAR Enterprise Servers Specification Version 2.0	https://www.energystar.gov/products/spec/enterprise_servers_specification_version_2_0_pd
US Environmental Protection Agency (EPA)	ENERGY STAR Data Center Storage Specification Version 1.0	http://www.energystar.gov/products/spec/data_center_storage_specification_version_1_0_pd

Appendix 5: Diagram of standard interactions