

Comments on Draft Specification Framework ENERGY STAR® for Enterprise Storage
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Fujitsu appreciates the efforts of EPA to establish a set of definitions for ENERGY STAR® requirements for Enterprise Storage systems. The Draft Specification Framework ENERGY STAR® for Enterprise Storage will rely especially on a well-founded taxonomy of Storage systems. We recommend taking into account the taxonomy SNIA has drafted in their Green Storage Power Measurement Specification working draft, i.e. taking the broad categories Online, Near-Online, Removable-Media Library, Virtual Media Library as a base for further specifications.

Page	Chapter	Requirement / Definition	Comment
2	#1 c.	c. Preliminary List of Definitions ^{1,2} : a. Storage Hardware:	<p>Storage product: We recommend that the definition explicitly include aggregating storage systems such as RAID, tape libraries, filers, virtual tape libraries etc. To better reflect end customers' requirements, storage products with integrated ILM functionality (Information Lifecycle Management, where data is moved automatically from tier 1 consisting of hard disks to tier 2 consisting of tape technology) should be explicitly included. Only this combination delivers the most energy efficient solution where inactive data is moved to inactive media which indeed do not consume any power if not accessed.</p> <p>Storage media: We recommend including media such as hard disks, solid state disks, tapes and optical disks. Drives, e.g. tape drives should be recognized within the storage product.</p> <p>The definition of Blade System / Blade chassis / Blade storage implies that other form factor definitions as rack-mounted and stand-alone should also be included.</p>
3	#1 b.	b. Storage Characteristics:	<p>We recommend to define Capacity in detail, e.g. to use capacity based on binary bytes (1 MiB=1.048.576 Byte) or decimal bytes (1MB=1.000.000 Byte).</p>

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4	#1 e.	e. Operational States:	<p>Idle: Characteristically for Storage systems even without external workload there are different idle states: A RAID system which is rebuilding a disk or does disk scrubbing and other precautionary tasks (but other than that idle), will consume more electricity than a completely idle system. As more intelligence is being added to storage devices (at target reduplication, index/search, ...) thus very often enhancing efficient use of energy or material, more internal activity of otherwise idle systems will arise (e.g. virtual tape libraries reorganise / refresh cartridges in the background thus reducing tape use).</p> <p>We recommend defining different "idle" modes with regard to end customer use scenarios vs. an artificial 'total idle' mode.</p> <p>We recommend taking into account "High availability (HA)" configurations. Enterprise configurations work in all probability with the HA function multipathing. If HA is not taken into account in the definition, single path configurations with lower energy use but less relevance to real usage could be measured.</p>
5	#2	Eligible Product Categories	<p>We recommend including Online, Near-Online, Removable-Media Library, Virtual Media Library Enterprise Storage systems in the specification. Within these broad categories special implementations, e.g. MAID should be recognized. Blade Storage is an implementation of Storage systems like Rack or standalone systems so opening a different view on Storage systems categories.</p> <p>Size of Storage Systems is influencing greatly efficient use of energy, therefore we recommend specifying different categories based on size within each product category.</p>
7	#3 b.	adopt or develop a test procedure to measure the energy consumed by a Storage Product	As to our knowledge there is no industry standard procedure for power measurement yet we recommend developing a simple and straight-forward test method.
7	#3 b	... seamlessly integrate software and hardware efficiency strategies that provide verifiable benefits without user intervention.	Comment: Virtual tape libraries do especially well in this respect, and could well lead in the field of combining HW and SW most efficiently for the purpose of efficient energy use.