

TGG Energy Star Data Center Storage Draft 1, Version 2 Comments

Section 1 D Storage Taxonomy:

TGG recommends incorporating the Storage Taxonomy in the SNIA Emerald Version 4.0 as follows.

D. Storage Taxonomy: A categorization scheme for use in segmenting the data center storage market by end-use application and key product characteristics. The major categories of the taxonomy that are referenced in this document are as follows:

- 1) **Disk Set Online Storage:** Storage products that are intended to service a mixture of Random and Sequential I/O requests with a short response time. All data stored in Disk Set Online storage must be accessible $\text{MaxTTFD} \leq 80$ ms, unless the storage product is in a Deep Idle state. Disk set Online storage is typically comprised of one or more HDDs and a storage controller, and provides primary data storage to supplement a Computer Server's internal memory.
- 2) **Disk Set Near-online Storage:** Storage products that are intended to service a mixture of Random and Sequential I/O requests with a short to moderate response time. Disk Set Near-online storage products offer an asymmetrical response; a portion of data may be accessible $\text{MaxTTFD} \leq 80$ milliseconds, while other data may be accessible $\text{MaxTTFD} > 80$ milliseconds.
- 3) **RVML (Removable Media Library) Set Virtual Media Library:** Storage products that are intended to service primarily Sequential I/O, with a short response time. The media in a Virtual Media Library (e.g., HDD, optical disk) is not designed to be physically removed from the system. All data stored in the Virtual Media Library must be assessable $\text{MaxTTFD} \leq 80$ ms, unless the storage product is in a Deep Idle state. Virtual Medial Libraries are intended primarily for moderate and long-term data storage.
- 4) **RVML Set Removable Media Library:** Storage products that are intended to service primarily Sequential I/O, with a moderate to long response time. The media (e.g., tape cartridge, optical disk) in a Removable Media Library is designed to be physically removed from the storage product. Removable Media Libraries are intended primarily for long term data archiving
- 5) **NVSS (Non-Volatile Solid State) Set Disk Access Storage.** Storage products that are intended to service a mixture of Random and Sequential I/O requests with a short response time. All data stored in NVSS Set Disk Access Online storage must be accessible $\text{MaxTTFD} \leq 80$ ms, unless the storage product is in a Deep Idle state. NVSS Set Disk Access Online storage is typically comprised of one or more SSDs and a storage controller, and provides primary data storage to supplement a Computer Server's internal memory.
- 6) **NVSS Set Memory Access Storage.** Storage products that are intended to service a mixture of Random and Sequential I/O requests with a short response time. All data stored in NVSS Set Memory Access Online storage must be accessible $\text{MaxTTFD} \leq 80$ ms, unless the storage product is in a Deep Idle state. NVSS Set Memory Access Online storage is typically comprised of one or more banks of Solid State Storage devices and a storage controller, and provides primary data storage to supplement a Computer Server's internal memory.

Section 2.1 Included Products, subsection iii:

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TGG recommends changing the text to:

are characterized within the Disk Set Online Category Online 2, 3, and 4 and NVSS Set Disk Access Category Online 2, 3, and 4 Storage Taxonomy categories with the following additional criteria;

Section 2.2 Excluded Products, subsection .2.2.2 vi:

TGG recommends changing the text to:

vi. Storage devices in the following categories of the taxonomy: Disk Set Near-online, RVML Set Removable Media Library, RVML Set Virtual Media Library, and NVSS Set Memory Access.

The Adjunct Storage Products and Interconnect Elements have been removed from the taxonomy in the SNIA Emerald Version 4.0.

Section 3.2 Power Supply Requirements, subsection 3.2.2 i Efficiency:

The Table for the Multi-output is incorrect. The table should read:

Power Supply Type	Rated Output Power	20% Load	50% Load	100% Load
Multi output (80Plus Gold)	All Output Loads	88%	92%	88%
Single output (80Plus Platinum)	All Output Loads	90%	94%	91%

Section 3.2 Power Supply Requirements, subsection 3.2.2 ii Power Factor:

TGG recommends that the PSU Type in Table 2 be made consistent with that in Table 1. We recommend changing “Redundant and Non-Redundant Capable PSU” to “Multi-Output and Single-output PSU”

Section 3.3 Power Modeling Requirements.

Is this section relevant anymore now that modeled data is no longer accepted?

Section 3.4.1 Active State requirements for Transaction Hot Band

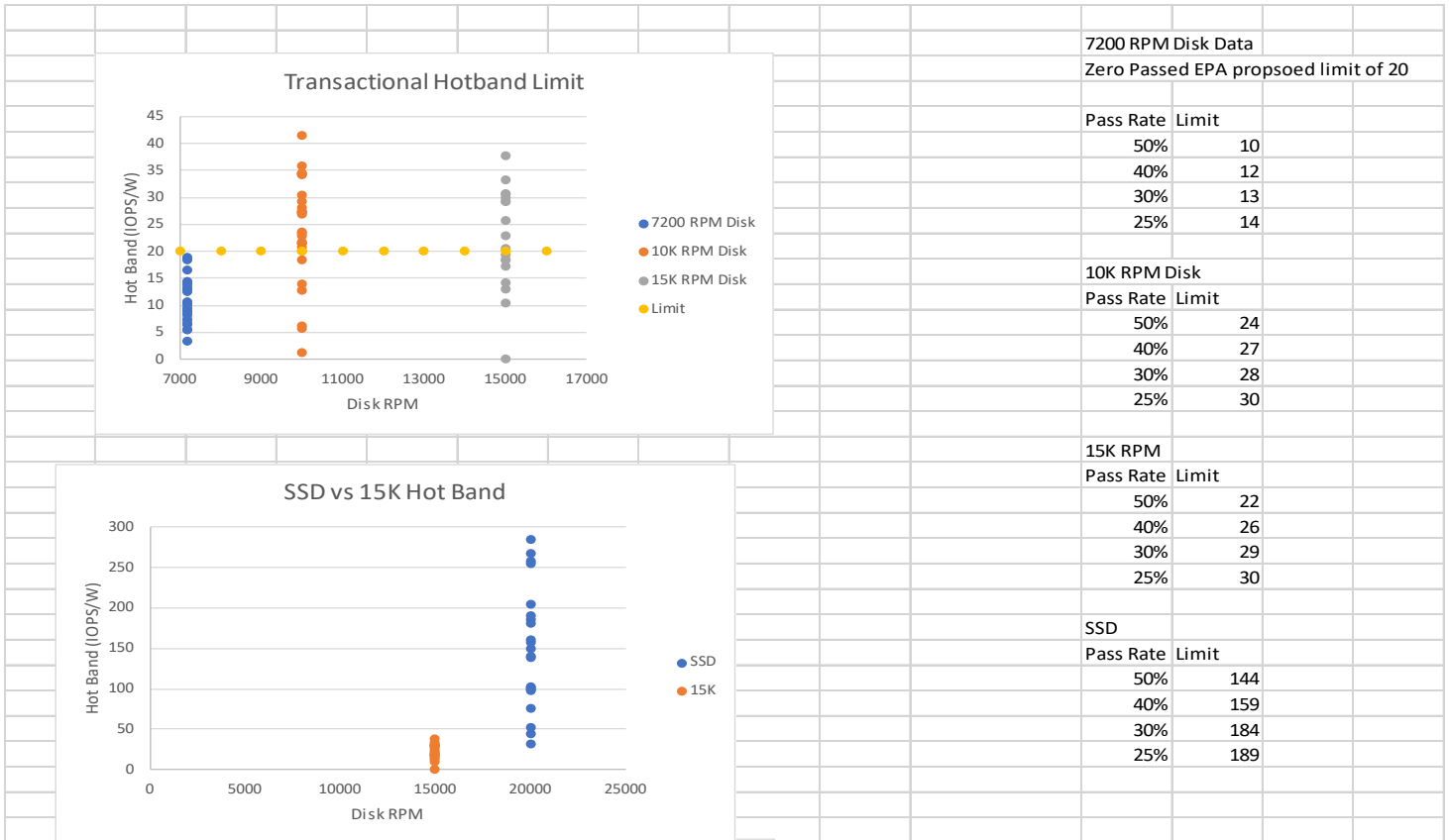
TGG proposes breaking this up into Disk Set Online Category and NVSS Set Disk Access Category with a separate performance rating for each. As it is currently set up, it favors NVSS Set system over Disk Set. TGG feels that a lower requirement for Disk Set and a higher requirement for NVSS Set would remove this bias. In addition, the Disk Set Online products are currently using 7200 RPM, 10,000 RPM and 15,000 RPM drives. The SSD costs for high performance storage have been coming down to the point where the 15,000 RPM drives are more costly than SSDs and the 10,000 RPM Drives are approaching parity with SSDs. It is anticipated that within the next couple of years, only 7200 RPM drives will remain in the Data Storage products. With the current limits, this will eliminate hard disk systems from Energy Star as only 10,000 RPM and 15,000 RPM drives can meet the proposed criteria. Alternately, this might drive Storage Product Manufacturers to use the higher speed drives for performance testing, but not actually sell any in systems, as 7200 RPM drives and SSDs will be more cost effective for customers. The Spreadsheet summary below shows the results of the TGG analysis

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of the data combining Online 2, 3 and 4. This shows that with the current limit of 20 for all transactional systems the following result:

Disk Type	Quantity	Passed the EPA Limit	Percent
7200	27	0	0%
10K	27	21	78%
15K	18	10	55%
SSD	21	21	100%

Based on this, TGG recommends setting separate limits for 7200 RPM disk drives, 10K & 15K RPM disk drives, and SSDs. The data indicates that the 10K and the 15K RPM drive systems provide similar results, so setting the same limit for both seems appropriate. The 7200 RPM drives are significantly different from the 10K and 15K RPM drives which indicates a lower level would be appropriate to avoid excluding them from consideration.



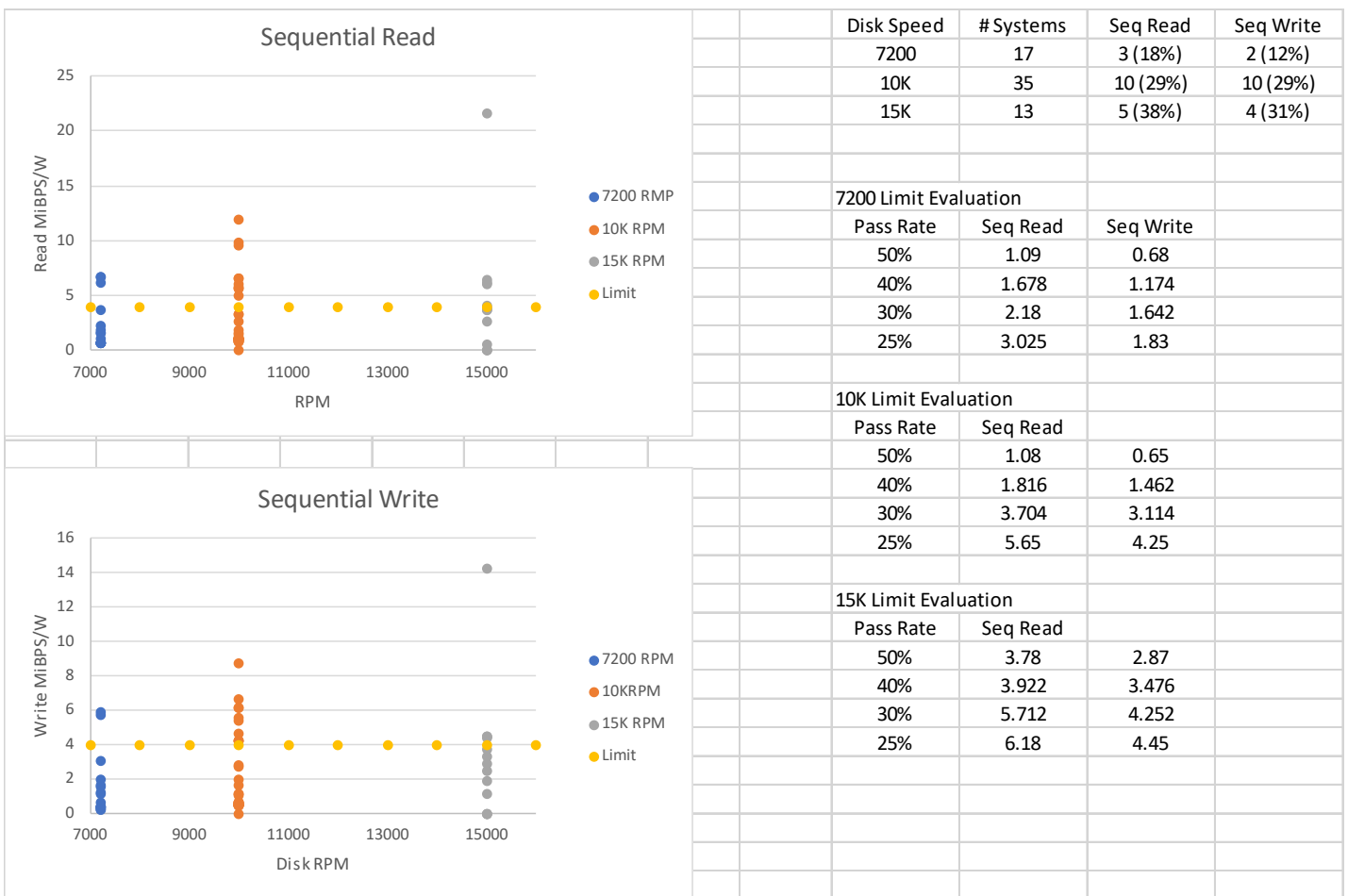
Section 3.4.1 Active State requirements for Streaming:

Like the discussion on the Transaction Hot Band, there is a distinction between 7200 RPM and 10K & 15K RPM drives. There is currently no data on SSDs, but one might surmise that they will

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be significantly faster than disk drives. The data below shows the results for the disk drives performance for the various speed disk drive systems. The proposed limit seems reasonable for the 10K & 15K drives but is again too high for the 7200 RPM drives. As is the case for the Transactional discussion, this could cause manufacturers to keep 10K RPM drives for the purpose of qualification, but most likely they would not be sold in actual systems during the life of this specification.

Based on this, TGG recommends setting separate limits for 7200 RPM disk drives, and the 10K & 15K RPM disk drives. The data indicates that the 10K and the 15K RPM drive systems provide similar results, so setting the same limit for both seems appropriate. The 7200 RPM drives are significantly different from the 10K and 15K RPM drives which indicates a lower level would be appropriate to avoid excluding them from consideration.



Section 3.6.3, ii Optimal configuration and line 444 in the Note:

These are in conflict with Section 1 I, subsection 2) Optimal Configuration definition. TGG would like the manufacturer to have the option to choose the optimal configuration as a system which has been optimized for the NVSS Set may have issues complying with the requirements when

using a non-optimal configuration from the Disk Set. This will become a more significant issue when only 7200 RPM disk drives are offered for Data Storage Products in the future.

Section 3.8.1, ii. Inlet Air Temperature (optional)

Optional should be removed as the requirements are for Online 3 and Online 4 storage products.

TGG proposes that the Inlet Air Temperature be reported for the Controller Chassis only for Version 2.0.