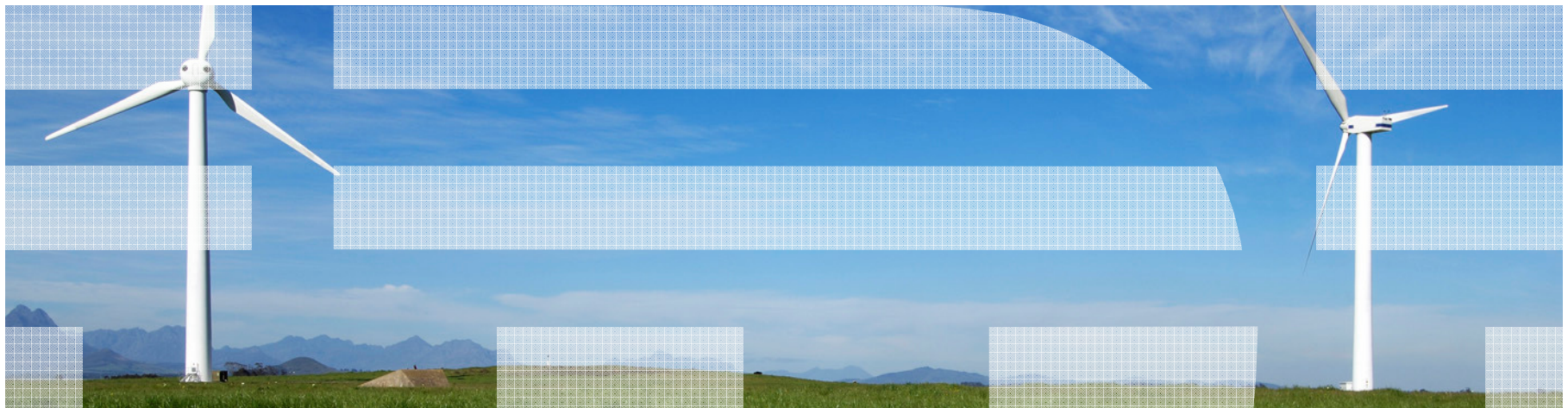




EPA - Energy Star

Overview of Energy Star for Storage

April 9, 2013



Carlos Pratt

IBM: Storage Performance, Storage Energy efficiency lead and corporate liaison to EPA on Storage Energy Star.

SNIA: Co-Chair of the Green Technical Working Group and IBM representative to the Green Storage Initiative governing board

Contact info:

Phone: (520) 799-5409

Email: jcpratt@us.ibm.com

- What is Energy Star for Datacenter Storage
- Where Energy Star affects Storage
- Where Energy Star affects Server
- Where Energy will affect NETWORK equipment
- What others have done (that works)
- Latest update for storage (from meeting with EPA)
- A closer look on storage
 - Entry Conditions to get energy Star (update)
 - How to Certify-Qualify a storage system (update)
 - Energy Star decision process (update)
- World Wide influence of Energy Star
- Conversation and personal experience

What is Energy Star for Datacenter Storage



ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping us all save money and protect the environment through energy efficient products and practices.

http://www.energystar.gov/index.cfm?c=about.ab_index

For Datacenter Storage is a program in flux (about to be released)

http://www.energystar.gov/index.cfm?c=new_specs.enterprise_storage



Compliance with Energy Star™ represents the ability to remain and compete on markets highly regulated by governments. In some cases this compliance is NOT voluntary as it normally is in the USA.

Where Energy Star affects Storage



The Importance of an Energy Star for Storage products represents the ability to be able to maintain a presence on key markets; some examples are:

▪ **Government at all levels**

- Federal
- State
- Local

▪ **Health care systems**


- Hospitals
- Clinics
- Medical offices
- Laboratories

▪ **Education and research facilities**

- Universities
- Meteorological systems

▪ **Tax Incentives**

- Data Centers with the Energy Star certification may get up to a 30% on incentives
- For a data center to be Energy Star ALL its equipment MUST be Energy Star qualified



Energy Star qualification will be fully based on SNIA Emerald Program

SNIA Focus Taxonomies		
Online 2 (OL2)	Online 3 (OL3)	Online 4 (OL4)
Small drive count	Medium drive count	Medium to large drive count
Entry level systems	Mid range systems	Mid range to large systems
For EPA NO JBODs	No JBODs	Non large Enterprise
	RAS is considered	RAS is a must

Emerald web site is <http://www.snia.org/emerald>

Where Energy Star affects Server



- Mainly Servers that fall under the definition of sockets
 - Lead by SPEC
 - Use the sert tool <http://www.spec.org/sert/>
 - Recently the introduction of resilient servers
- It remains a huge data gathering effort:
 - Learn where the thresholds should be set
- On version 1 of energy start it was mainly an IDLE (definition according to SPEC) measurement
- On version 2 some performance has been introduced.
- Still the biggest challenge remains on how to cover the bigger servers.
- Server definition can be found here

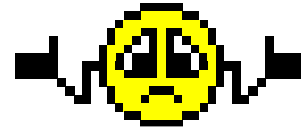
<http://www.energystar.gov/products/specs/sites/products/files/Final%20Version%202.0%20Computer%20Servers%20Program%20Requirements.pdf>

- Percentage market affected
 - Confirmed 30% (current market sales)
 - Expected a minimum of 50% and a maximum of 90% by end of 2016 (this information is based on possible government regulation and incentives, in the case the regulation and incentives aren't present then the market will dictate the percentage)

Where Energy Star affects Networks??????



Don't Know?



Feel LOST?



One simple fact: THE EPA WILL ASK FOR YOUR GUIDANCE

If not you will get the SHRECK benchmark



- **Agree to a way to divide the type of equipment**
 - Servers → Number of processors
 - Storage → Taxonomy
 - For both (servers and storage)
 - Family (EPA prefers the term family)
- **Look to first go for a minimal common denominator**
 - Attack what is known that can have immediate positive look from the EPA
 - Power supplies is a good start
 - Eliminate from the proposal the most complex systems
- **What defines “work” on your hardware (no, not the Nm or Joule ... but close)**
 - Servers → MIPS
 - Storage → (IOPS and MBPS)
 - Basically what causes your equipment to consume those precious watts (and watt-hour) of electric energy in the data center
 - And cause BTUs
- **From the previous, can you define a specific metric to use that makes sense?**

- **Based on EPA information, target launch date for E* is end of July 2013**
- Data submission will be by end of October 2013
- Energy Star label will be granted within 90 days of data submitted

System Optimization	SNIA Emerald Power Efficiency Measurement Spec.	Metric	Objective
Optimal Cache use	Hot Banding	Mixed	Show quality of caching system by increasing performance and reduction of power used
Transaction Optimized	1. Random Write 2. Random Read	IOPS/watt	To Maximize IOPS/watt
Streaming Optimized	1. Sequential Write 2. Sequential Read	MBPS/watt	To Maximize MBPS/watt
Idle Optimized	Idle Ready	GB/watt	Largest system a stakeholder can assemble to amortize controller overhead over many disks

Certification and Qualification Criteria:

- Each vendor can choose to submit their system as transaction optimized, streaming optimized, or both. This choice will determine which data is published and which data will determine the range of the product family for each line of products.
- How to certify on next charts

- The next 6 charts show how the EPA plan to evaluate the storage systems on version 1. This can change by the time the final spec is released. Target month is July 2013

Entry conditions



Condition	Online 2	Online 3	Online 4
Power supply 80+ Silver or better	Yes	Yes	Yes
Power reporting (watts)	Optional	Yes	Yes
Temperature Reporting	Optional	Optional	Optional
IOPS Reporting	Optional	Yes	Yes
MBPS Reporting	Optional	Yes	Yes
IOPS/watt Reporting	Optional	Optional	Optional
MBPS/watt Reporting	Optional	Optional	Optional
Available Capacity Optimization Methods (COMs)	0	1	1
User available software to collect data and/or API that grants access to the data	Yes if any of the options is available	Yes	Yes

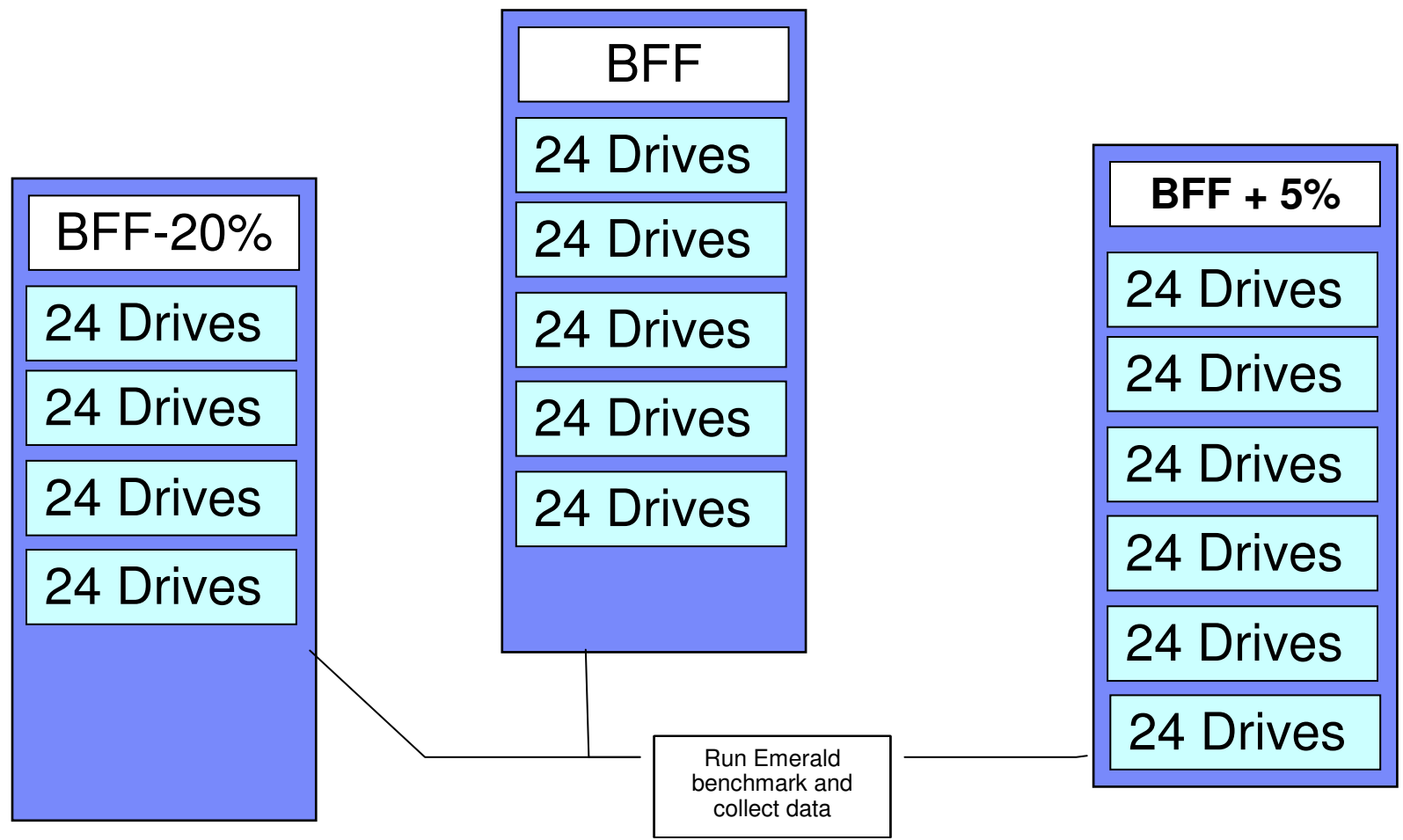
How to Certify/Qualify (example) part 1



15 K RPM
146 GB
Drive

BFF = Best Foot Forward

Run COM Validation
and collect data

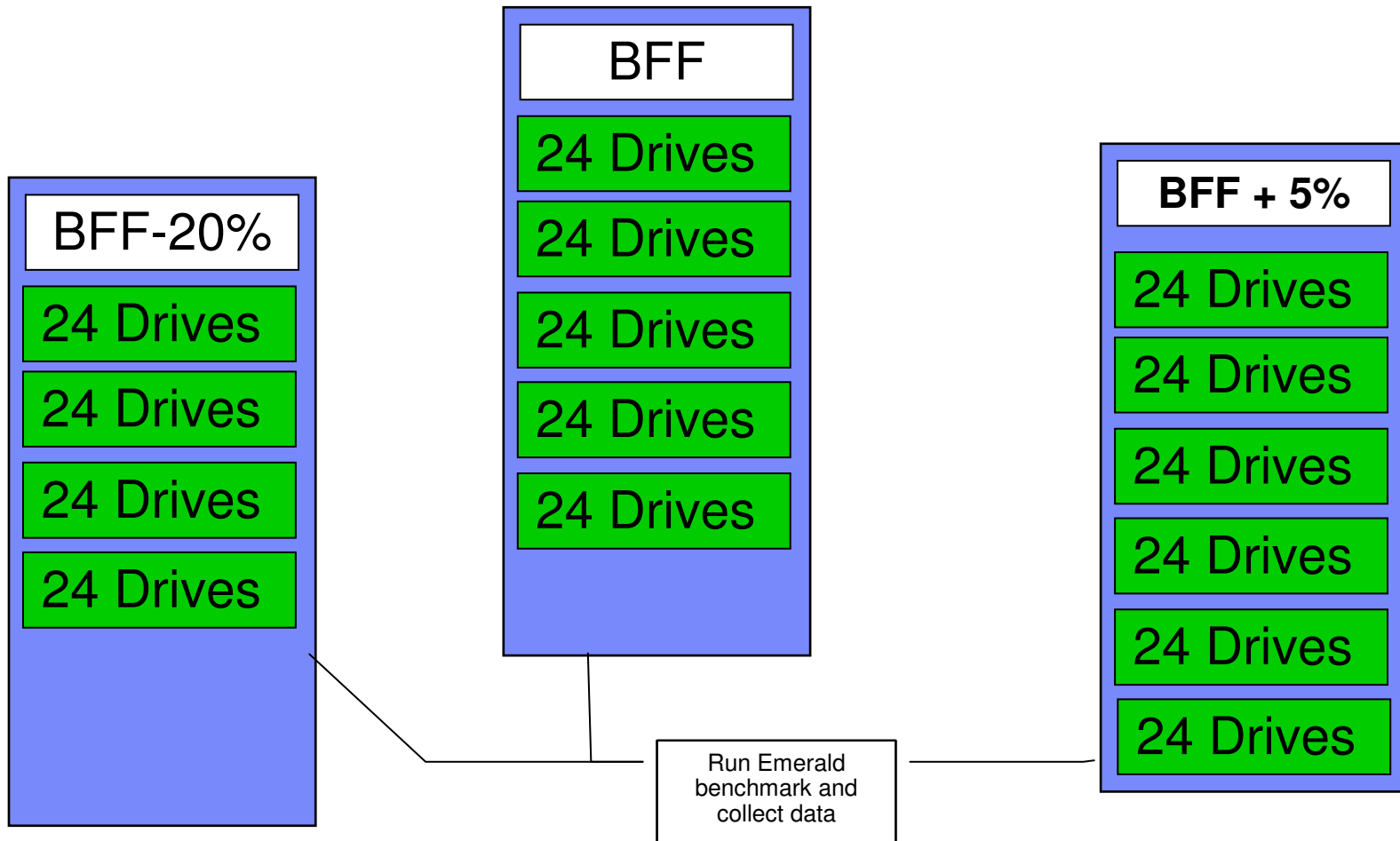


How to Certify/Qualify (example) part 2



10 K RPM
300 GB
Drive

BFF = Best Foot Forward



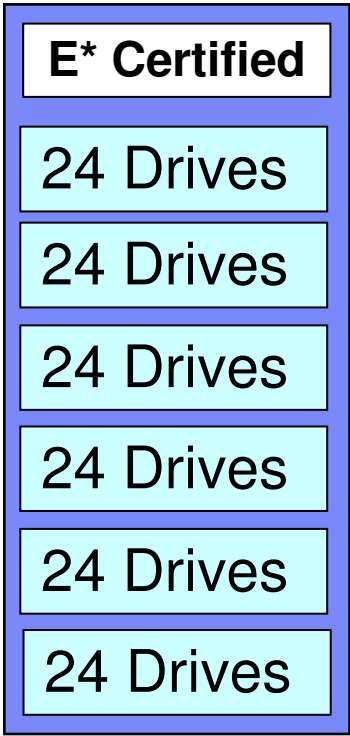
How to Certify/Qualify (example) part 3



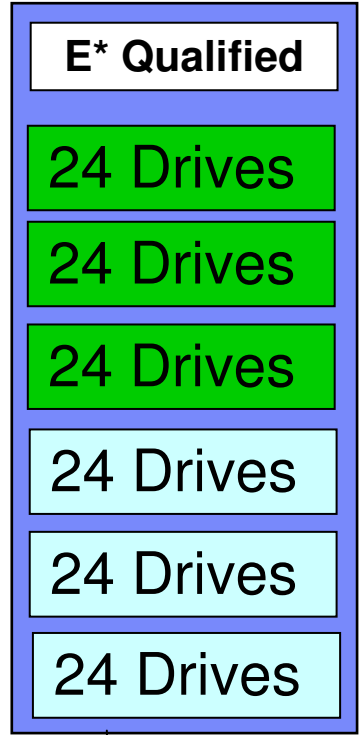
15 K RPM
146 GB
Drive

10 K RPM
300 GB
Drive

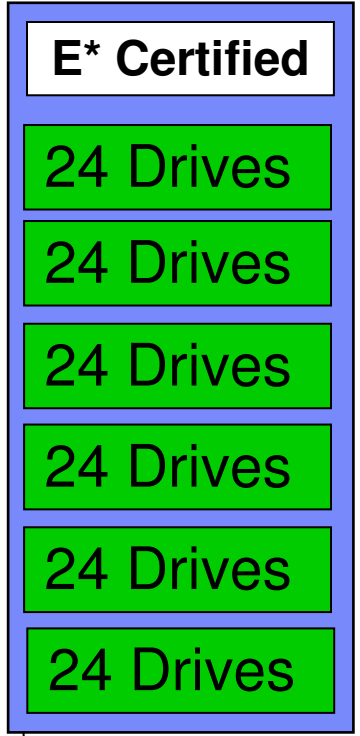
ALL THESE SYSTEMS CAN
HAVE THE  LOGO




From Part 1
Certified System



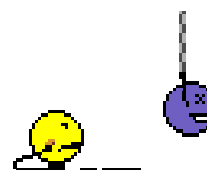
No Benchmark or
data needs to be
sent to EPA



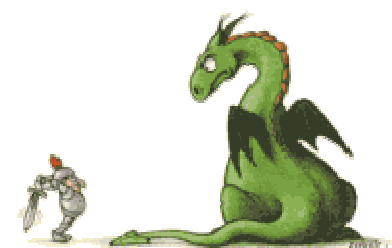
From part 2
certified system

- Contract signed with the EPA for the identified systems that will apply for Energy Star.
- Certifying Lab will validate that:
 1. Entry criteria on chart is met
 2. Run the benchmarks and verify results
 3. Generate the documentation for the CB (Certifying Body)
 4. Deliver the data to the CB and wait for the response from EPA
- Once EPA receives the data of the candidate systems will review the data with the CB and if it is to their satisfaction **EPA will grant an Energy Star.**
 - The CB will notify YOU the date that it can start using the  logo

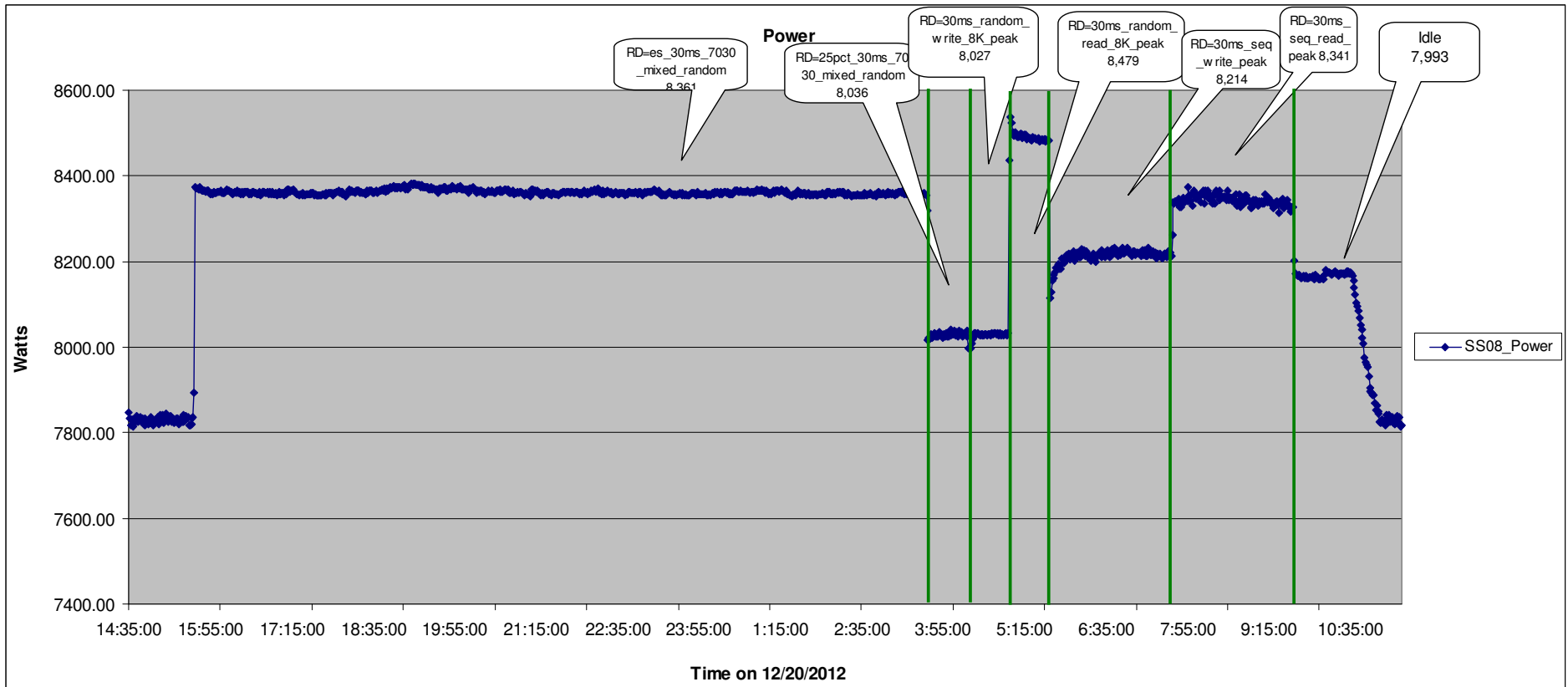
- European Code of Conduct Commission
- Japan has started to implement centralized labs for industry certification in cooperation of SNIA/ASIA .
- Other Geographies like South Pacific have plans to be disclosed in a near future.



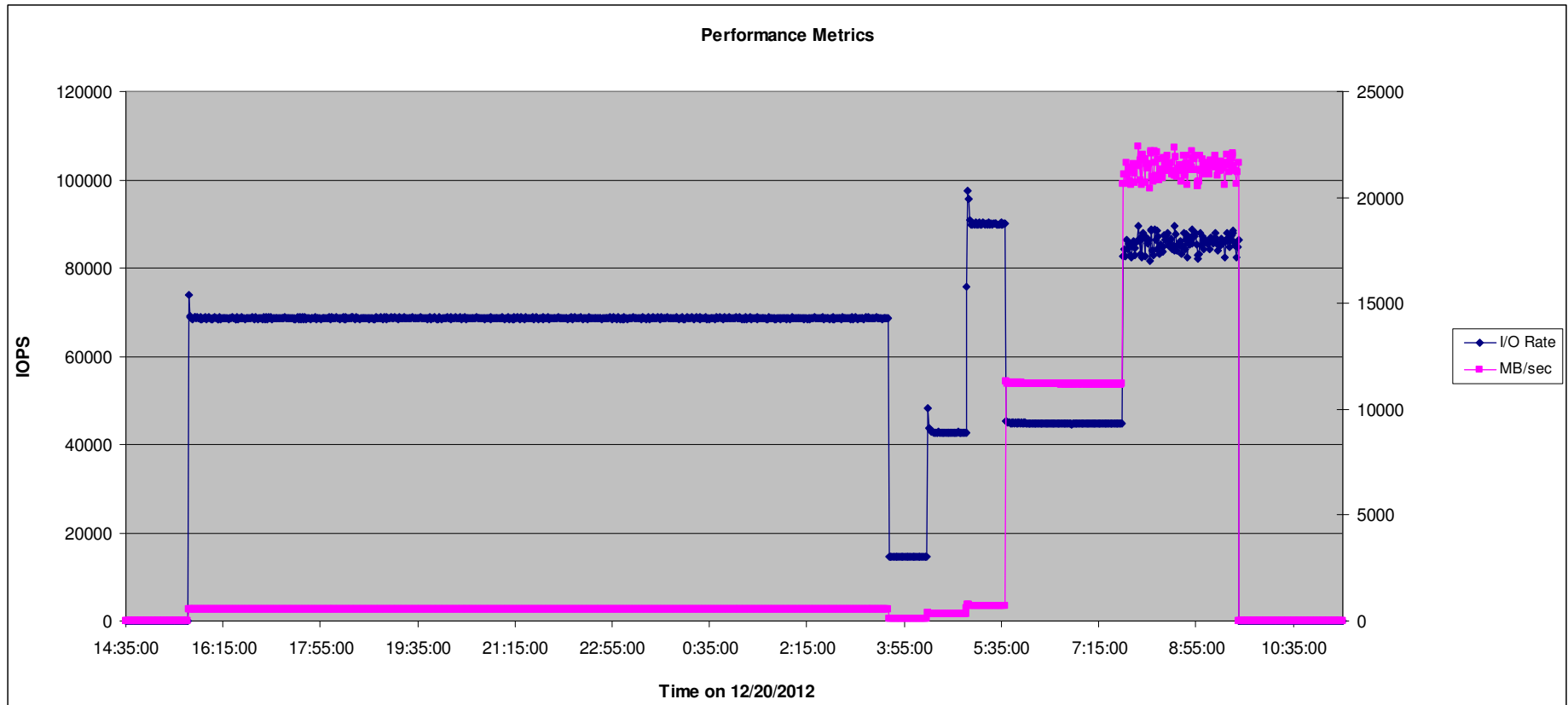
Conversation of personal experience Questions and Answers



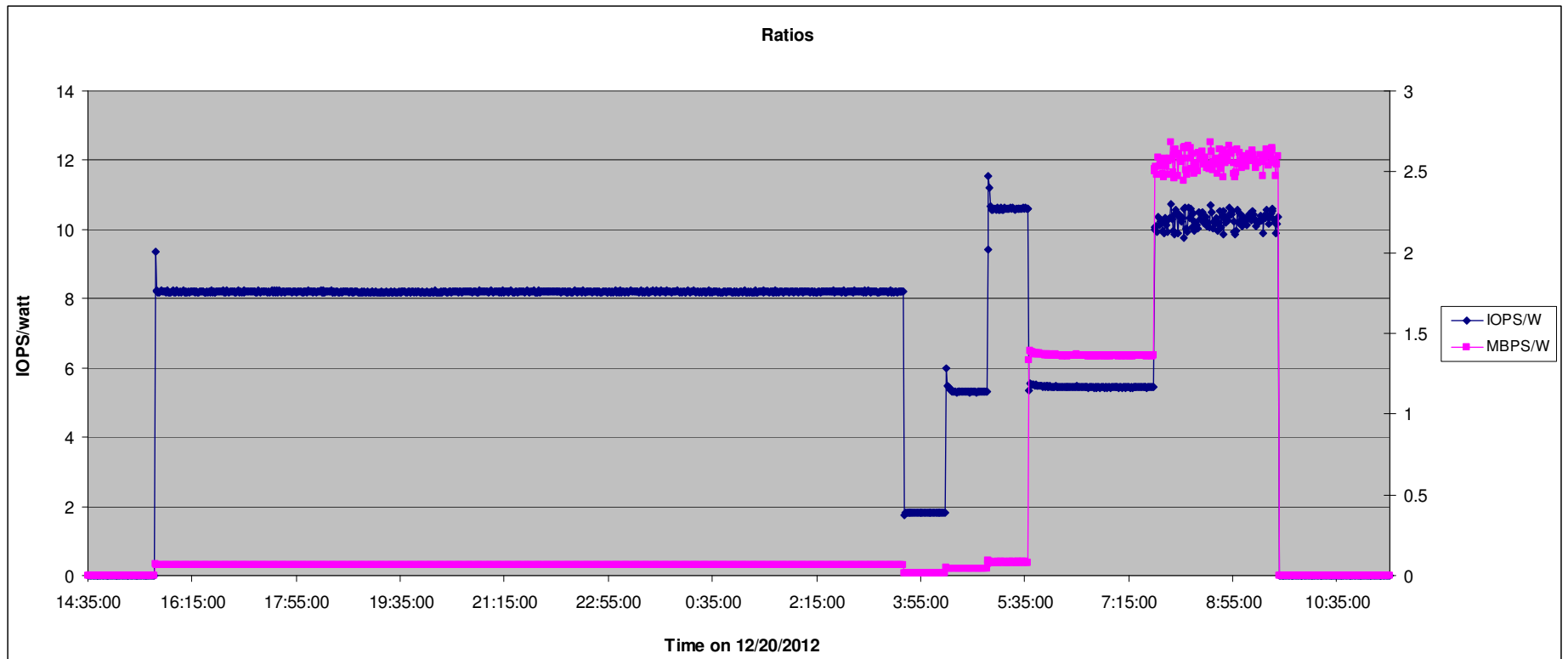
An example using storage raw power



An example using storage performance metrics



An example using storage ratios



This is what EPA wants to see for Energy Star

THANK YOU
Carlos Pratt
(jcpratt@us.ibm.com)

