# ENERGY STAR®
# Data Center Storage
# Specification Development

## SNIA Technical Symposium
## Chicago, IL

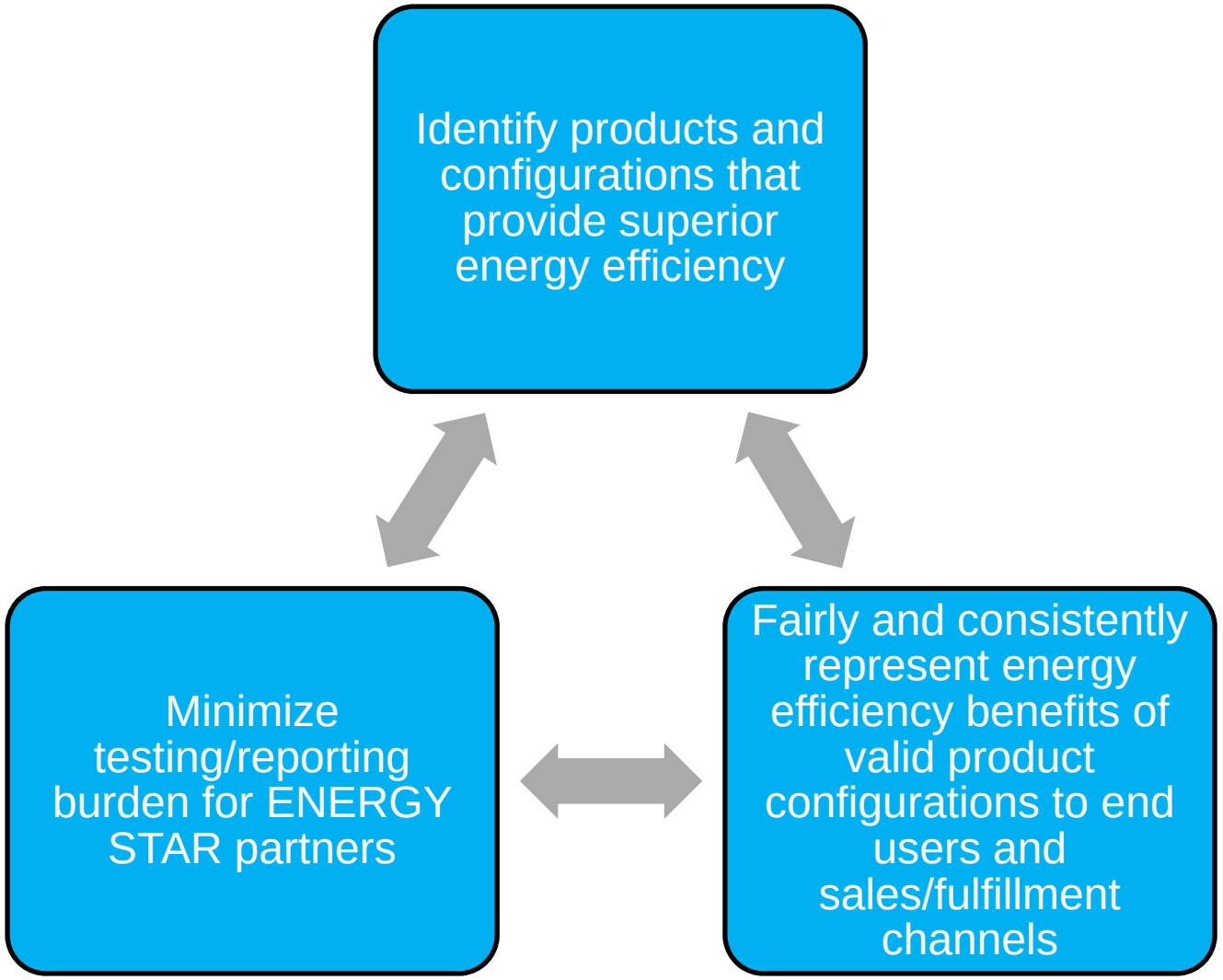
July 19th, 2011

EPA

# Agenda

- Review of ENERGY STAR goals
- Activities to date
- Test data assembly status
- EPA proposal
  - Options for product qualification and family definition
- Discussion
  - Brainstorming and questions
- Stakeholder feedback
  - SNIA questions and concerns

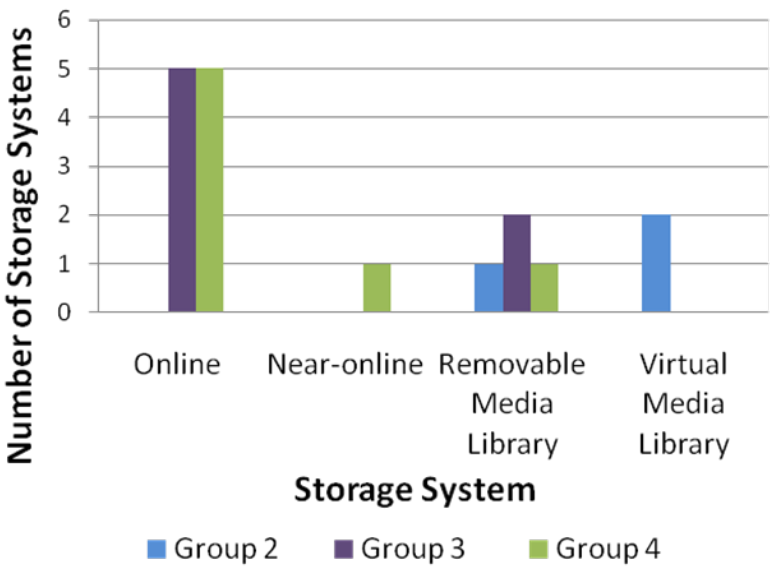
# Review of ENERGY STAR Goals



# Activities to Date

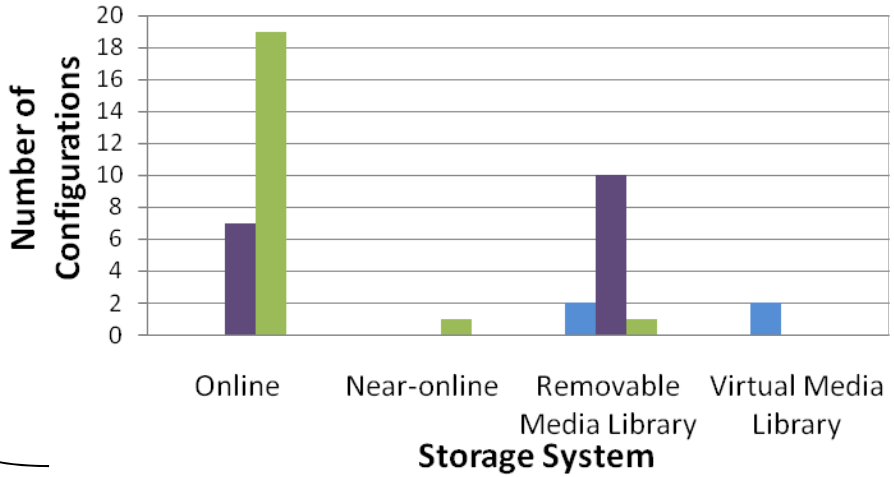
| | |
|---|---|
| 2009 | *Framework distributed* |
| | *Stakeholder meeting (San Jose)* |
| | *Test Procedure Workshop (Phoenix)* |
| | *Start 1st round data collection* |
| 2010 | *Stakeholder meeting (San Jose)* |
| | *Complete 1st round data collection* |
| | *Draft 1 distribution* |
| | *Stakeholder meeting (Orlando)* |
| | *Draft 1 comments submitted to EPA* |
| | *Stakeholder meeting (San Jose)* |
| 2011 | *Supplemental data collection* |
| | Stakeholder Webinar |
| | Stakeholder Meeting (Chicago) |

# First Round Test Data




17 storage Products

42 data points




*All terminology and grouping is based on SNIA's Taxonomy

# Second Round Test Data

- Designed to complement 1st round, plus to help understand:
  - Variation across taxonomy categories;
  - Relationship between hardware/software configuration and energy performance in both active and idle states;
  - Effect of drive quantity and system scaling;
  - Effect of RAS features (hardware or software); and,
  - Differences between isolation of controller vs. drawer PSUs.
- To date EPA has received power supply data under the 2nd round
- Additional storage data is being generated.
  - Will continue to accept data; including simulated data.

# Stakeholder Feedback

- Recognize controller characteristics
  - RAS
  - Scalability
  - Configuration
    - Cache Size
    - Processor type and quantity
    - Host and drawer connection technology
    - Configured software
- Evaluate with single media type
  - Reduces testing permutations

# Stakeholder Feedback (Continued)

- Recognize unique deployed *storage needs:*
  1. Transaction
  2. Streaming
  3. Raw storage
     - E.g.:  overloading controller with MAX disks.
     - EPA needs to better understand this type of storage need and how it might effect qualification approaches

# ENERGY STAR Proposal

# Assumptions

- This proposal restricted to Online storage
  - EPA hopes to receive additional information pertaining to other categories, i.e., Near Online, Tape, Virtual tape, for inclusion within the specification.
- Most meaningful factors for energy:
  - Disk type
  - Controller configuration
- Software important, still under evaluation.
  - At a minimum, software details will be included on the Power & Performance Data Sheet

# ENERGY STAR Proposal

- Establish efficiency thresholds by demand type
  - Transaction-based demands
  - Streaming-based demands
- Test a given system with
  - Single controller type
  - Multiple media types (?)
- Qualify system against thresholds set for transaction and/or streaming
  - Identify which threshold is met—one or both.
  - Marked as ESTAR for its demand type.

# Approach for Thresholds

- Based on active, idle measurements
  - Transaction-type demand:
    - More weighting to Random Operations
  - Streaming-type demand:
    - More weighting to Sequential Operations
    - Idle measurement
- Potential approaches to determine qualification:
  - Calculate weighted average of performance by demand type across loading points. Set single threshold to pass.
  - Exceed some number of individual test thresholds.

# Aside: A Note on Metrics and the ENERGY STAR Label

- ENERGY STAR is a single, binary label
- Does not have to be a single measurement that goes toward awarding that label.
- Hypothetical:
  - 4 metrics to measure storage system efficiency
  - May be combined in a weighted average for a single, composite metric
  - Or, 3 of 4 metric values must pass their thresholds.
  - Or, define sub-set of metrics that system is intended for, pass/fail based on those.

# Qualifying Mixed Storage Media

- Approaches
  - Individually qualify media types in “singular” media systems
    - Then allow mixed systems composed of these media to qualify.
  - Allow “mixed” media systems to qualify directly.
- Issues around “mixed” systems
  - How would changing the ratios of media types impact results?
  - Will end consumer be able to apply mixed system results to their situation?
    - Deploying like mixed system
    - Deploying single media (or segmented) system

# Family Proposal

- Bookending
  - Test minimum and maximum configurations with a test point in between.
  - All three test points must meet the qualification levels
    - Test point in between demonstrates equal or better results than either maximum or minimum configuration
- EPA is open to further conversations and ideas for families.
  - SNIA Best Foot Forward
  - TGG Sweet Spot

# Qualification Questions

- Does transaction / streaming approach effectively cover anticipated deployments?
- Is there existing industry standard for weighted formula approach?
- Will streaming criteria effectively cover “raw storage” type demands?
- Family scope question: What can change, what must remain the same in a family?
  - Controller options – e.g.: Cache size, Connection options
  - RAS features – e.g.: Redundant controllers
  - Scalability
  - Mixed / segmented media type deployments

# Discussion

## Brainstorming and Questions

# SNIA Questions and Concerns

- For Draft 1 V1.0 ENERGY STAR Data Center Storage specification, SNIA suggests:
  1. Removing real-time temperature measurement or utilize a 30 second interval reporting
  2. Removing tape storage from the eligibility criteria
  3. Removing power management requirements
  4. Clarifying the proposed power supply rating
  5. Excluding the power supply efficiency goals for third party included items, e.g., SAN Switches.
- How will the ENERGY STAR specification handle the definition and qualification of third party devices?

# ENERGY STAR Answers

- Temperature measurement:
  - Understand this is different from servers
  - If we want to capture temperature data, where should sensor go?
- Tape storage:  EPA remains open to data from this and other categories
- Power supply rating:  80+ Silver seems appropriate

# ENERGY STAR Answers (cont)

- 3rd party hardware and power supplies
  - If ENERGY STAR has a specification for this hardware category, must use a labeled product
  - If not, then no requirement on 3rd party.
  - Drawers and controllers may not be treated as 3rd party hardware. Their PSUs must meet 80+ Silver.
- As always, we are open to suggestions and comments on all of these answers.

# Next Steps

- Additional test or simulator data will by considered by EPA.
- Anonymous test data and analysis will be published on the Data Center Storage product development website here: http://www.energystar.gov/index.cfm?c=new_specs.enterprise_storage.
- A 2nd draft product specification will be distributed for comment in the fall 2011.

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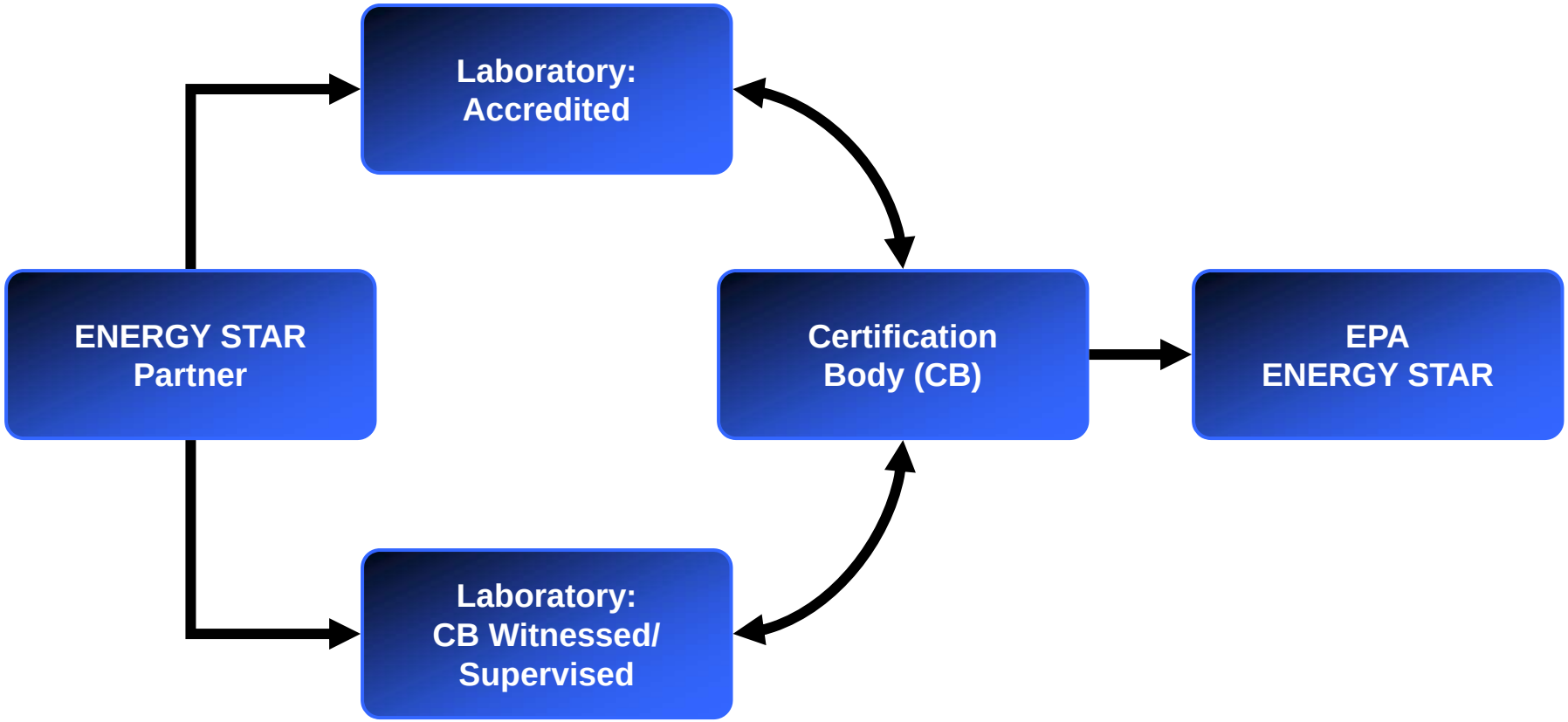
More Info:
http://www.energystar.gov/NewSpecs

# 3rd Party Testing: Entities Involved

- **U.S. Environmental Protection Agency (EPA)**: Manages ENERGY STAR program
- **Partners**: Seek product qualification
- **Laboratories ("Labs")**: Test products
- **Certification Bodies ("CBs")**: Provide third-party certification of test results
- **Accreditation Bodies ("ABs")**: Provide third-party assurance of Lab and CB competencies

# Product Qualification Process



# Product Re-testing

- Three types:

| Verification Testing | Challenge Testing | Significant Changes* |
|---|---|---|

*Retesting in the case of significant changes to a given qualified model

- In case of failure to meet program requirements, EPA disqualifies and delists model and/or requires corrective and preventive measures on the part of the Partner

# Product Re-testing: Verification Testing

- Verification testing ensures models meet ENERGY STAR requirements post-qualification
- U.S. Department of Energy initiated verification testing of ENERGY STAR qualified models in 2010