

CSCI PSU Proposal for ENERGY STAR Storage Server Specification

EPA Energy Star for Storage
Development Workshop

Kathleen Fiehrer
CSCI Technical Program Manager



Energy Storage Spec Framework Document

- **Power Supply Requirements:** EPA stated intentions of exploring a *Net Power Loss* approach for Computer Storage and Tier 2 Server power supplies.
 - Approach would aim to specify a maximum allowed power loss through the power supply at actual operating conditions (e.g., Idle and full load power).
- Alternatives
 - Specify the minimum efficiency for a power supply under actual use conditions
 - Evaluate both Multi-Output and Single-Output power supply efficiency and power factor levels.

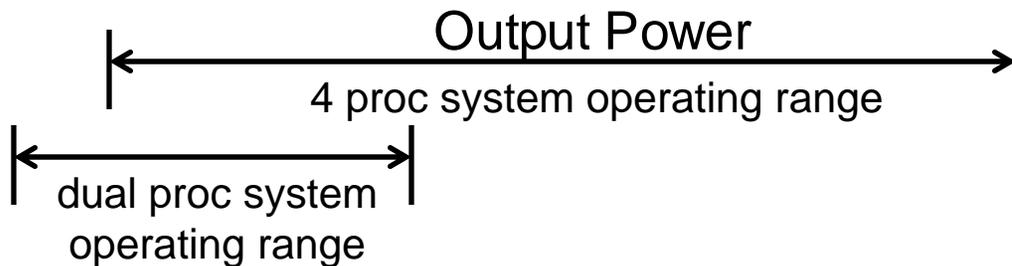
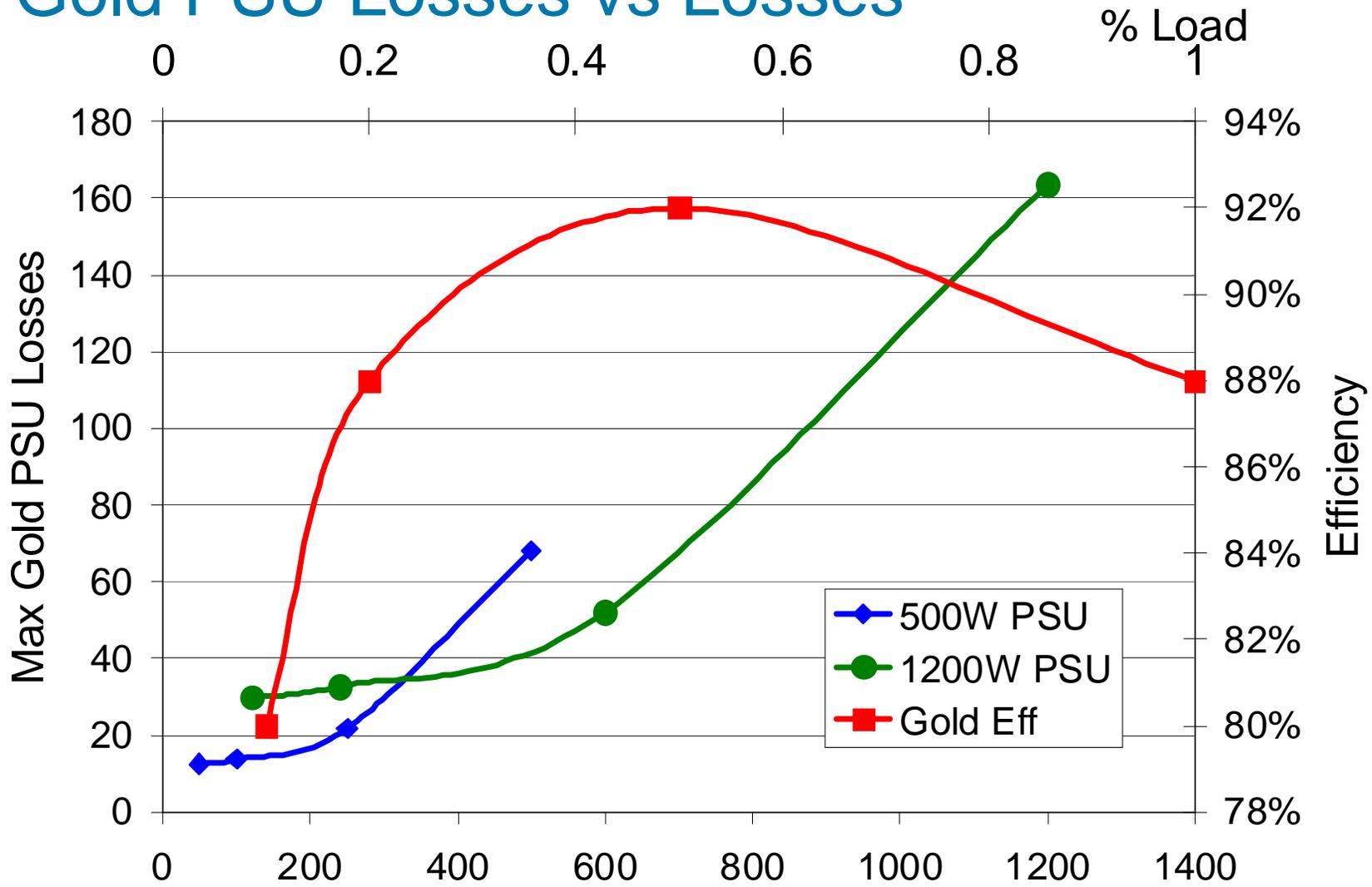
ENERGY STAR Motivation for NPL Approach

- ENERGY STAR Goals for Storage PSU requirements
 - Maximize and promote *operational* efficiency
 - Encourage right sizing and address impact of redundancy
 - Continue to recognize PSU as possible energy bottleneck AND ALSO opportunity for savings regardless of hardware configuration, work load, or application
 - Maintain momentum toward more efficient supplies as mainstream
- Current method does not consider how a PSU is installed and operated in the field.

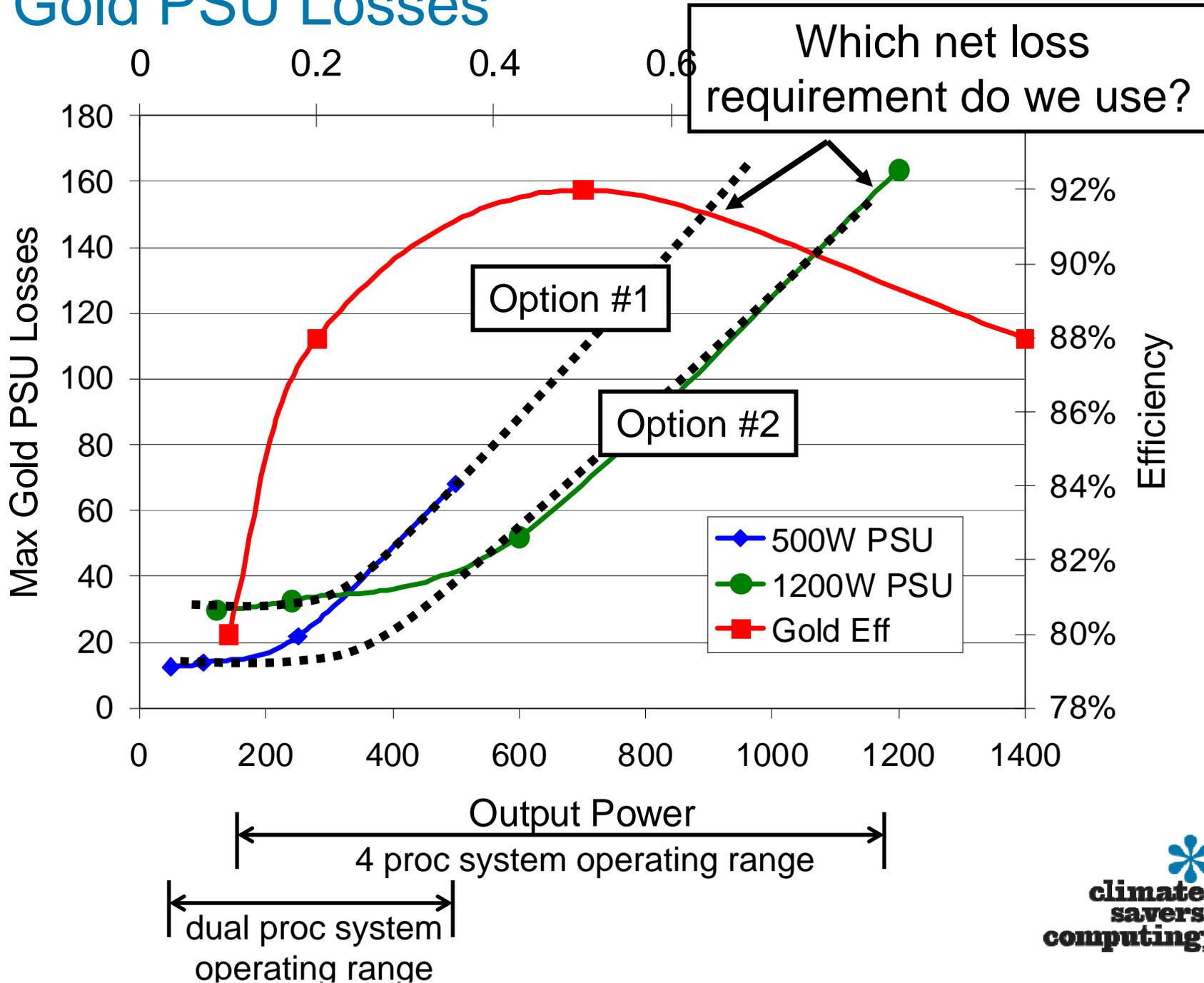
ENERGY STAR NPL Method

- ENERGY STAR has indicated that NPL is a possible approach for measuring system efficiency rather than current PSU efficiency and PF approach
 - Measures $AC\ Power_{in} - DC\ Power_{out}$ at Idle and Max vs current method $DC\ Power_{out} / AC\ Power_{in}$ at designated rated loads
- Address actual wattage losses at real operating conditions instead of efficiency at arbitrary load conditions
 - Directly correlates to wasted wattage / real-world conditions
 - Eliminate current arbitrary load points of 10%, 20%, 50% and 100% loading
 - Includes effects of redundancy and PSU sizing
- Industry opposes
 - No accepted protocol
 - Industry aligned behind current methods

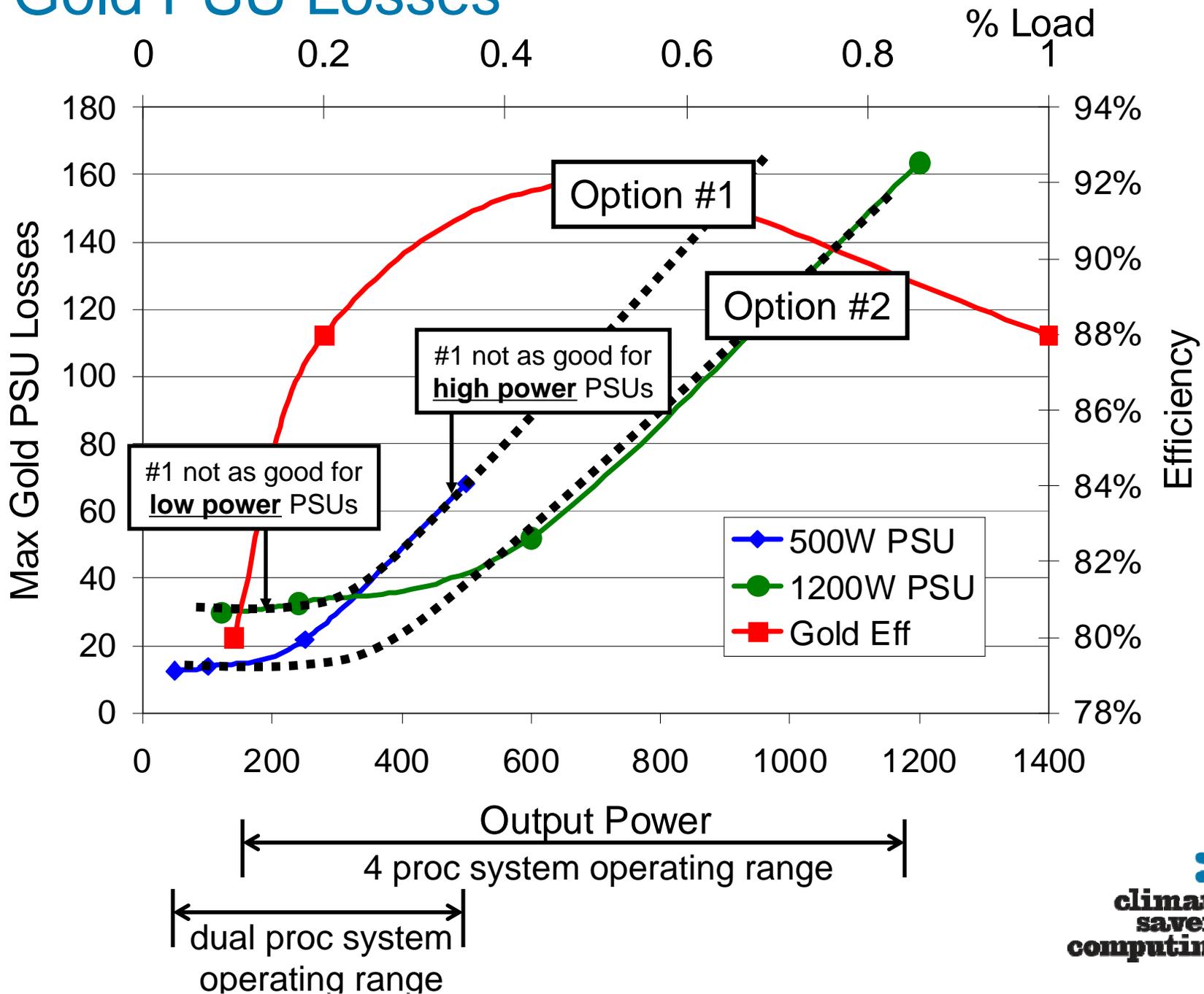
Gold PSU Losses vs Losses



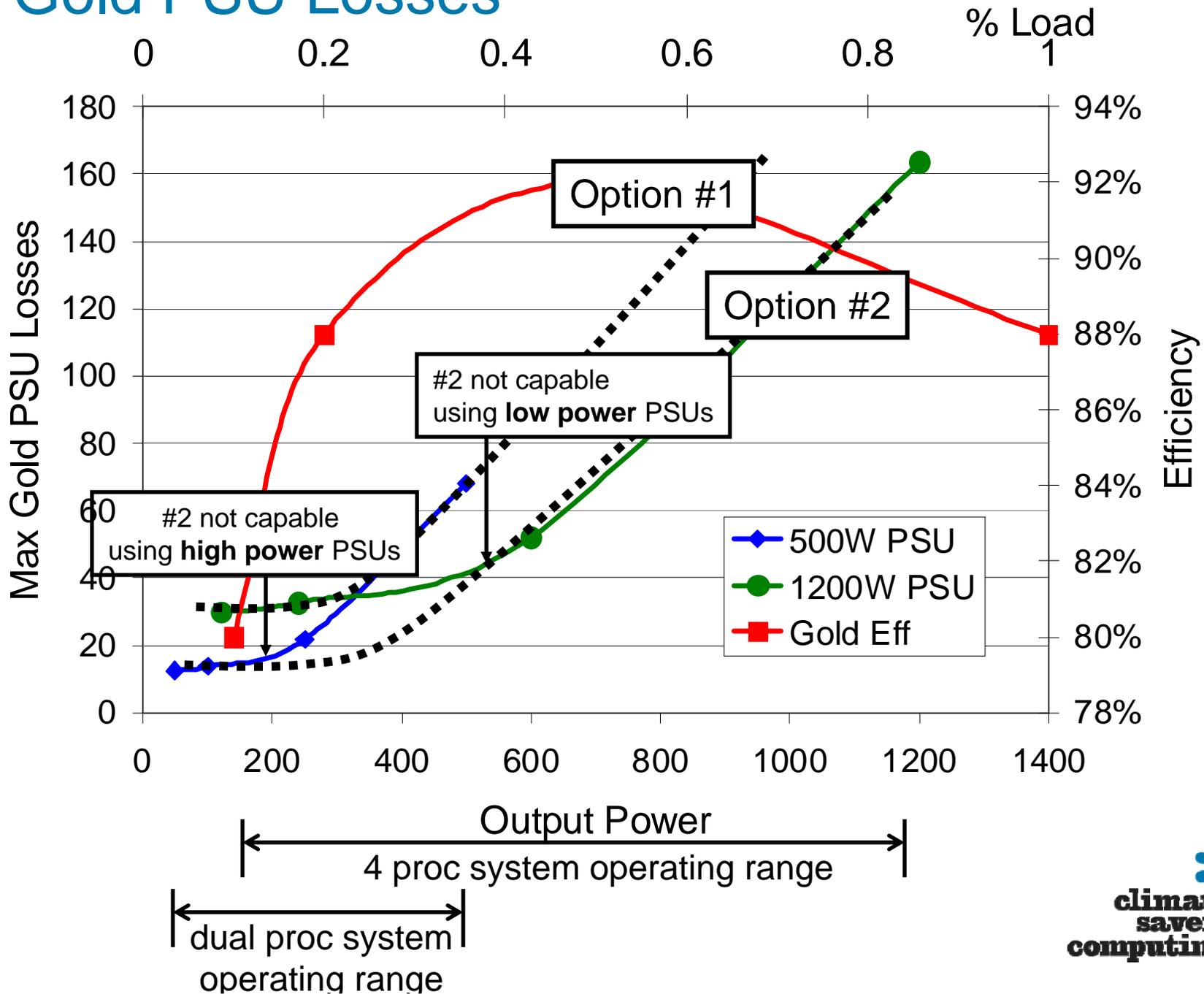
Gold PSU Losses



Gold PSU Losses

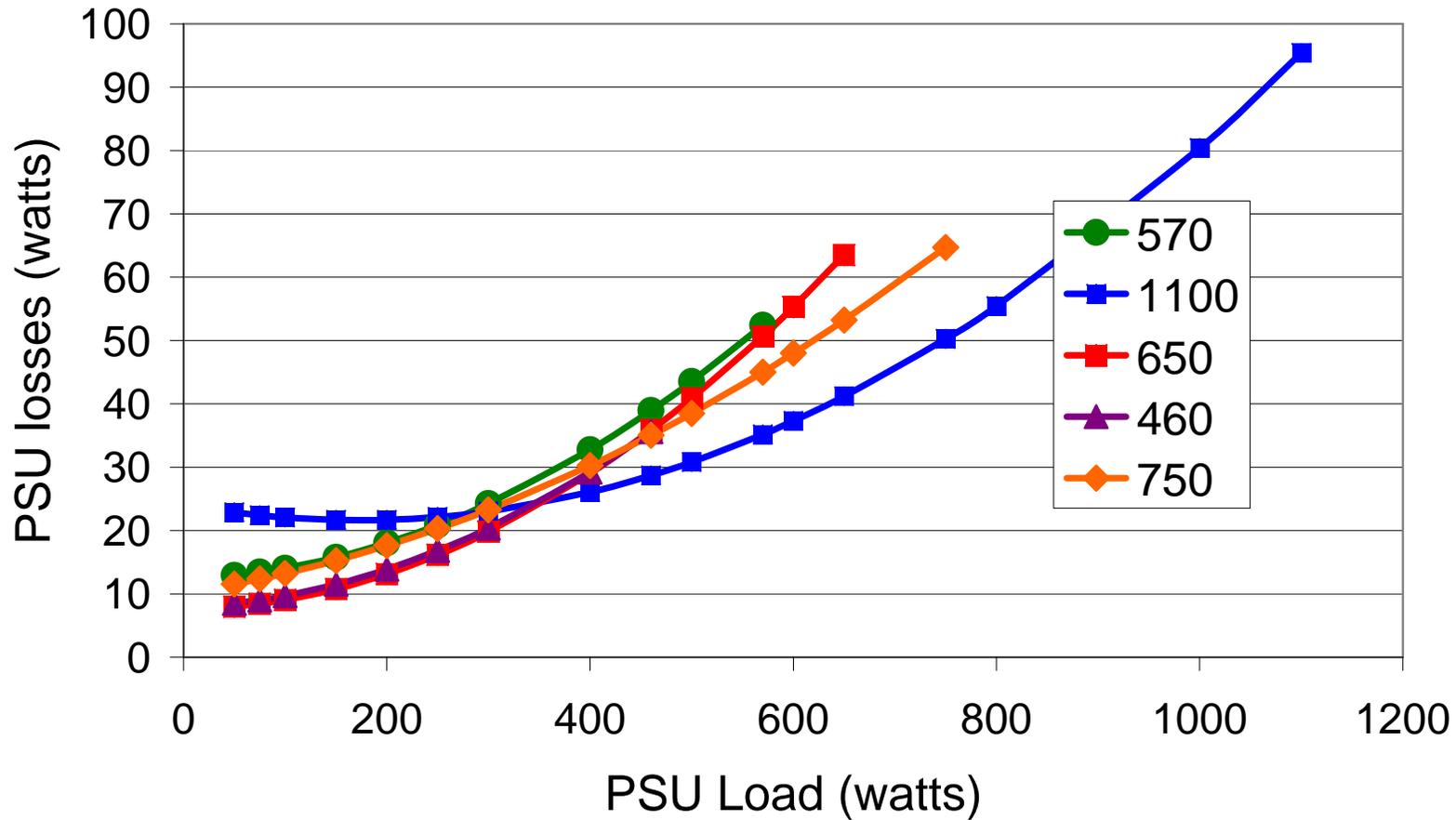


Gold PSU Losses



Curve Fitting with NPL

Single O/P Gold PSUs (best in rating)



Proposed PSU Requirements for Storage Spec

- Create three PSU categories for ENERGY STAR specifications
 - Single O/P PSU category
 - Same efficiency and PF requirements as CSCI and 80+ Gold requirement for single O/P PSU
 - Measurement excludes fan power
 - Multi O/P PSU category
 - Same efficiency and PF requirements as CSCI and 80+ Silver requirements for multi O/P PSU
 - Measurement includes fan power
 - Multi O/P PSU category for storage
 - Efficiency and PF requirements should be based on SNIA's Green Storage TWG – expected late Oct'2009
 - Special consideration that data center storage PSU's max operating load is 50% of its rated power load.
 - Measurement **excludes** fan power
 - The storage power supply fan is used to cool the entire storage chassis, not just the power supply.
 - Efficiency testing conducted at 230V for all power supplies
- Maintain PSU consistency and alignment for all ENERGY STAR specifications

Proposed PSU Requirements (cont)

- Withdraw consideration of system level PSU requirement – consideration from Tier 2 server
 - Idle load power specification encourage right sizing
 - The definition of idle and storage idle power requirements will need to be refined relative to server requirements
 - Use adders to address redundant power supplies
 - Estimated system NPL based on efficiency curves for installed power supply
- Focus on system level requirements rather than additional PSU requirements
 - CSCI supports SNIA and other industry efforts to develop storage performance/efficiency metrics but recognizes the complexity of such a metric
 - ENERGY STAR needs to move cautiously when defining storage performance and energy metrics given the complexity of enterprise storage systems.

Proposed Accuracy Requirements for Storage

- Accuracy requirement of $\pm 5\%$ accuracy with a maximum error of $\pm 10\text{W}$ **per PSU**
 - As the load decreases the ability to accurately measure the power becomes increasingly difficult \rightarrow maintain max error of $\pm 10\text{W}$ for loads less than 100W.
- Requirement should be **per PSU**
 - Fixed maximum system error becomes increasingly difficult for systems with redundant and additional PSUs
- Eliminate specialized power metering solutions
 - Sacrifices additional power losses to accurately measure input power
 - Unnecessarily drive up PSU costs

Other questions:

www.climatesaverscomputing.org

kathleen.m.fiehrer@intel.com

