230V ENTERPRISE PSU MARKET-READY EFFICIENCY STUDY

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Executive Summary

- Background information
  - The EU ErP (Ecodesign in Europe) Lot 9 has established an efficiency baseline for servers that will go into effect January 1, 2023.
  - This is currently slated to be 96% efficiency of the PSU, power supply, at 50% of rated power.
  - This is equivalent to the 80 PLUS® 230V Data Center Titanium Certification, the highest Certification currently offered.
- Issues
  - Currently only power supplies above 750 watts have achieved Titanium 80 PLUS.
  - An overwhelming majority of Data Centers specify power supplies **under** 750 watts.
  - Adopting this new EU ErP Lot 9 efficiency baseline will be counter to prevailing power supply product offerings and will not meet the EU ErP mandated efficiency ratings.
  - Power supply manufacturers are not set to increase offerings of sub-750 watt power supplies that meet the 80 PLUS Titanium Certification which will potentially be problematic for Data Centers.
- Outcome if EU mandate not modified
  - If this mandate is fully adopted as written, Data Centers will be required to utilize much higher wattage power supplies than necessary in order to meet operational needs specific to the mandate. This is completely counter to achieving the energy savings hoped for by establishing this efficiency mandated specification in the first place.
  - This will result in:
    a) Increased costs for Data Centers due to requirement for using the 96% efficient (Titanium Certification) power supplies (over 750 watts) when they are not operationally required for the Data Center servers.
    b) Potentially decreased energy savings as power supply wattages will be oversized, larger than the wattage needed and peak efficiency will be achieved less frequently due to lack of need for more power in the servers.
- Possible solutions
  - Modify the current EU ErP recommendation to create a 2 tier system of efficiency baseline targets:
    a) For power supplies **over** 750 watts, retain the current mandated ratings and require a 96% efficiency at 50% load, i.e. equivalent to 80 PLUS Titanium Certification.
    b) For power supplies **at or under** 750 watts, use a baseline of 94% efficiency at 50% load, i.e. equivalent to the 80 PLUS Platinum Certification.
  - Work with power supply manufacturers to encourage a substantial offering of sub-750 watt power supplies that meet the Titanium Certification level.

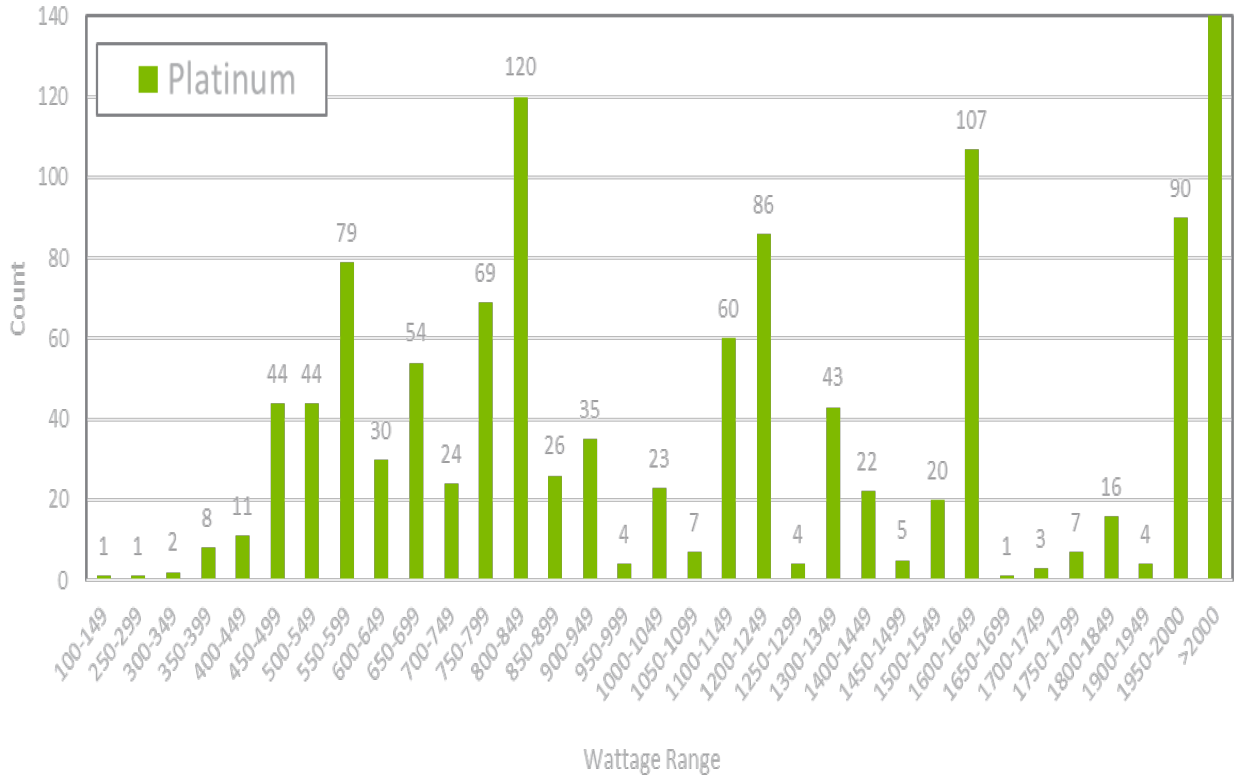
Table of Contents

1 Introduction and Scope

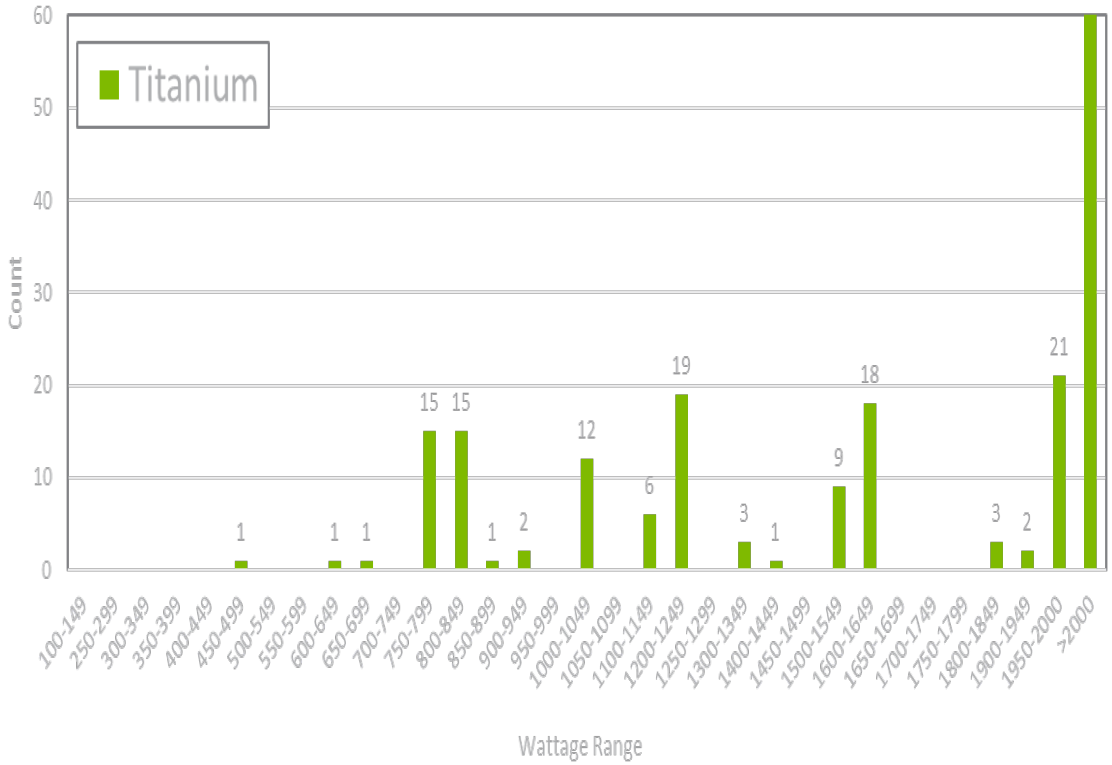
- Investigating existing power supply units to validate if they will or will not meet the EU ErP Lot 9 2023 established efficiencies.
- Analyze Platinum and Titanium Power Supply units to quantify what is available in the market today.
- Discuss investigation of the Platinum and Titanium Power Supply units and what that means for the new EU Mandate.
- Analyze the types of power supplies that are slated to be tested in the Q1 and Q2 2021.
- Provide suggestions and recommendations.

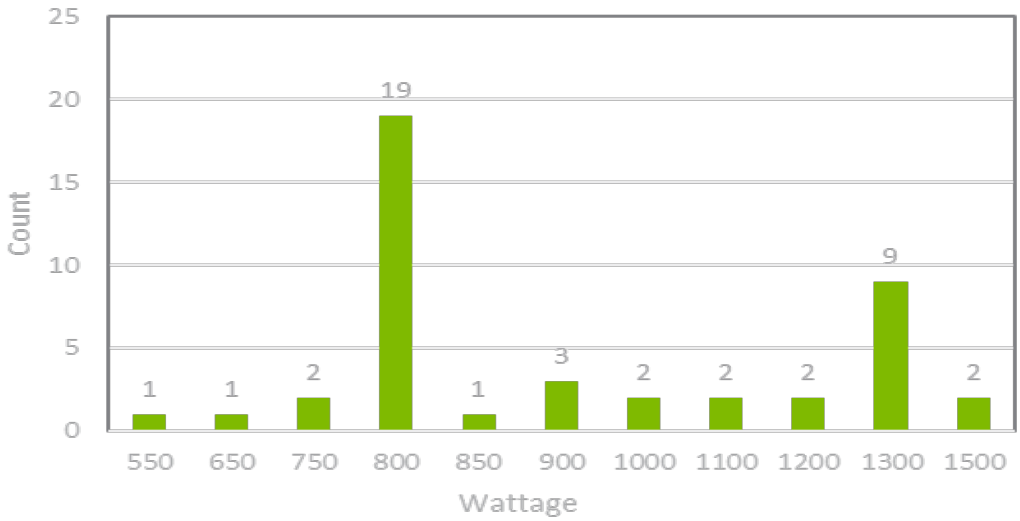
Discussed in this white paper.

1. Quantity of power supply units that meet Platinum and Titanium certification, using data from January 1, 2018, to end of June 2021.
    a. Chart showing quantity of power supply units that meet Platinum Certification for wattages up to 2000 watts, in increments of 50 watts.



b. Chart showing quantity of power supply units that meet Titanium Certification for wattages up to 2000 watts, in increments of 50 watts.





2 Right Sizing and Next Steps

a. EU ErP could revise the 2023 established efficiencies such that.
   i. Power supply units above 750 watts will need to meet Titanium efficiencies.
   ii. Power supply units below 750 watts will need to meet Platinum efficiencies.
b. This would accommodate the fact that there is no middle ground* between Titanium and Platinum efficiencies and very few Titanium 750 watt power supplies.
c. Alternatively, EU ErP could add time frames for recommendation until market can develop more <750w Power supplies

   Note: At minimum new development is typical a 4-year cycle. Ideally the EU ErP could establish the efficiencies in item (a) above until there is sufficient market supply to meet the intended market efficiency requirement of Titanium.

*Even if Platinum PLUS, 95% at 50% of rated power, were available as an option there are not enough models that a middle ground would satisfy an interim efficiency criteria.

Right Sizing issues with Titanium PSU requirement

There are several Titanium PSUs at 800 Watts and greater. These will work well for servers that require 800 Watts for operation. As an example, a server that operates at 800 Watts maximum with two 800 Watt PSUs will have the following characteristics.

Load	Load per PSU	PSU efficiency
800 Watt (max)	400 Watt	96%
700 Watt (typical)	350 Watt	~96%
320 Watt	160 Watt	94%
160 Watt	80 Watt	90%

As there are virtually no Titanium PSUs below 800 Watts, a server that requires 600 Watts will be sold with two 800 Watt PSUs will have the following characteristics. A right sized Platinum PSU is provided for comparison.

Load	Load per PSU	Titanium PSU efficiency	Platinum PSU efficiency
600 Watt (max)	300 Watt	~95%	94%
525 Watt (typical)	263 Watt	~95%	~94%
240 Watt	120 Watt	90%	90%
120 Watt	60 Watt	<90%	<90%

As there are virtually no Titanium PSUs below 800 Watts, a server that requires 400 Watts will be sold with two 800 Watt PSUs will have the following characteristics. A right sized Platinum PSU is provided for comparison.

Load	Load per PSU	Titanium PSU efficiency	Platinum PSU efficiency
400 Watt (max)	200 Watt	~94%	94%
350 Watt (typical)	175 Watt	~94%	~94%
160 Watt	80 Watt	90%	90%
80 Watt	40 Watt	<90%	<90%

As there are virtually no Titanium PSUs below 800 Watts, a server that requires 200 Watts will be sold with two 800 Watt PSUs which will have the following characteristics. A right sized Platinum PSU is provided for comparison.

Load	Load per PSU	Titanium PSU efficiency	Platinum PSU efficiency
200 Watt (max)	100 Watt	~90%	94%
175Watt (typical)	88 Watt	~90%	~94%
80 Watt	40 Watt	<90%	90%
40 Watt	20 Watt	<<90%	<90%

As can be seen from the above analysis, right sizing with a Platinum PSU will provide an equal to or greater level of efficiency, and as such savings, for any application at 400 Watt or below when compared to an oversized Titanium PSU.

Based on the above analysis, requiring Titanium 96% efficient PSUs for any application at or below 400 Watt, will produce a less efficient system.

3 Conclusion

Based on the data above, specifically with regards to the analysis of the lower wattage data server needs and efficiencies, our conclusion is as follows:

1. A 2-tier system of efficiency baseline targets as shown below would provide for maximum efficiency:
    a) For power supplies **over** 750 watts, retain the current mandated ratings and require a 96% efficiency at 50% load, i.e., equivalent to 80 PLUS Titanium Certification.
    b) For power supplies **at or under** 750 watts, use a baseline of 94% efficiency at 50% load, i.e., equivalent to the 80 PLUS Platinum Certification.
2. Removing this 2-tier system could occur as soon as there is a reasonable amount of Titanium Certified products in the marketplace. An annual review of certificates starting in 2024 should facilitate a staged adoption of 96% efficiency at 50% of rated power as Titanium equivalent Certified power supplies become available.
3. Review recommendation in three years, 2027, regardless of power supply availability to revisit the market needs vs. product availability vs. energy efficiency requirements.

4 References

1. Ecodesign and Labelling ENTR Lot9: Enterprise Servers
https://www.eceee.org/ecodesign/products/enterprise-servers/

5 About ITI's Green Grid

The Green Grid is an affiliate membership level of the Information Technology Industry Council (ITI), a premier trade association that works to advance public policies for the tech sector. ITI's Green Grid works to improve IT and data center energy efficiency and eco-design around the world. It is an open industry consortium of information and communications technology (ICT) industry end-users, policymakers, technology providers, facility architects, and utility companies. We offer the data center expertise that governments turn to for industry insight and counsel, bringing to bear the combined influence of a diverse body of ICT industry leaders.

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