

Computer Power Supplies:

a Case Study in Internal Power Supply Efficiency Testing



Internal Power Supply

Test Procedure Technical Workshop

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You Know Heat and Noise Are Problems When...

Oil-Cooled PC



Courtesy TomsHardware.com

Water-Cooled PC

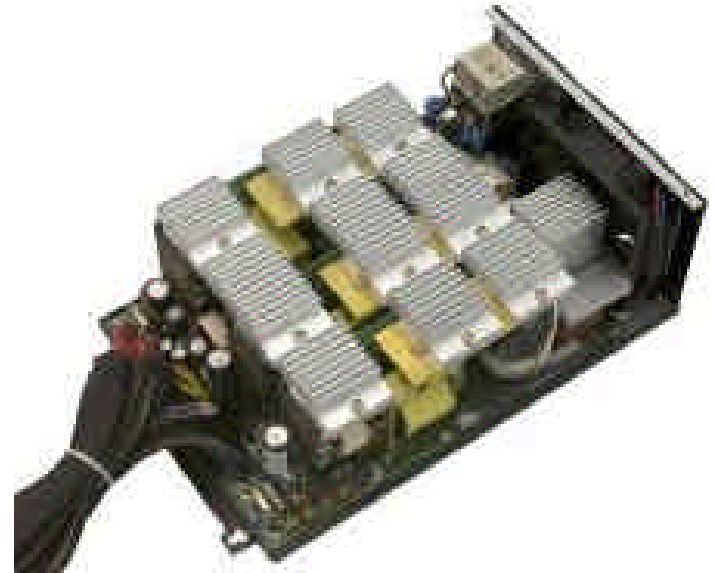


Courtesy ModderPlanet.it

Silent PC Market






Courtesy SilentPCReview.com



The world's first 1 kW
desktop computer
power supply...

Efficiency Claims as Selling Points in Desktop and Server PSUs

Product	Manufacturer Claim
	82%
	high efficiency, over 70%
	74% typical

A Little Can Mean A Lot

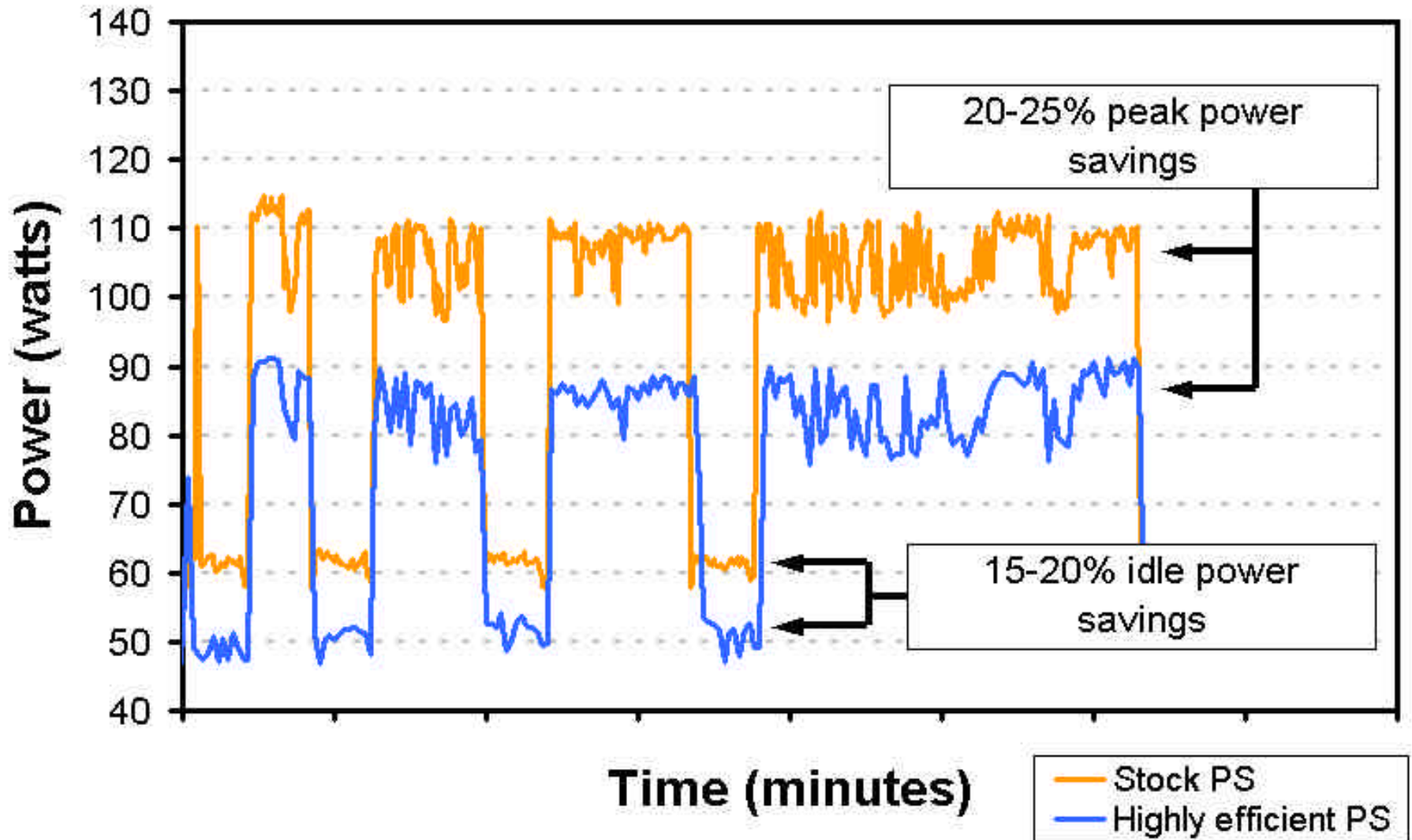
1kW PSU operating at 50% load...

	70% Efficient	72% Efficient
DC Power (W)	500	500
AC Power (W)	714	694
kWh per year <small>24-7 operation</small>	6,254	6,079
Dollars per year <small>\$0.10 per kWh electricity</small>	\$625	\$608

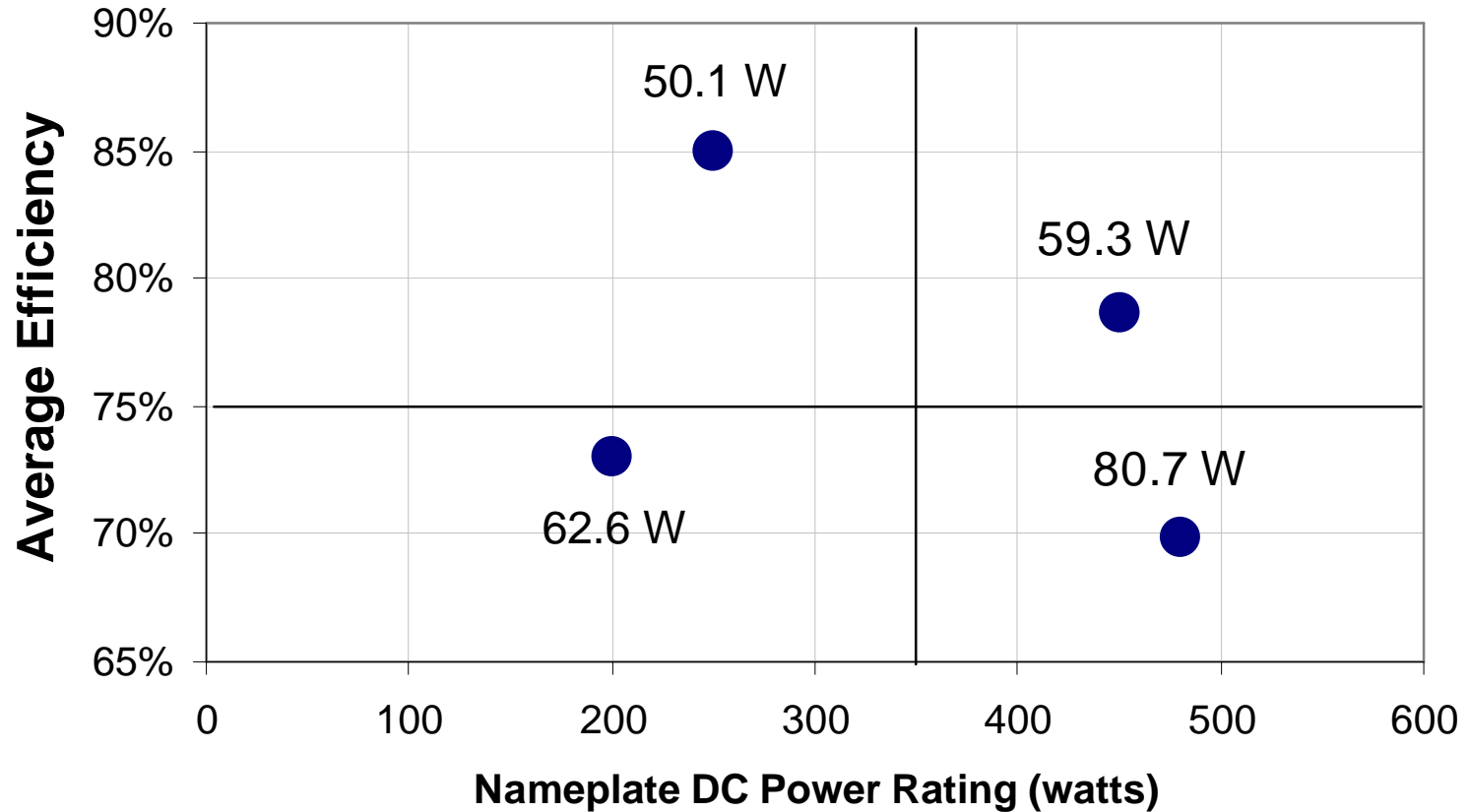
PSU Efficiency, IT and the Bottom Line

- \$8 billion annual bill for IT equipment operation in US
- 2% efficiency improvement means over \$160 million reduction in electricity bills, plus HVAC energy savings

Impact of Power Supply Efficiency on Energy Use



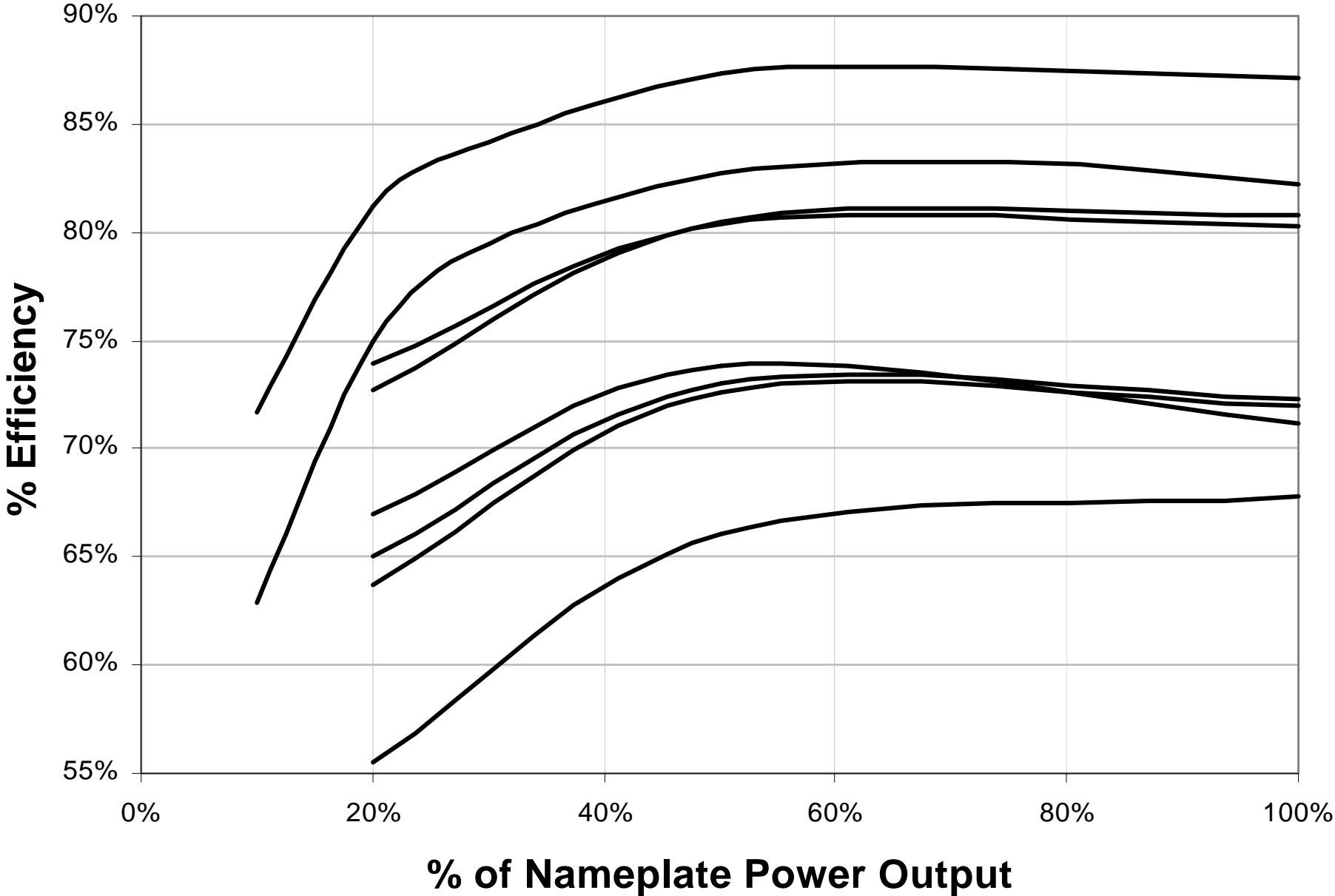
Effect of PSU Efficiency & Sizing on Idle State Power, Intel-based system



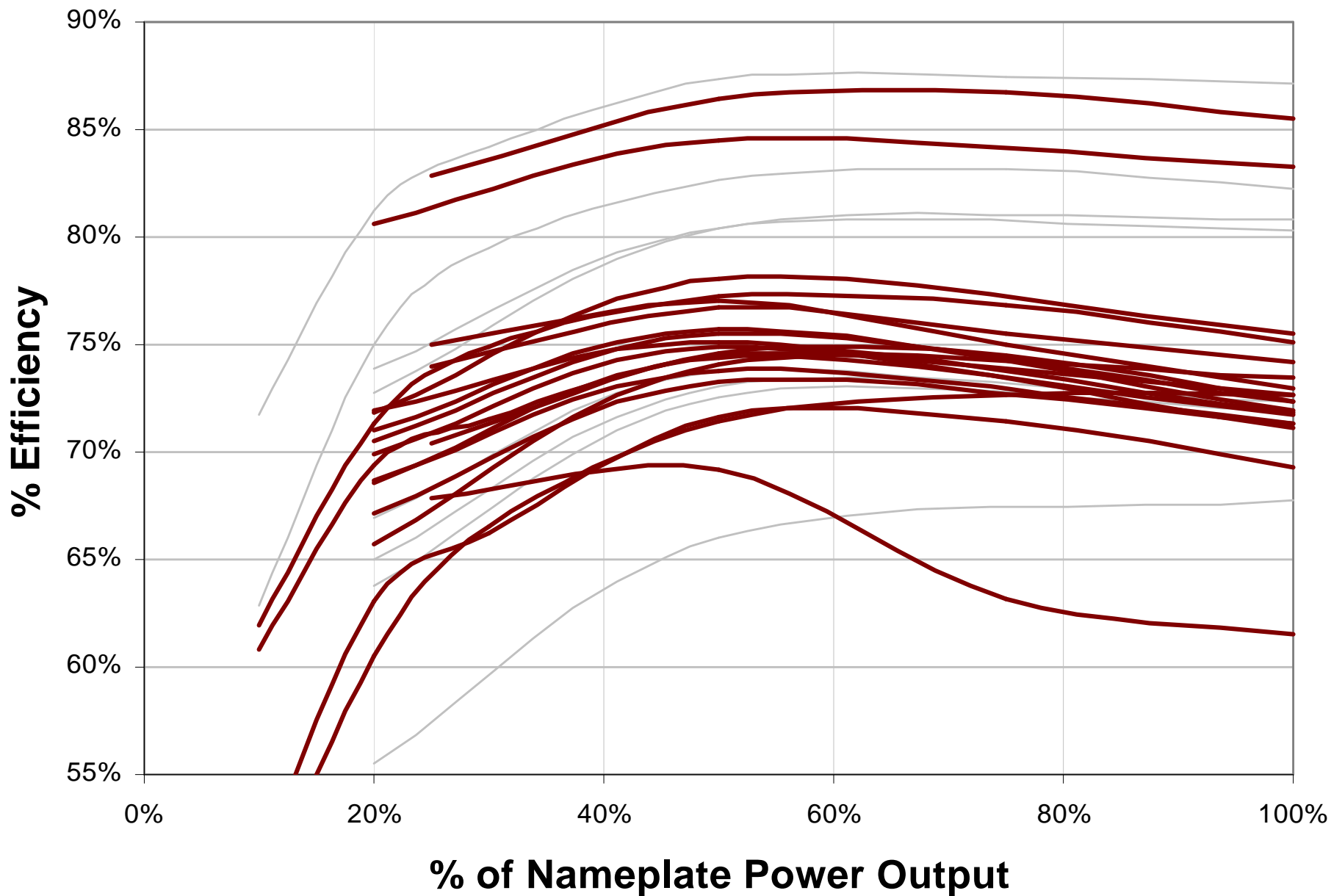
Desktop Computer Power Supplies

- Over 70 desktop power supplies measured since 2001
- Intel form factors (ATX, SFX, TFX, BTX) and several product-specific form factors measured
- Proportional allocation method (Rev. 4 and later of the IPS test method) used to conduct about 2/3 of these measurements

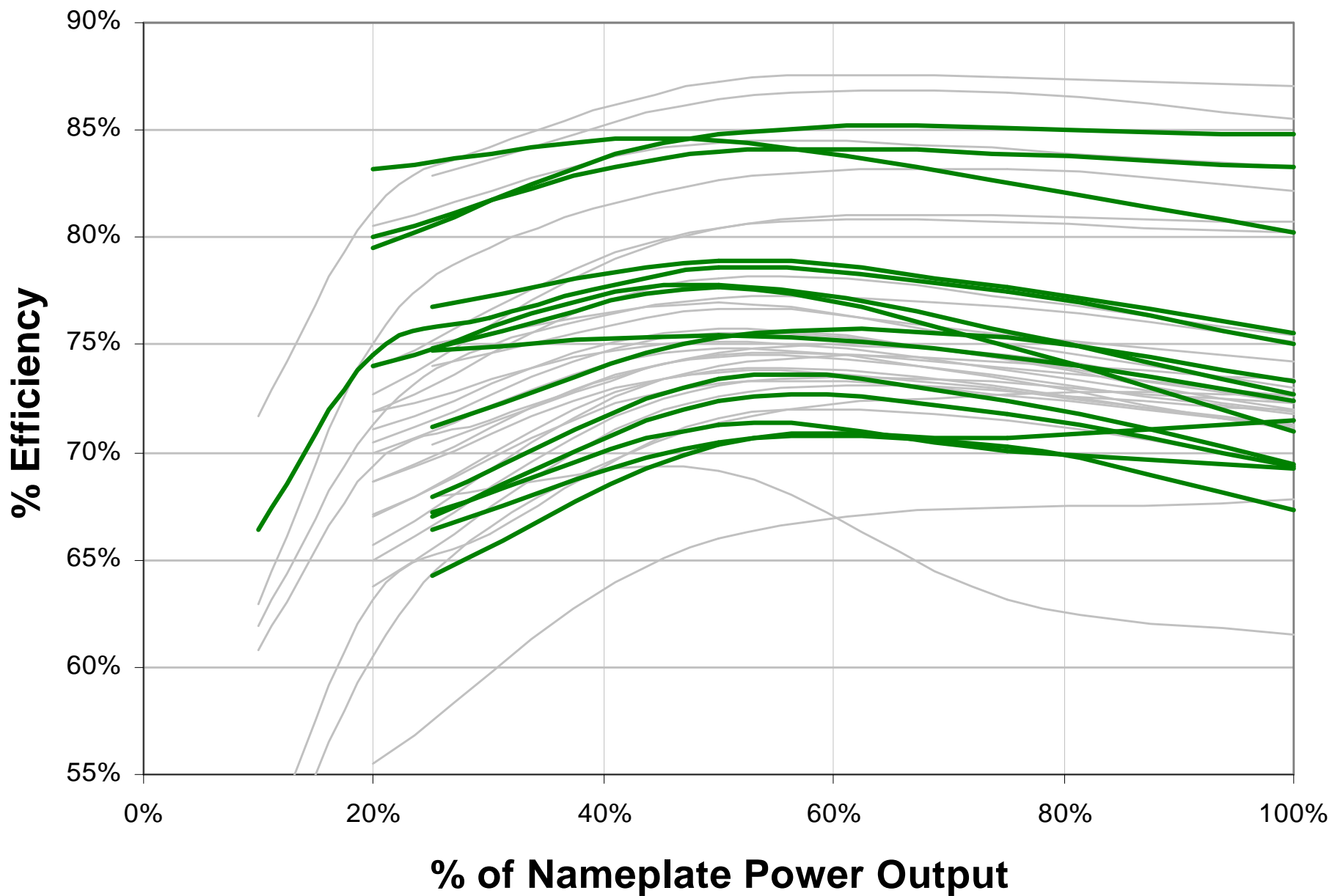
Desktop PS Efficiency: < 200W



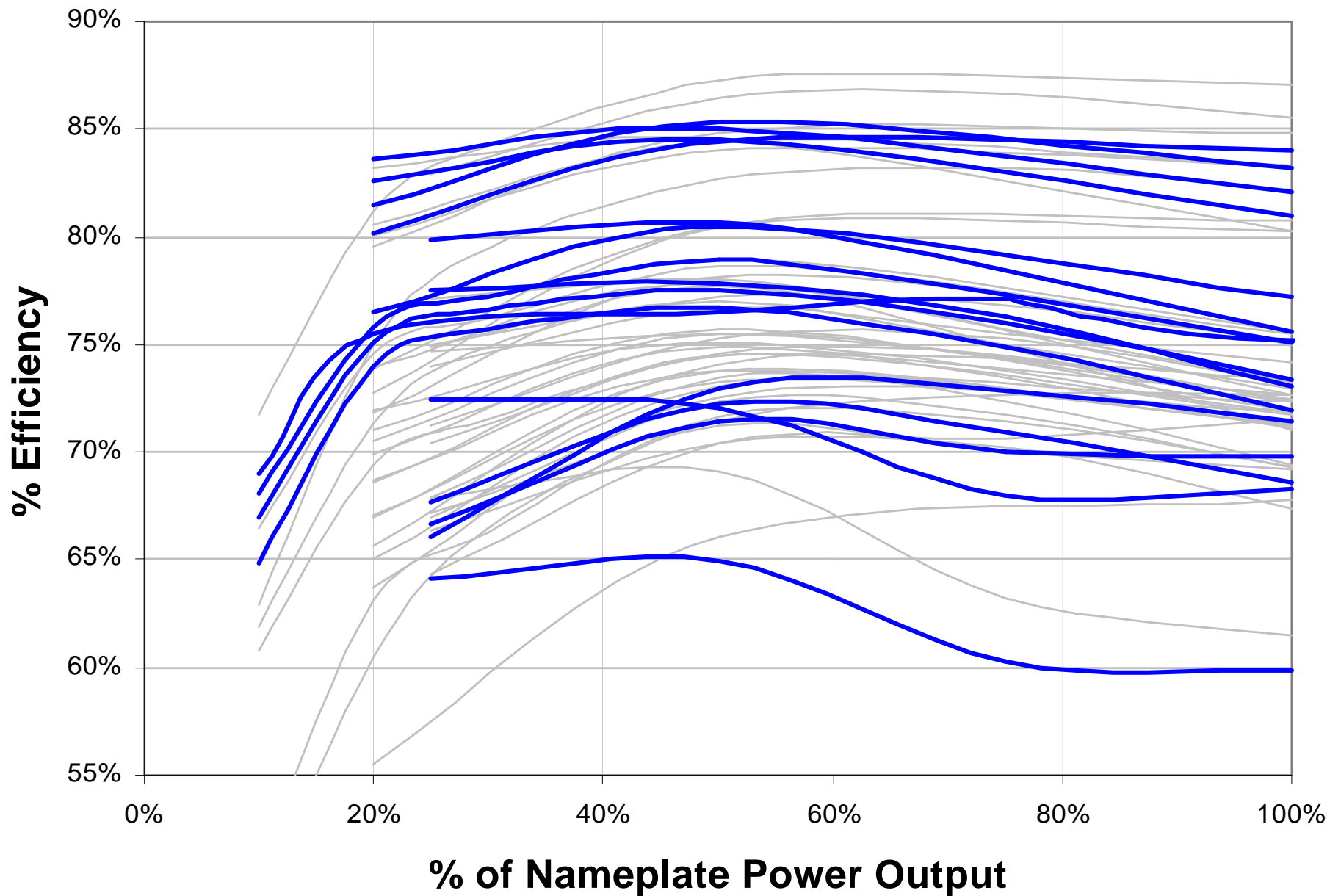
Desktop PS Efficiency: 200W - 299W



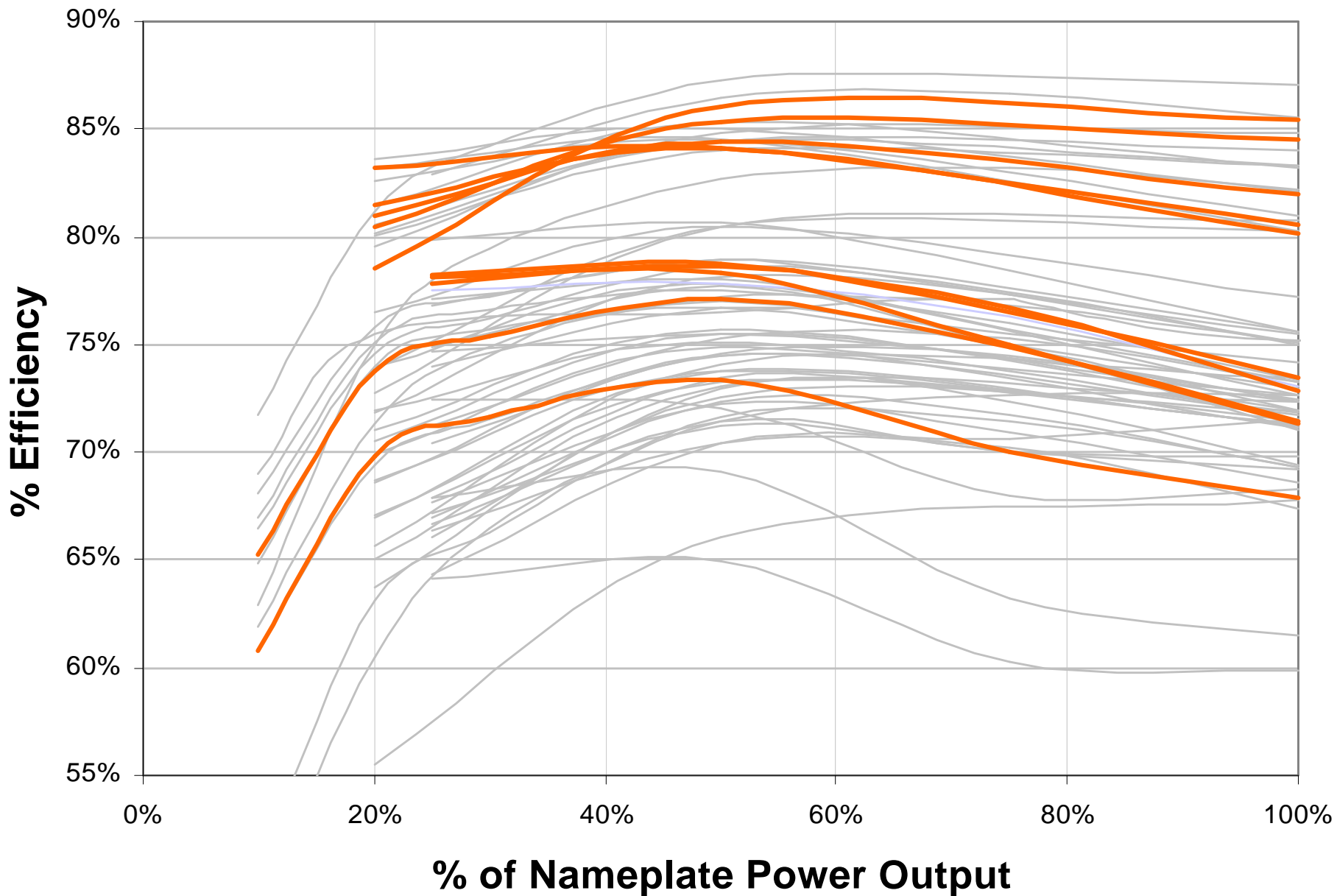
Desktop PS Efficiency: 300W - 399W



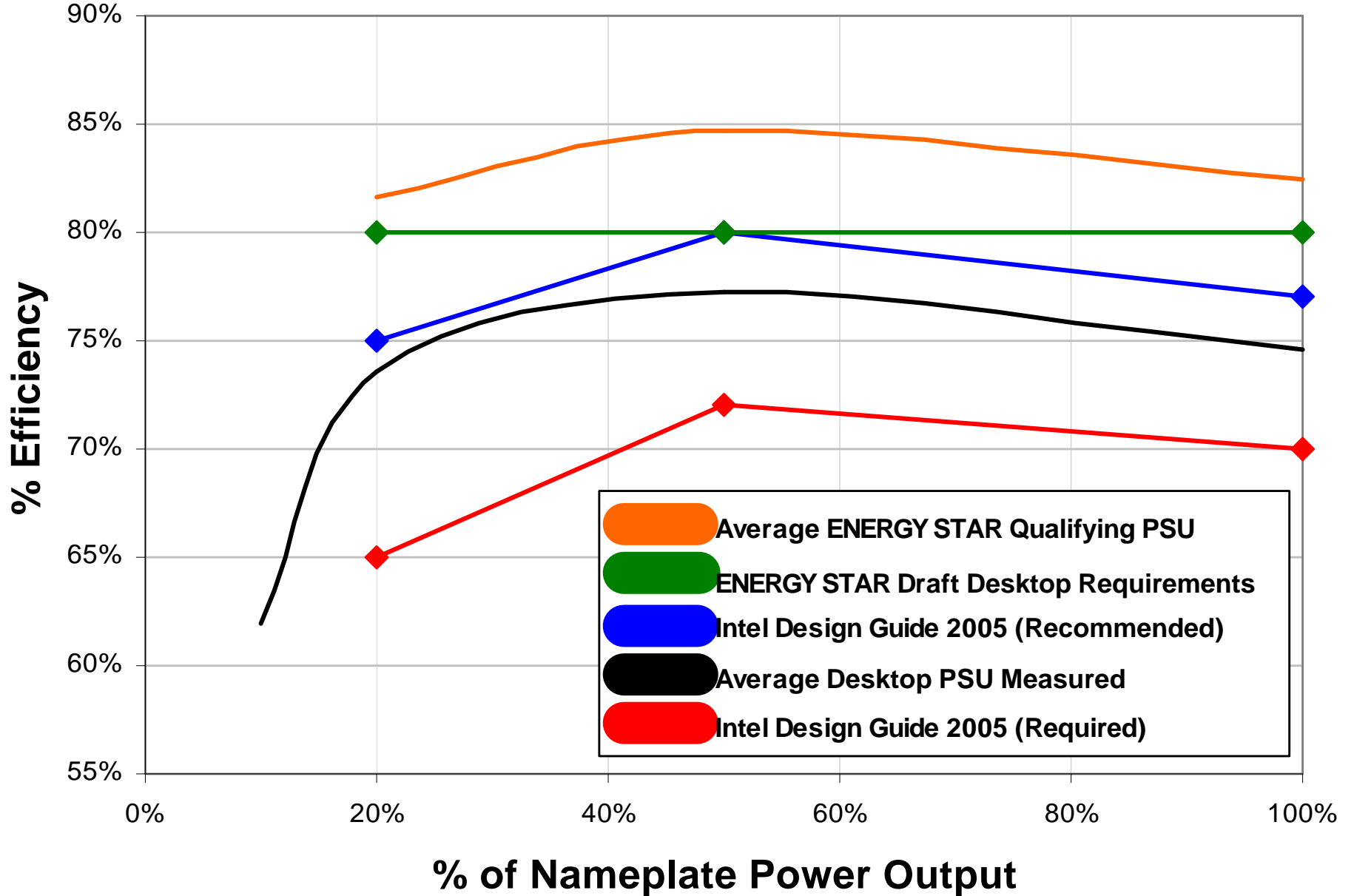
Desktop PS Efficiency: 400W - 499W



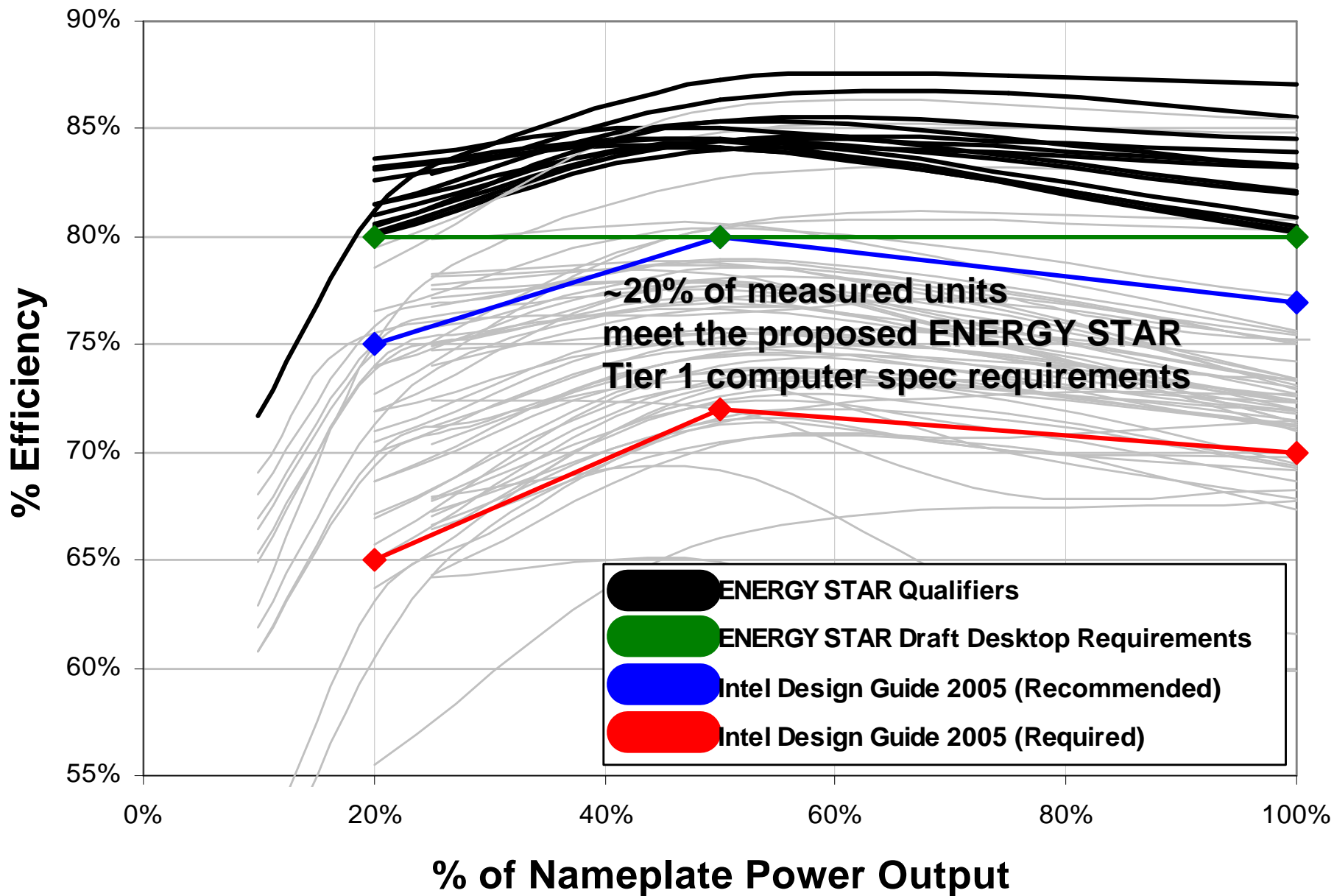
Desktop PS Efficiency: > 500W



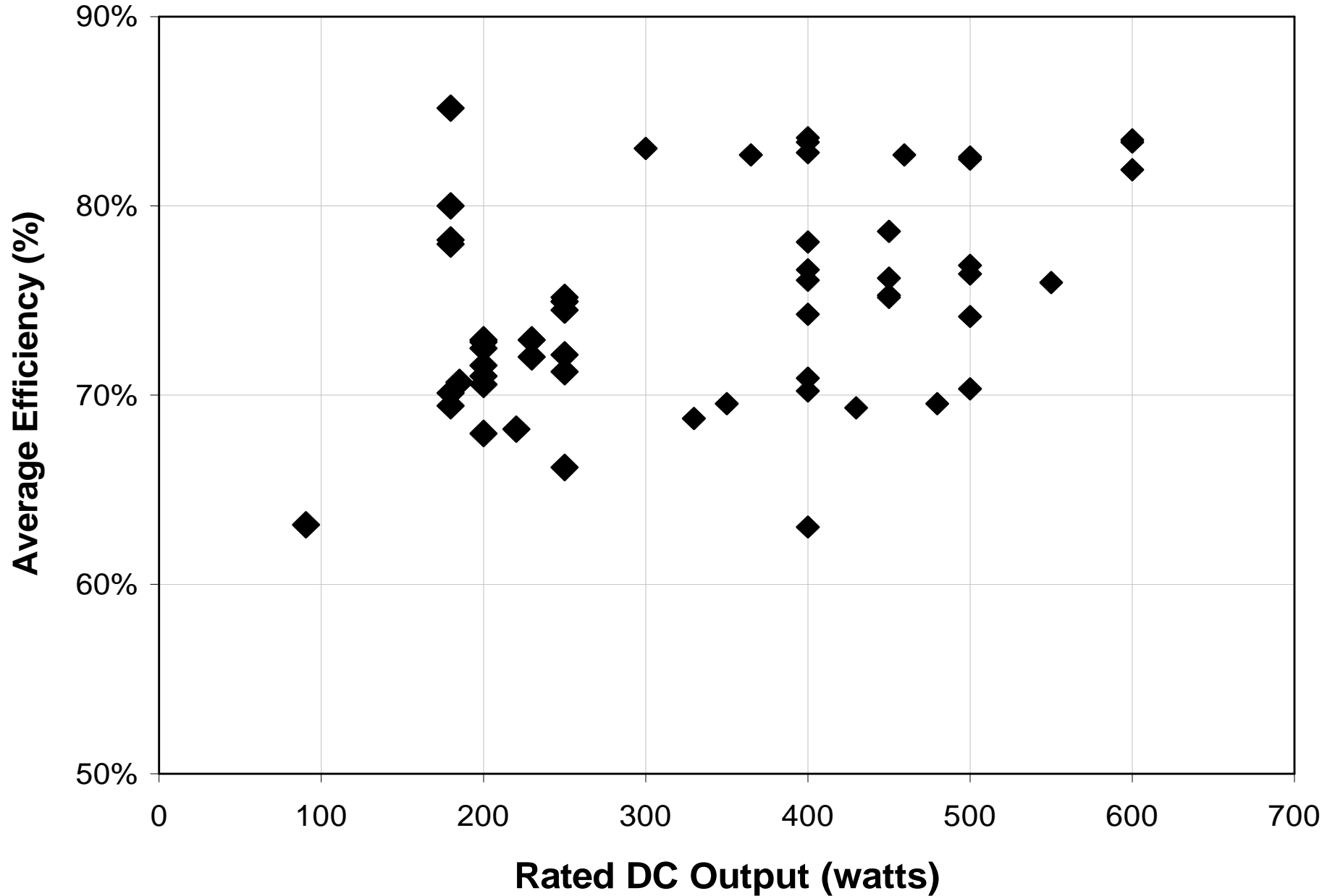
Desktop PS Efficiency: What is Typical?



Desktop PS ENERGY STAR Qualifiers



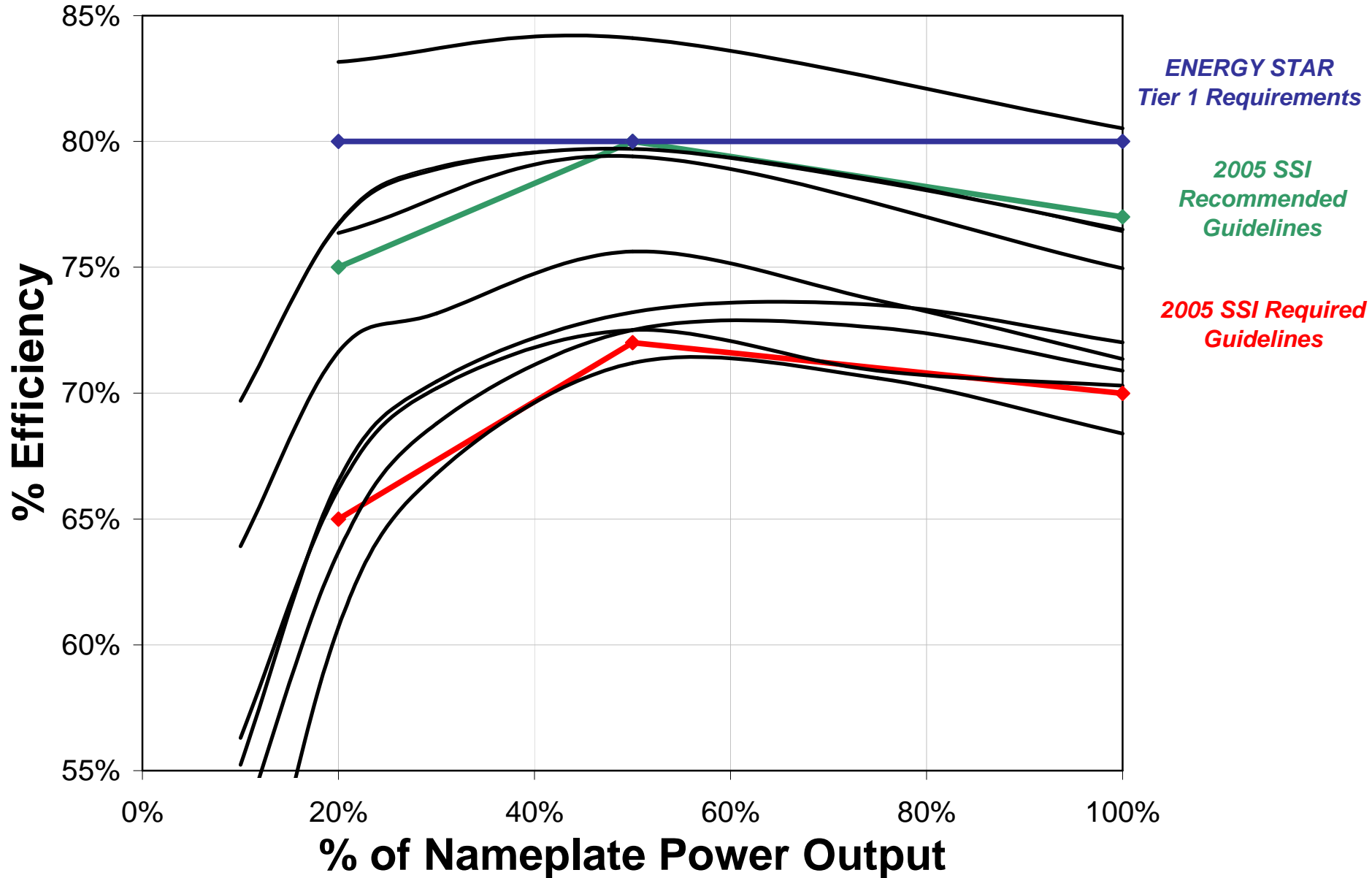
Desktop Average Power Supply Efficiency



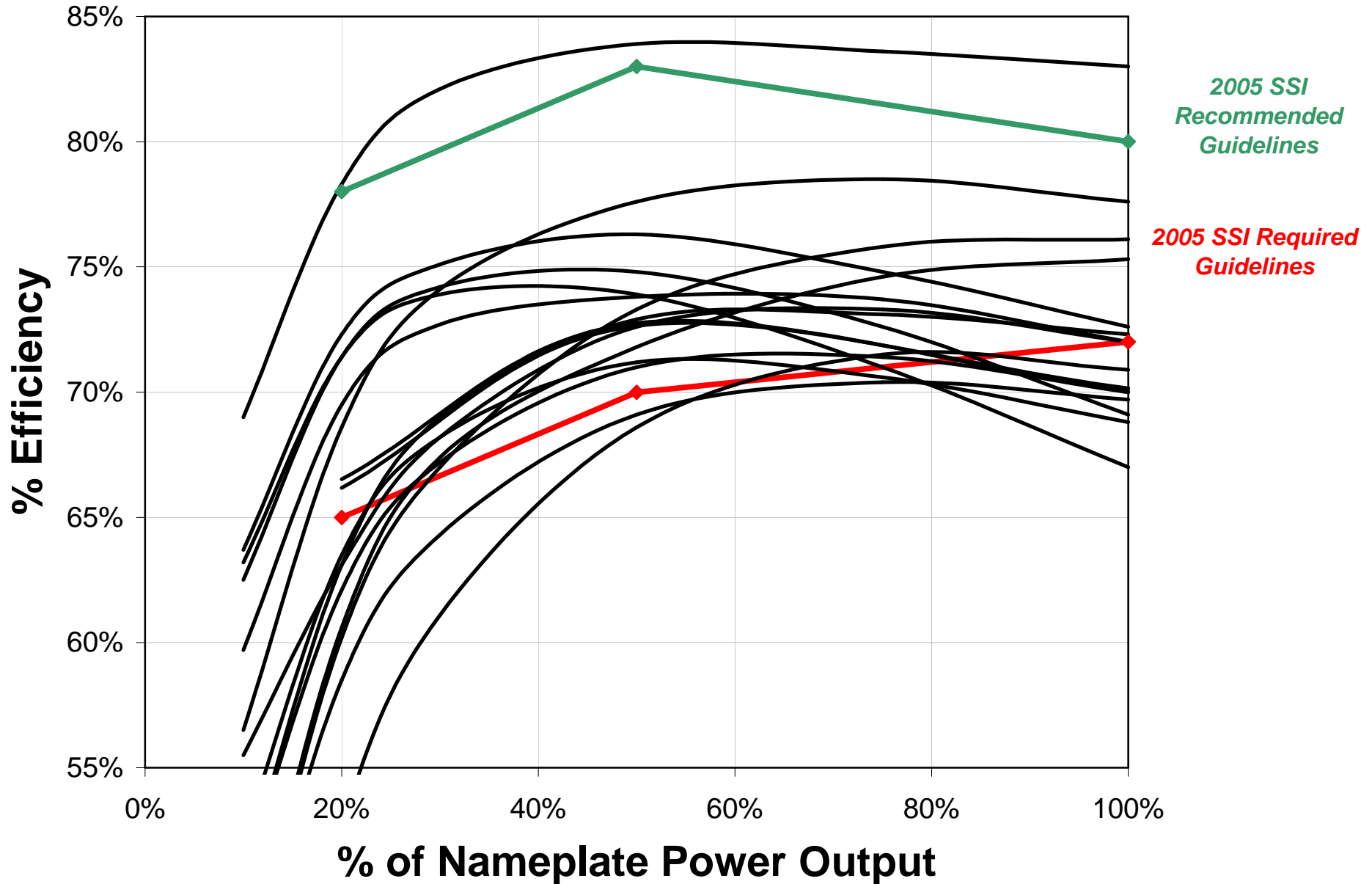
Server Power Supplies

- 29 server power supplies tested
- EPS12V, EPS1U, TPS1U and EPS2U form factors measured
- Surprisingly few PSUs with >80% efficiency

Pedestal Server Power Supply Efficiencies



Rack Server Power Supply Efficiencies



Key Findings

- Efficiency data widely used as a selling point for desktop and server PSUs, but test conditions rarely referenced
- Currently a wide range of efficiency in all but the largest output desktop PSUs
- Still not seeing best-in-class efficiency in rack server PSUs

Also of interest...



You Are Invited to a
Conference on
**Enterprise Servers and Data Centers:
Opportunities for Energy Savings**

Sun Microsystems Conference Facility, Santa Clara, CA
January 31, 2006, 8:30 a.m. – 5:30 p.m.
Welcome Reception: January 30, 2006, 6:00 – 8:00 p.m.

<http://www.energystar.gov/serverconference>