Power Supplies: Half a Billion New Ways to Save Energy Coming to a Store Near You

Presented on behalf of

The Natural Resources Defense Council

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What Is a Power Supply?

A circuit that converts 120 volt AC power into low voltage DC power

Two styles:

External

Internal

Two Technology Types

Linear

Switching

Key Questions

- How many power supplies are out there?
- What does it mean for a power supply to be energy efficient?
- How important are active power losses compared to standby power losses?
- Is it cost effective to improve efficiency?
- How much difference would it make?
- How can we make it happen?

How do you know if an electrical product uses a power supply?

What's Inside Includes:

- Integrated circuits (chips)
- Electronic timers, sensors or control circuits
- Rechargeable batteries
- Information storage
- Anything "wireless"

What's Outside Includes:

- Digital displays or screens
- Keypads or keyboards
- Speakers
- A thin wire leading to an external box that plugs in:
  - Bricks
  - Wall warts
  - Fat snakes
  - Vampires

Estimated Power Supply Sales & Number in Use

	North America		Global	
Power Supply Type	Unit Sales / Year	Total Units in Use	Unit Sales / Year	Total Units in Use
External	200 million	> 1.0 billion	0.6 to 0.8 billion	> 3 billion
Internal	> 250 million	> 1.5 billion	0.5 to 1.0 billion	> 3 billion
Total	> 450 million	> 2.5 billion	1.1 to 1.8 billion	> 6 billion

At least 8 power supplies in use per American

Nearly 1 per person worldwide

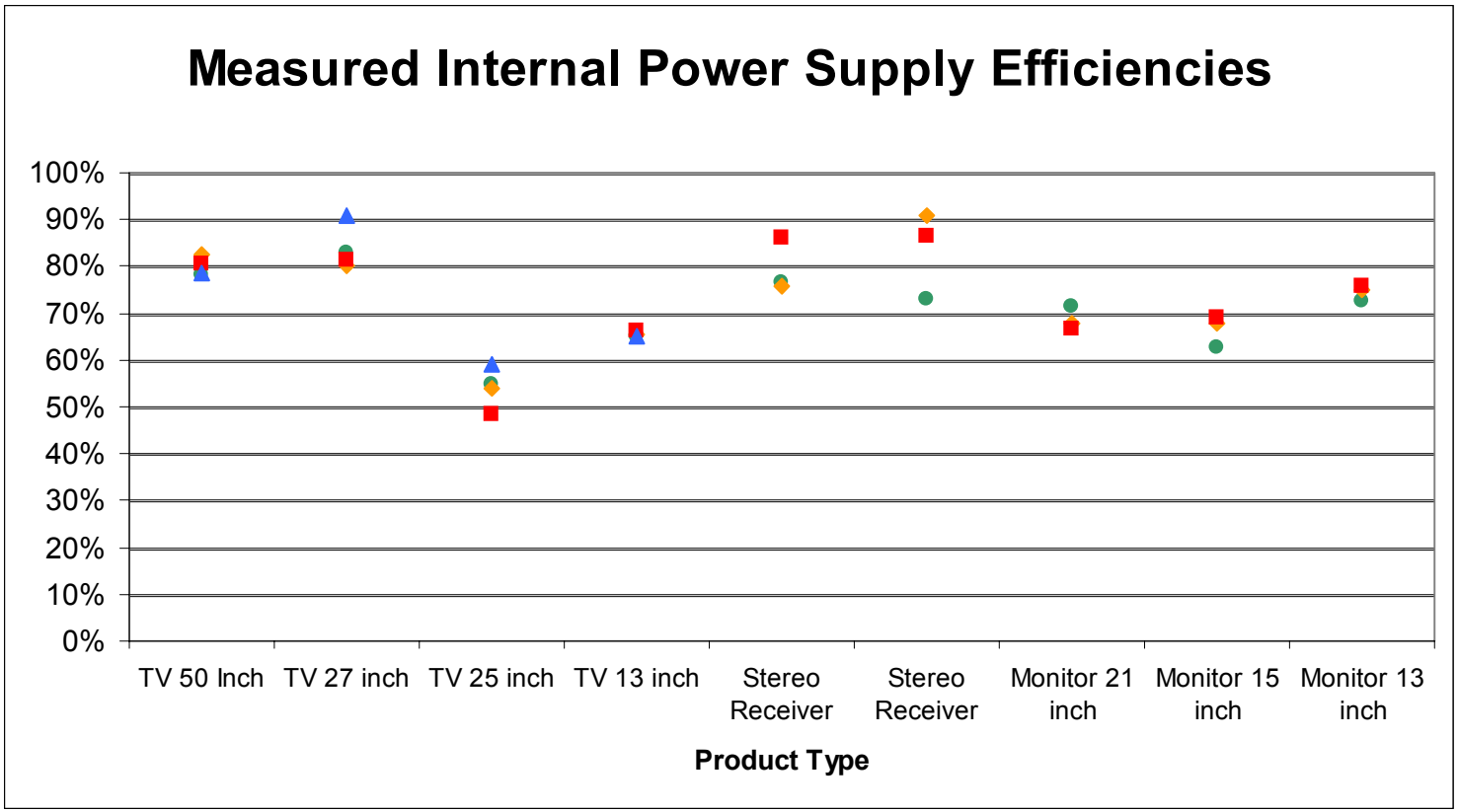
Sales growing by 15% / year

Defining Terms

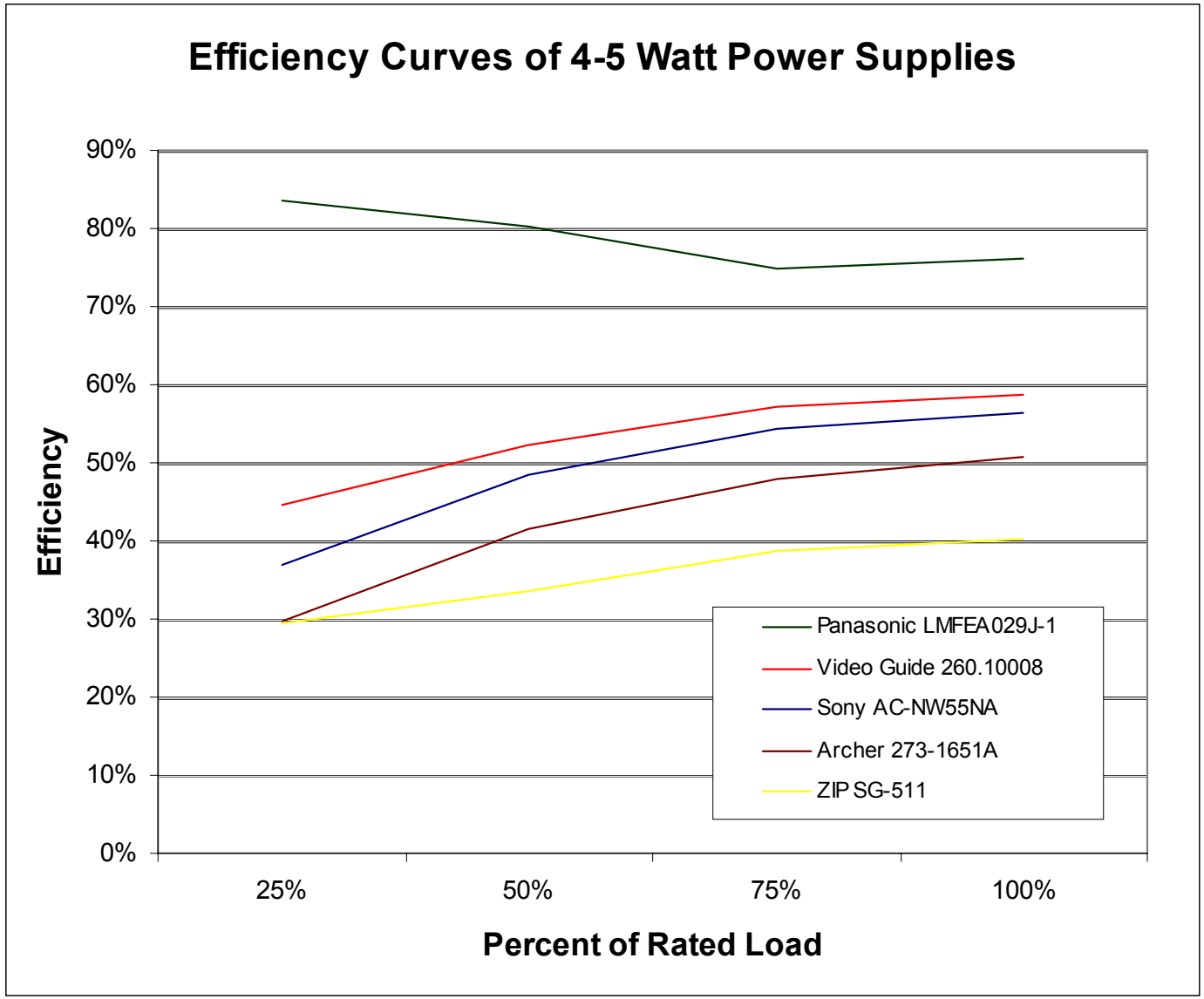
Term	Meaning
active mode	Full operational state (usually not 100% of rated load, though)
sleep mode	A lower power state than active mode – product can respond to input or “wake up”
standby mode	User thinks product is “off,” but it may still be drawing some electrical power
hard “off” mode	Switch allows power to be interrupted in front of power supply, causing zero power consumption in standby mode

What Is an “Efficient” Power Supply?

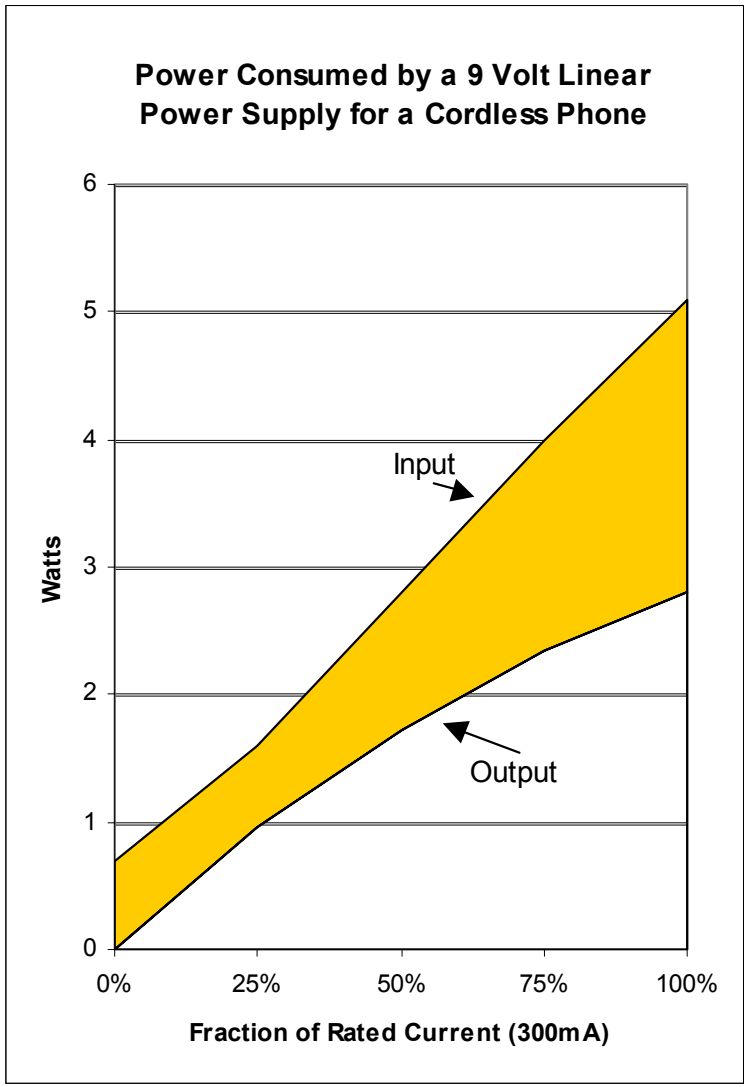
Efficiency = useful DC power out / total AC power in

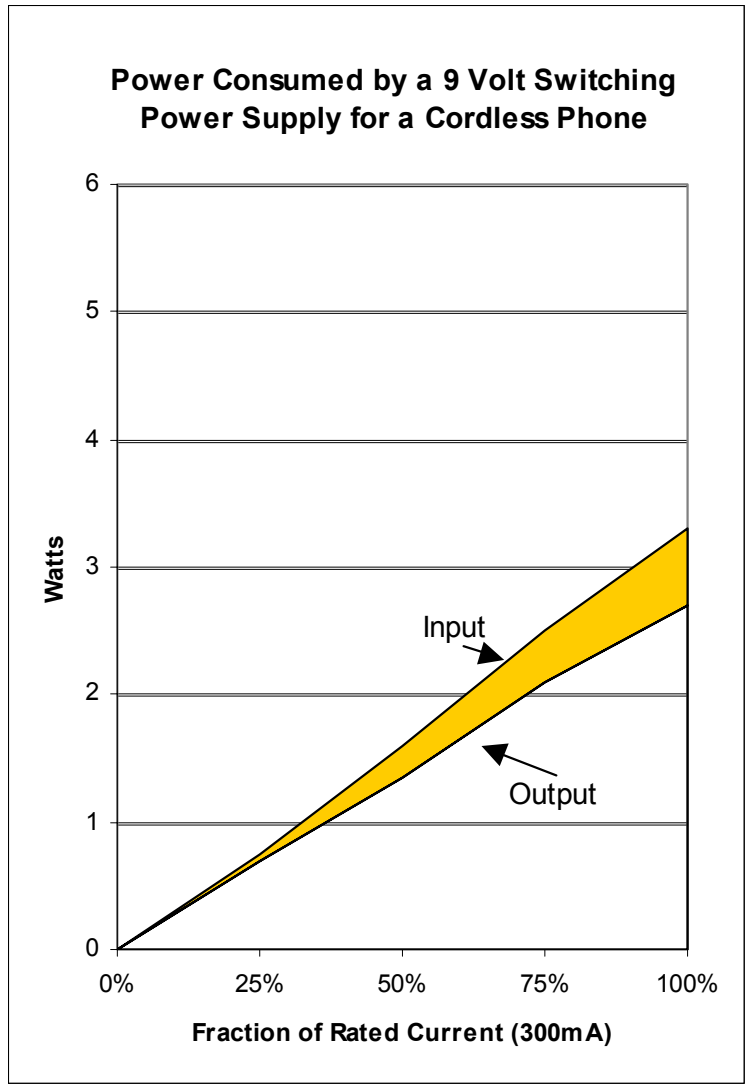


AC ➜ Meter ➜ Power Supply ➜ Meter ➜ DC Load

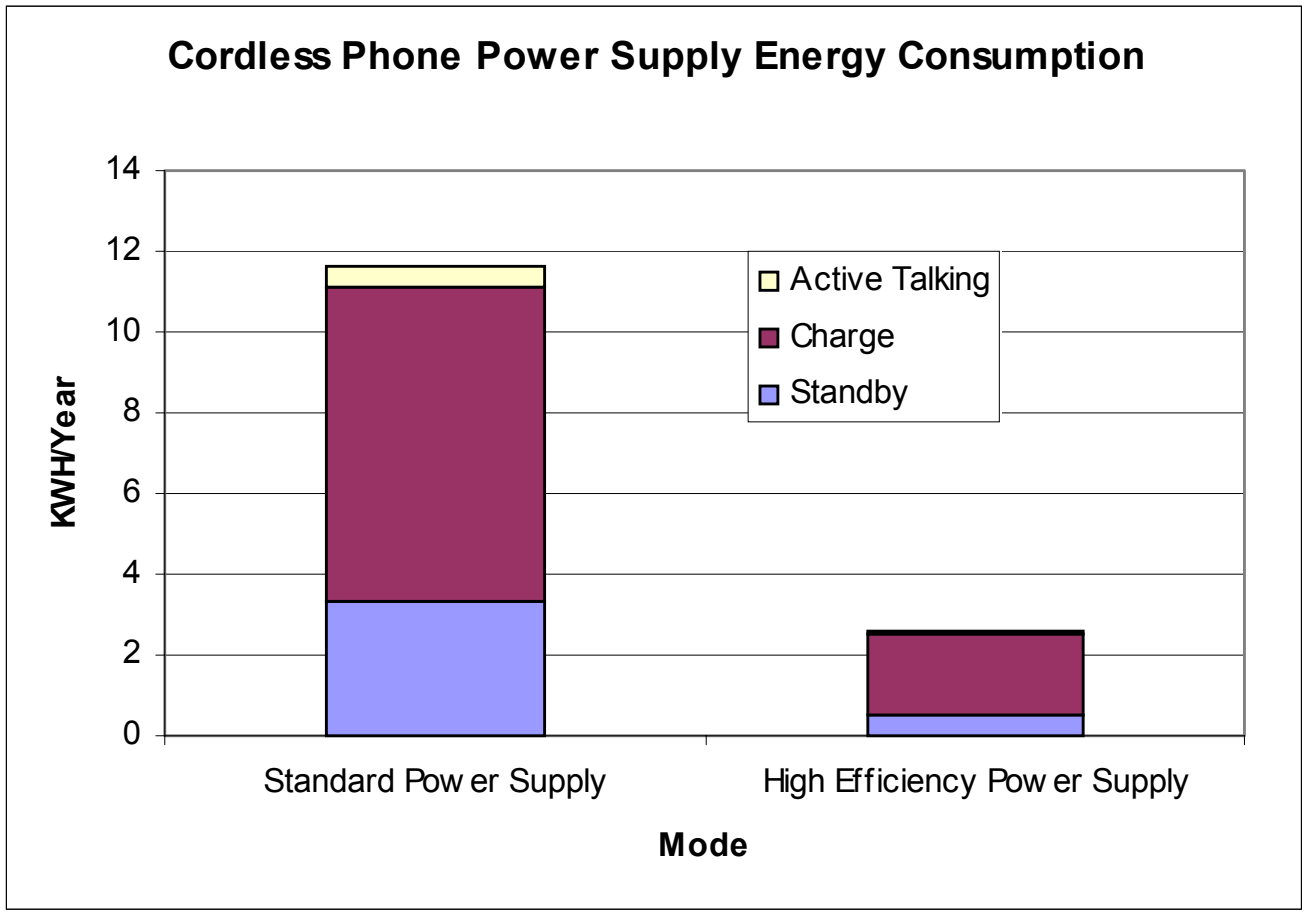

Efficiency Curves of 4-5 Watt Power Supplies
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Efficiency
25%
50%
75%
100%
Percent of Rated Load
Panasonic LMFEA029J-1
Video Guide 260.10008
Sony AC-NW55NA
Archer 273-1651A
ZIP SG-511

What the Measurements Tell Us…

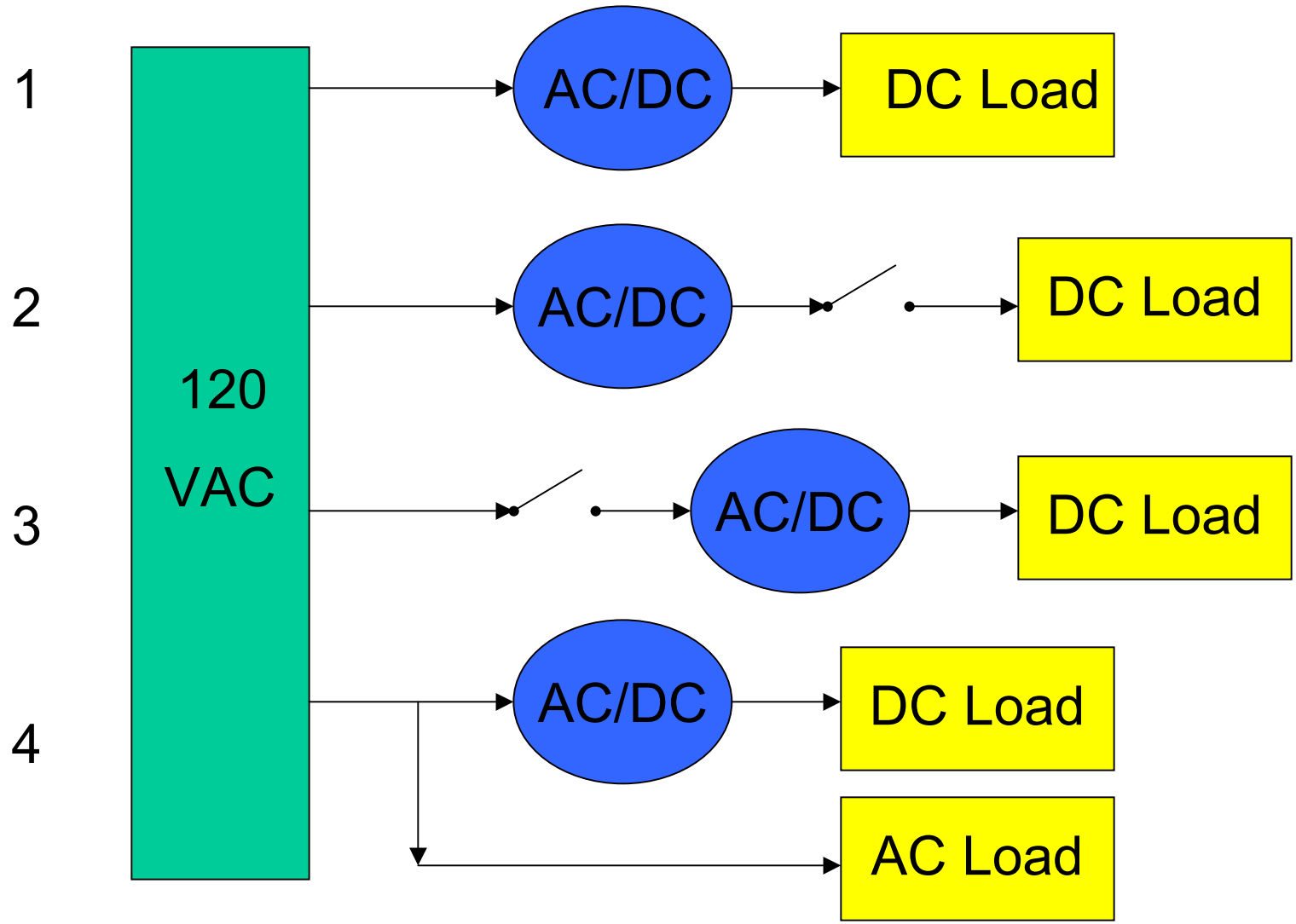




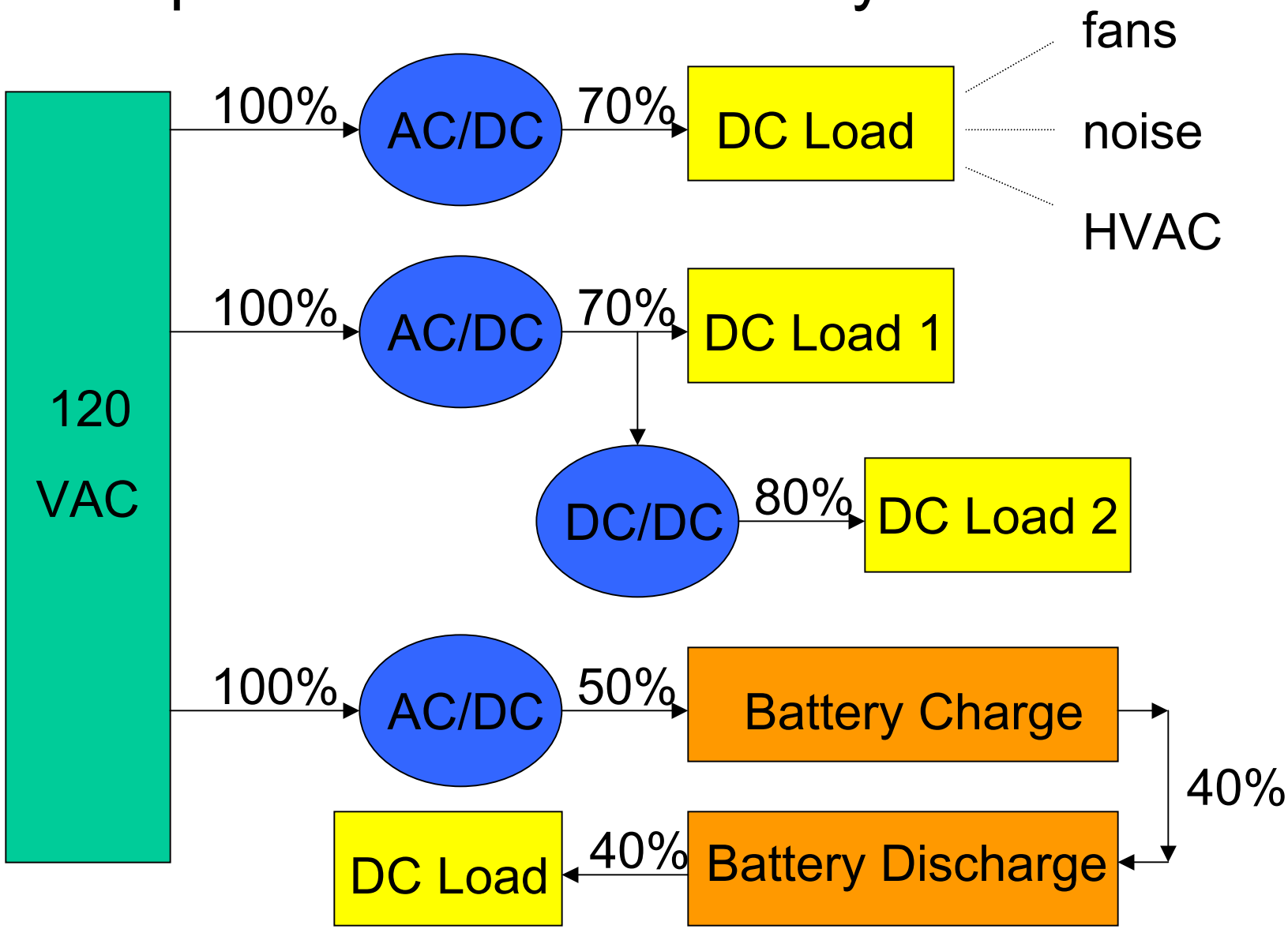
Which Modes Use the Most Energy?



Power Supply Location in the Circuit Matters



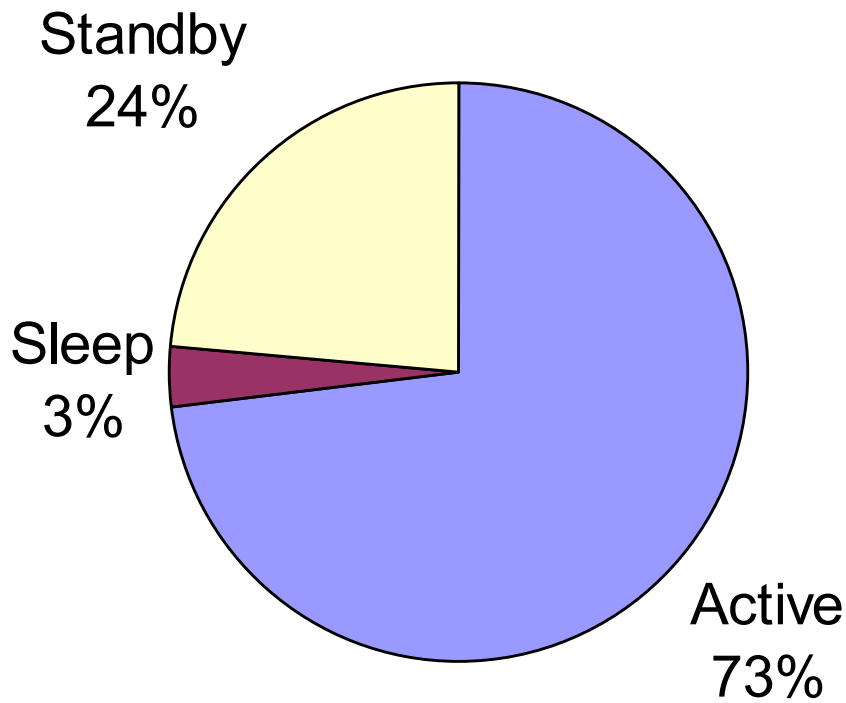
Multiple Places for Efficiency Loss



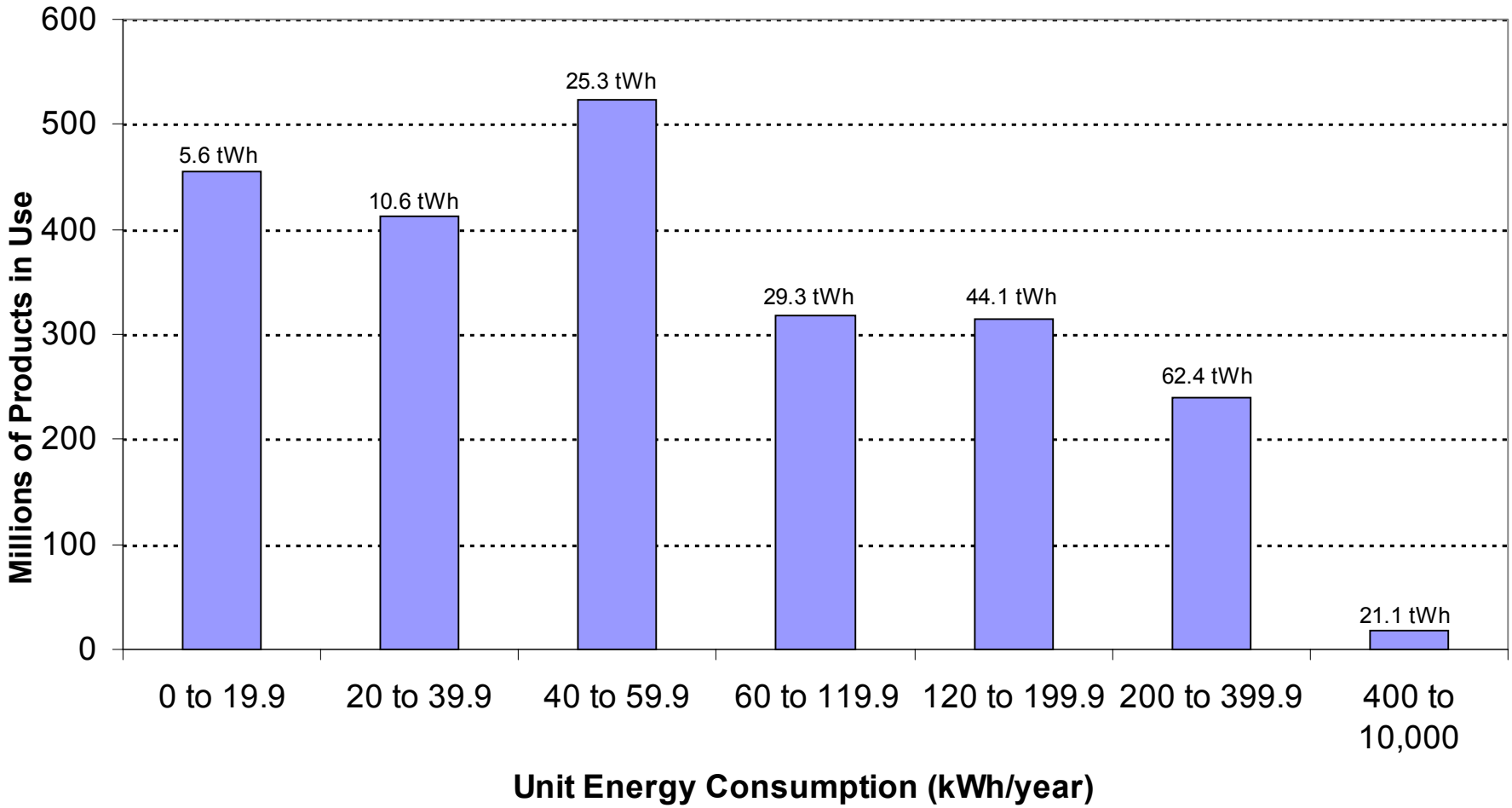
Total U.S. Electricity Flowing Through Power Supplies:

207 billion kwh/year, worth about $17 billion/year

At least 6% of U.S. electricity use!



Total Number of Power Supply-Containing Products in Use in the U.S., by Unit kWh/year



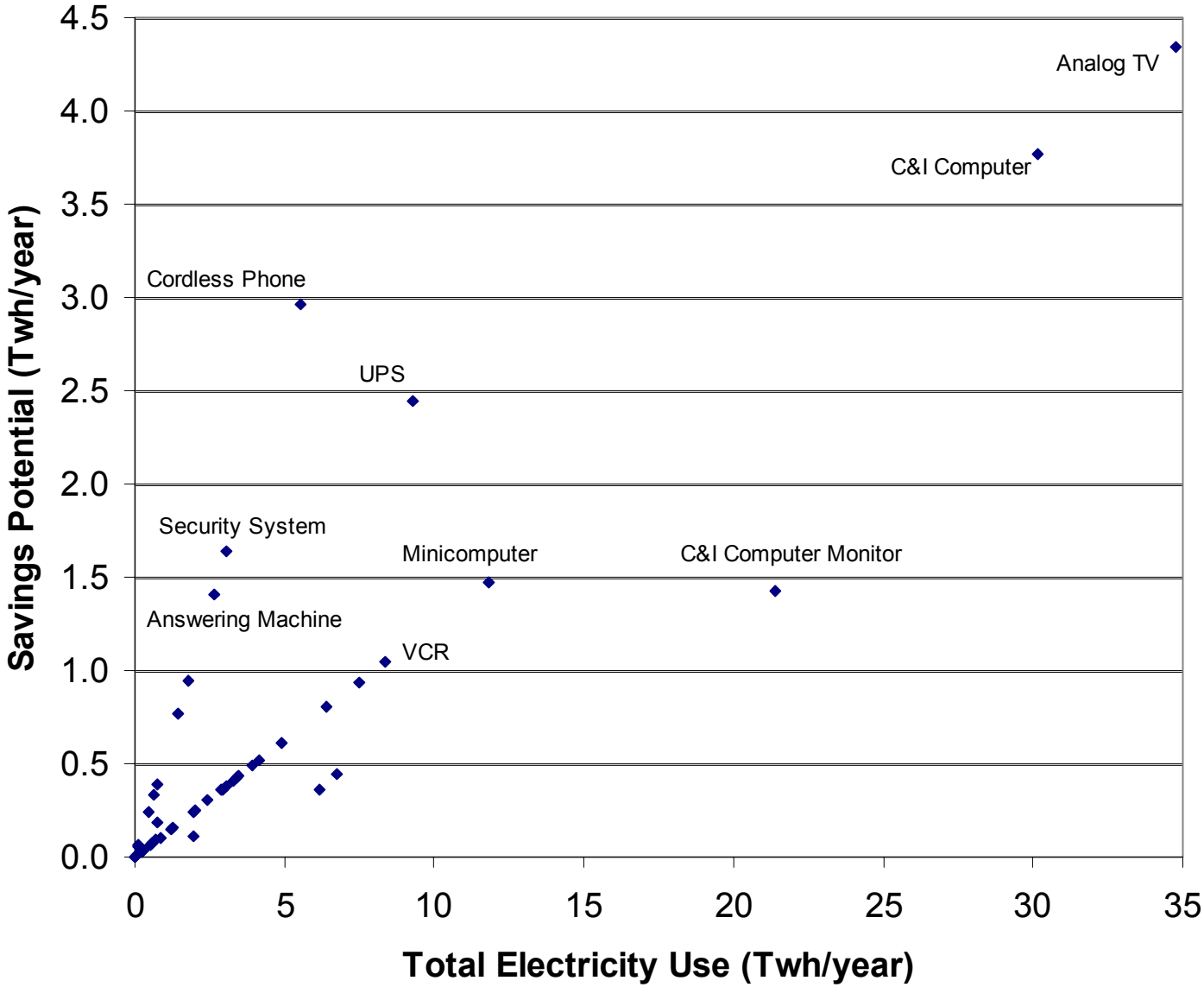
Which Power Supply-Containing Products Use the Most Electricity?

Product	# in Use	Active kwh/year	Sleep kwh/year	Standby kwh/year	Total kwh/year	Total twh/year
Analog TV	250,000,000	105.1		33.8	139.0	34.7
Desktop Computer (C/I)	94,000,000	296.1	18	6.6	321.0	30.2
Computer Monitor (C/I)	94,000,000	205.0	20	2.2	227.7	21.4
Minicomputers	2,000,000	3,854.4			3,854.4	11.8
Uninterruptible Power Supply	29,500,000	314.8			314.8	9.3
VCR	150,000,000	6.0		49.6	55.6	8.3
Desktop Computer (Res)	75,000,000	79.7	4	16.0	99.7	7.5
Computer Monitor (Res)	75,000,000	56.9	4	29.1	89.7	6.7
Mainframe Computer	110,000	38,544.0			38,544.0	6.4
Stereo Component	75,000,000	73.2		9.2	82.5	6.2
Cordless Phone	128,400,000	31.3		12.0	43.3	5.6

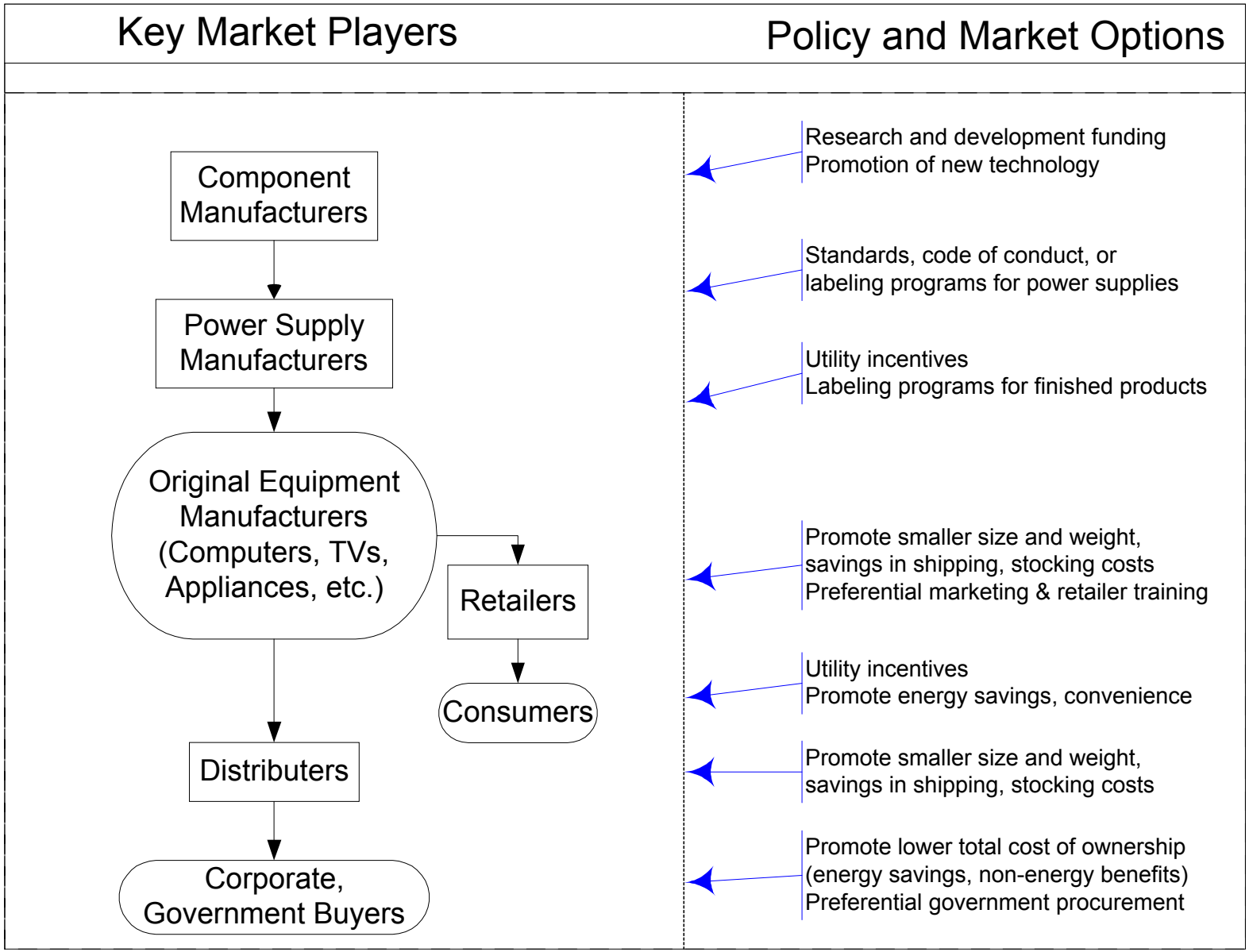
Savings Potential is Huge

- What if all linear power supplies were improved from about 40% efficiency to 80% or more?
- What if all switching power supplies were improved from about 70% efficiency to 80% or more?
- Annual savings would be more than 1% of total U.S. electricity use: about 32 billion kwh and more than $2.5 billion in lower energy bills.
- Very cost effective – incremental costs often less than $1 (in some cases pennies) per power supply.
- Additional savings possible from substantial reductions in standby mode power consumption (currently averages 50 to 100 watts/home in many industrial countries).

National Electricity Use and Savings Potential for Various Products Containing Power Supplies



Power Supply Market Snapshot



Focus on Non-Energy Benefits!

Key Market Advantages for Highly Efficient Power Supplies

- Reduce travel weight & size
- Free up outlets / increase convenience
- More units per shipping container & more room for merchandise in store
- Already meets existing standby and pending active mode efficiency specs – future-proof!

Price vs. Value Propositions

Goal: Lowest Price

- Take cost out "at all costs"
- Quality and reliability can drop
- No product differentiation
- Least common denominator design: no features, no profits
- Penny-wise/pound foolish – what saves the buyer $1 up-front can add $10 or $20 to lifetime energy costs
- All of us pay more – higher energy bills, more air pollution, more new power plants and power lines

Goal: Highest Value

- Emphasis on clever design and differentiation: multiple viable paths to success
- Minimize lifecycle cost: purchase price + lifetime maintenance, energy, & pollution costs
- Specs, labels, and utility programs help build a message of value: "may cost more, but worth more"
- Products more desirable – smaller, quieter, cooler, more convenient

Policy Ideas on the Table

- Consider sleep, standby, and active efficiencies in Energy Star specifications for electronics (at least 13 product categories starting with monitors this year)
- Work through voluntary industry specifications like Intel's PC 2000 process
- Use federal, state, and private procurement to encourage sale of highly efficient designs – go beyond Executive Order 13221
- Targeted utility incentives directed at OEMs or final assemblers (idea proposed by Art Rosenfeld in SF)
- Utility support to retailers / consumer education
- Federal and/or state-level efficiency standards