



The Greening of IT: Environmental Policy and the State CIO

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Data centers are at a tipping point and Energy use and cost is the driver

Increased Computing Demand

Changing Cost Dynamics

Data Center Lifecycle Mismatch

- In the next decade, growth in server shipments will be 6x and 69x for storage – *IBM / Consultant studies*
- Per square foot, annual data center energy costs are 10 to 30 times more than those of a typical office building. ² - *William Tschudi, March 2006*
- Data centers have doubled their energy use in the past five years.³ - *Koomey, February 2007*
- US commercial electrical costs increased by 10 percent from 2005-06.⁴ - *EPA Monthly Forecast, 2007*
- Energy costs for server will match acquisition costs by 2012 – *IDC 2007*
- “Eighty-seven percent of data centers were built before 2001”⁵
- “Twenty-nine percent of clients identified” data center capability affected server purchases ”- *Ziff Davis*

1. Gartner, *Data Center Power and Cooling Scenario Through 2015*, Rakesh Kumar, March 2007.

2. William Tschudi, March 2006.

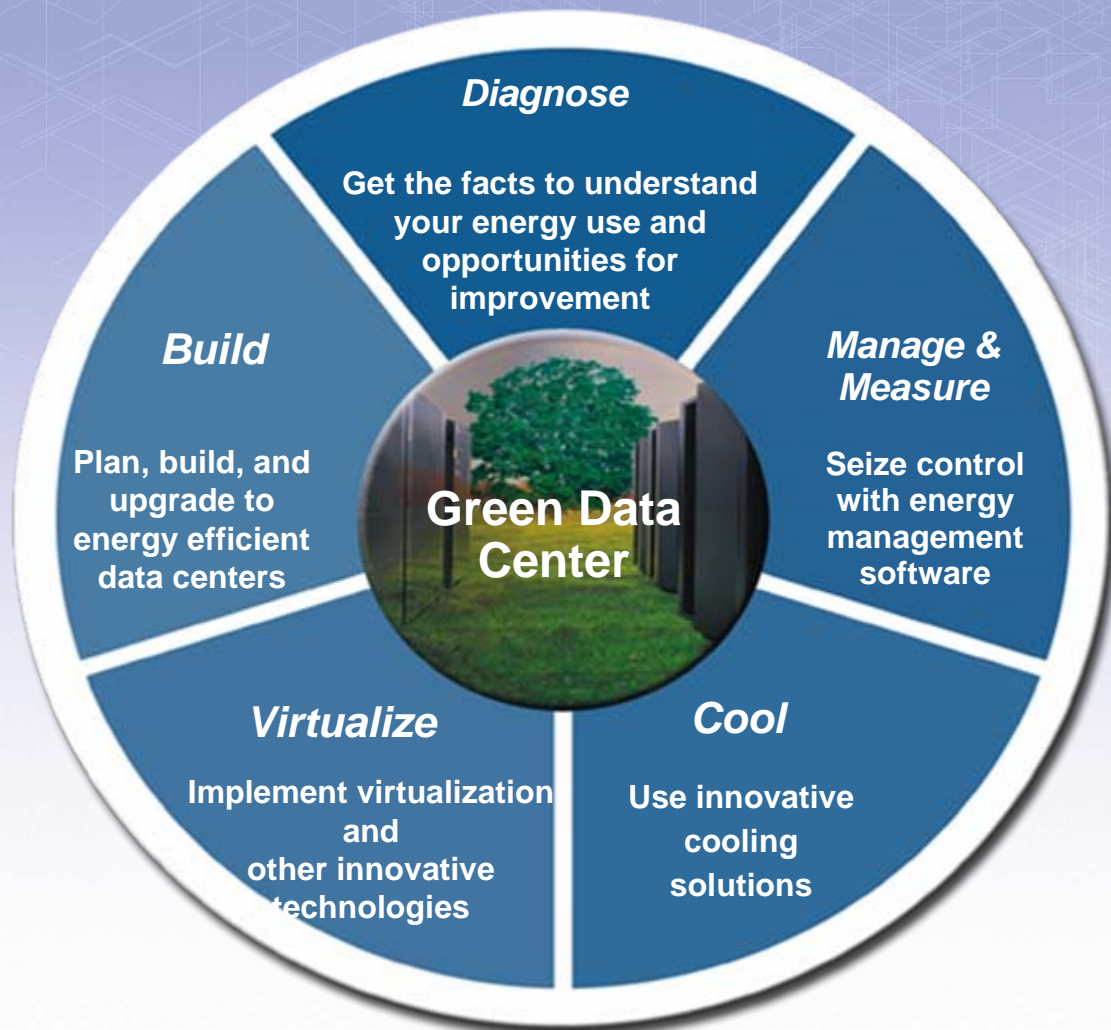
3. Koomey, February 2007.

4. *EPA Monthly Forecast, 2007.*

5. Nemertes Research, *Architecting and Managing the 21st Century Data Center*, Johna Till Johnson, 2006.



Green data centers are energy efficient and environmentally responsible. Five building blocks pave the way to savings

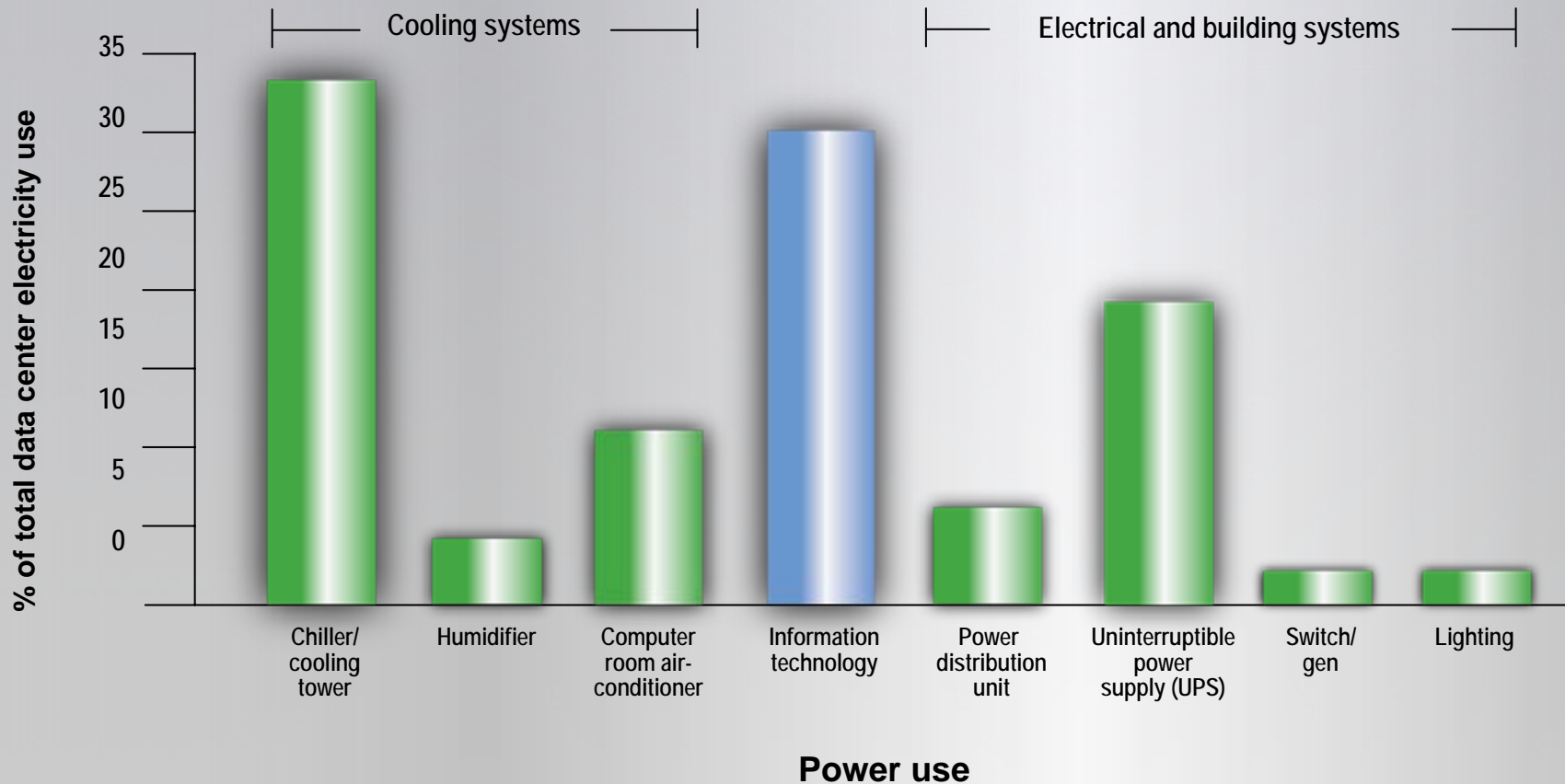


Going Green impacts the pocket-book and the planet

An average data center can save energy representing:

- *\$1.3M / yr savings*
- *1,300 less cars*
- *3.5 M pounds of coal*

Where does the energy go? The energy challenge is both in the physical data center and the IT infrastructure



A typical energy improvement roadmap has very short return on investment

Recommendation	Cost to Implement	Energy savings kW	Annual Energy savings \$K	ROI
Reduce recirculation and bypass of cooling air	< \$5k	See next	See next	< 1 year
Increase CRAC air discharge temperature to more closely mirror ASHRAE recommendations	<\$5K	13	11.5	<1 year
Adjust indoor temperature and relative humidity control	<\$3K	5	4.5	<1 year
Turn off CRAC units where no IT equipment load requires cooling	<\$1K	30	26	immediate
Improve efficiency of UPS systems	\$40-140K	85	74	1-2 years
Consider transferring IT loads to two PDUs	Varies	4	3.5	varies
Implement occupancy sensor lighting controls	<5K	5	4.4	1.5 years
Total	\$60K - \$250K	142kW	\$124K	< 2 years



Clients are implementing green solutions

Action

Impact



- Virtualization: 300 unix servers to 8
- Cool: Rear door heat eXchanger
- Build: Data center redesign using thermal analysis

- 80% reduction in energy use
- Elimination of hot spots
- Up to 60% heat reduction
- 10-80% utilization improvement



- Build: Scalable Modular Data Center replacing 4 locations
- Virtualization: 75 servers to 40

- Significant reliability improvement
- New site in production quickly
- Leadership energy efficiency



- Build: MareNostrum
- #1 Super computing site Europe
- 1,600 sq ft

- State-of-the-art power and cooling design to support high-density IT
- Upgradeable
- Attractive to investors



- Build: Grow Boulder data center capacity by adding 72,000 sq ft
- Virtualize: 3,900 servers being replaced with 30

- Add capacity within existing energy footprint
- 80% operational savings including energy and operations