

# Power and Cooling Trends Headed to Your Data Center

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## ***Agenda***

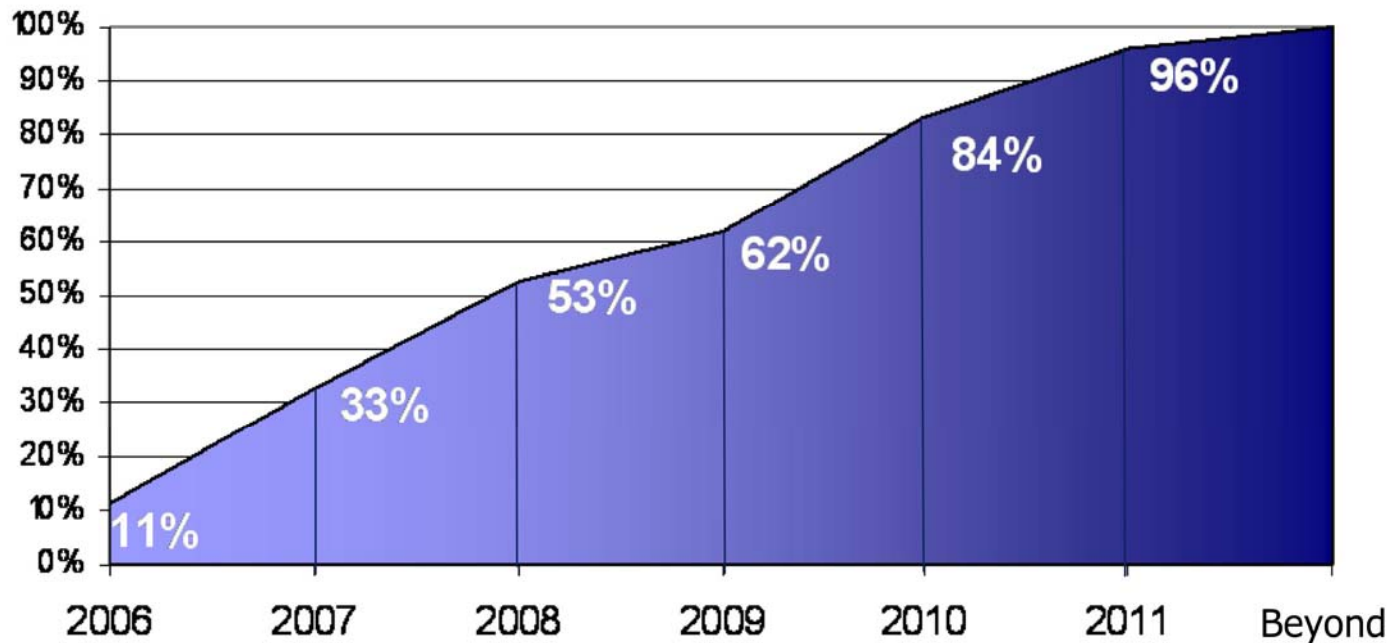
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- Top Trends & Concerns
- Power & Distribution Trends
- Cooling Trends
- Monitoring and Management Trends
- Energy Efficiency

# *Top Trends and Concerns*

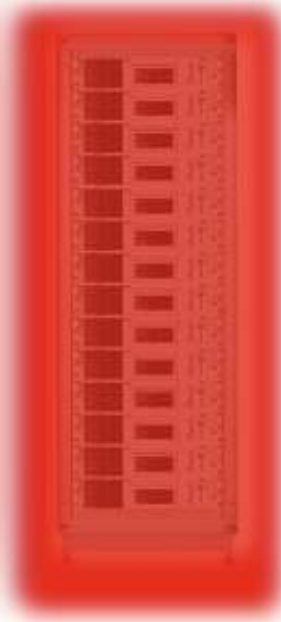
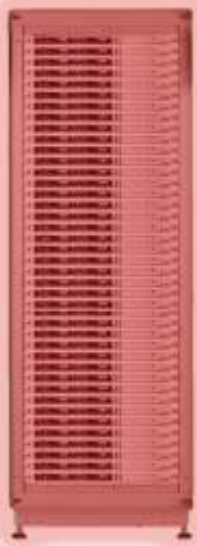
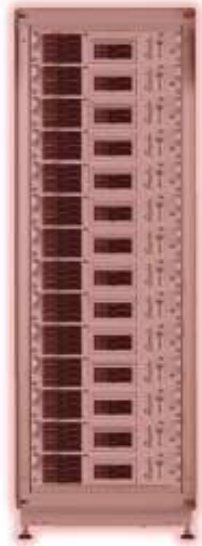
# Capacity & Density concerns will drive new priorities

## When Data Centers Will Run Out of Capacity



Source: DCUG Survey Fall 2006

# Racks are getting hotter



**2000**  
28 x 2U Servers  
2kW Heat Load

**2002**  
42 x 1U Servers  
6kW Heat Load

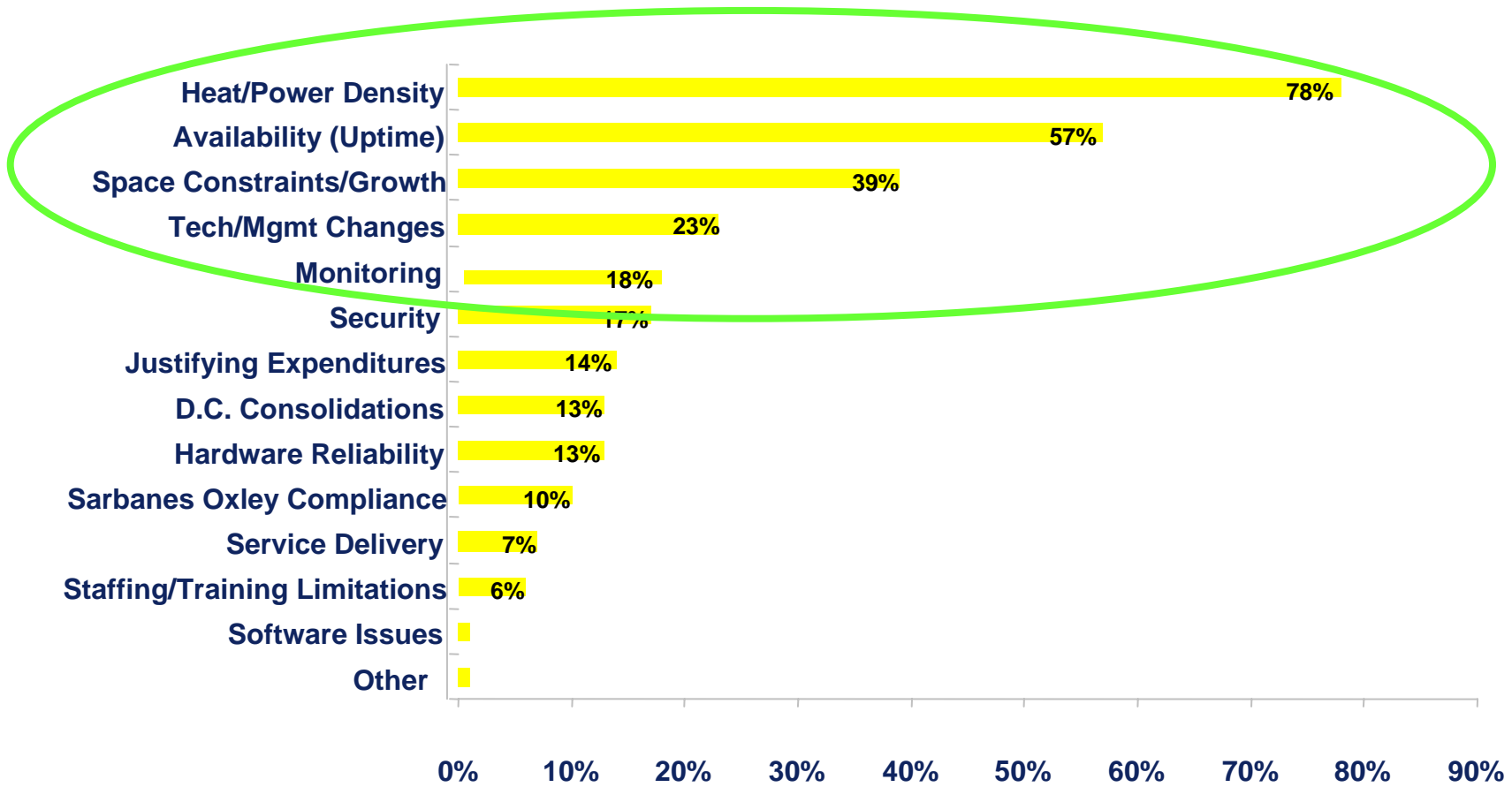
**2006**  
6 Blade Centers  
24kW Heat Load

**2009**  
Rapid Blades  
40kW Heat Load

**Heading Toward 50kW**




# Top Facility / Network Concerns - 2005



# *Density is driving change in the data center*

## Biggest Issues Related to Infrastructure - 2006

1. Heat Density	22%	
2. Space Constraints/Growth	19%	
3. Power Density	18%	
4. Adequate Monitoring Capabilities	8%	
5. Availability (Uptime)	7%	
6. Technology Changes	7%	
7. Energy Efficiency	5%	 New to the list

# *Power & Distribution Trends*

## *Changing power needs*

**Power needs only move in one direction, amid...**

- ***More power***
- ***More circuits***
- ***More cables***
- ***More heat***



# *Two-stage distribution adds capacity, reduces under-floor cabling*

## Traditional Distribution

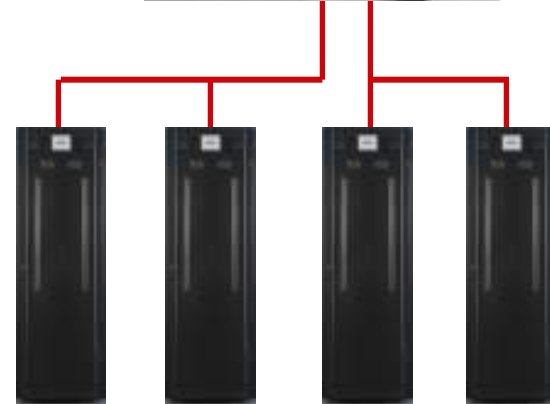


126 Poles

## Emerging Distribution



First Stage

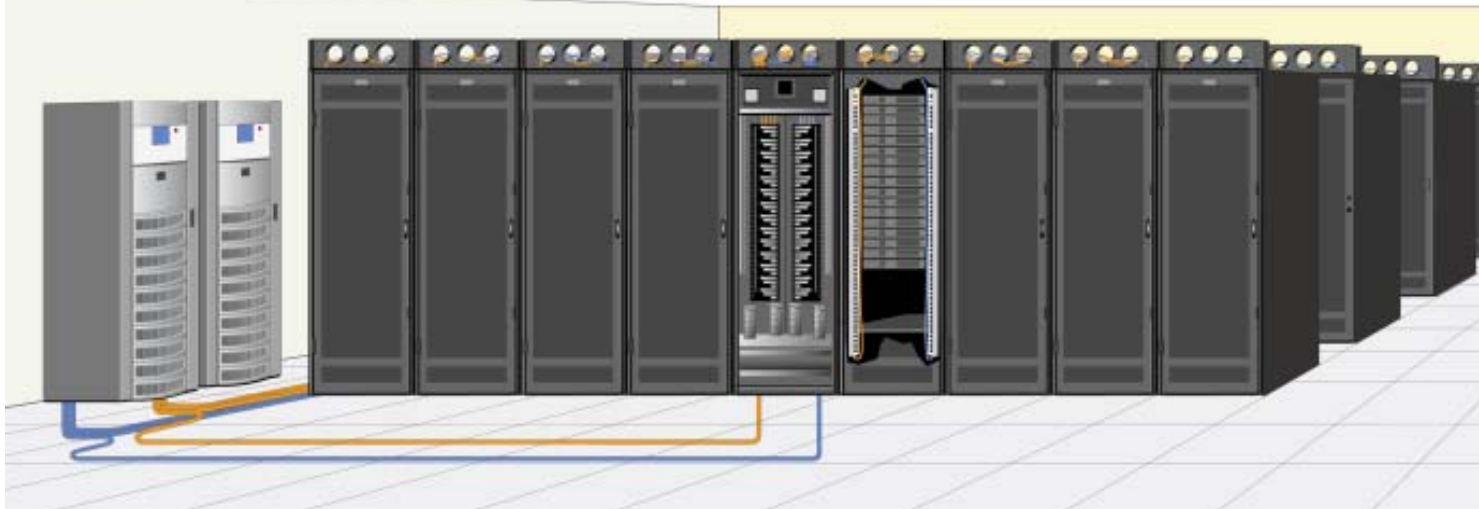


Second Stage

672 Poles

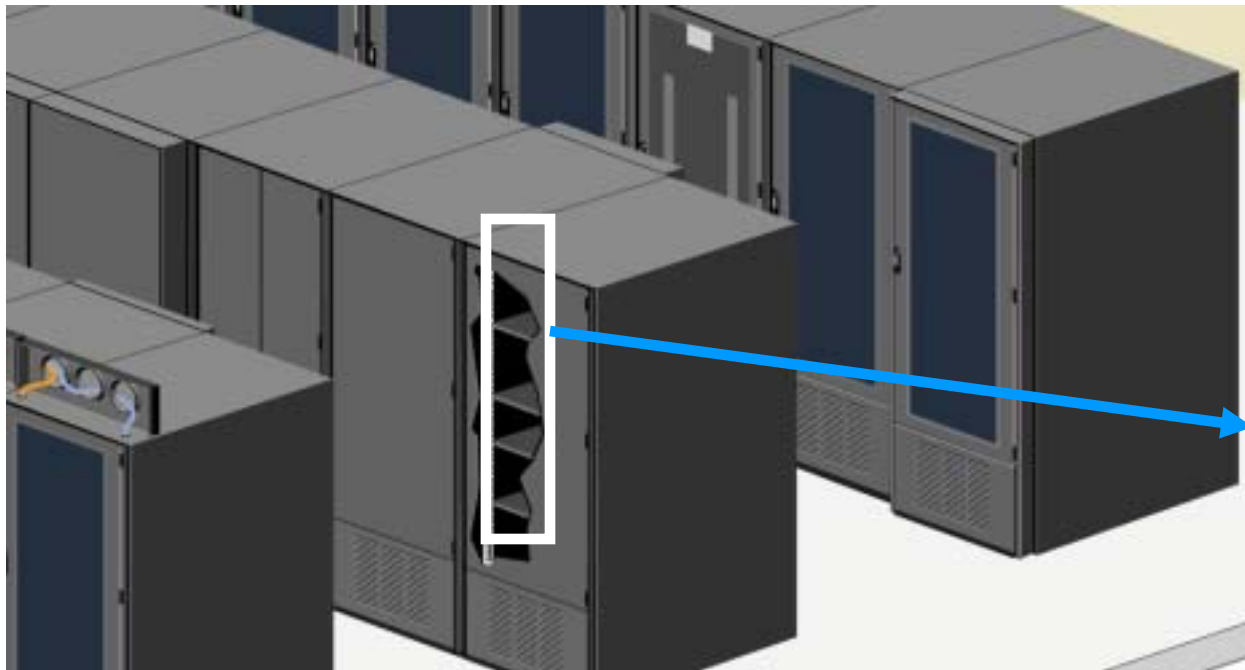
## *Power & Distribution flexibility*

- Tiered distribution closer to the rack
- Support moves, adds and changes - quickly
- Bottom or top input/output cables
- Adapt to high density
- Supports high availability schemes
- Support circuit level monitoring



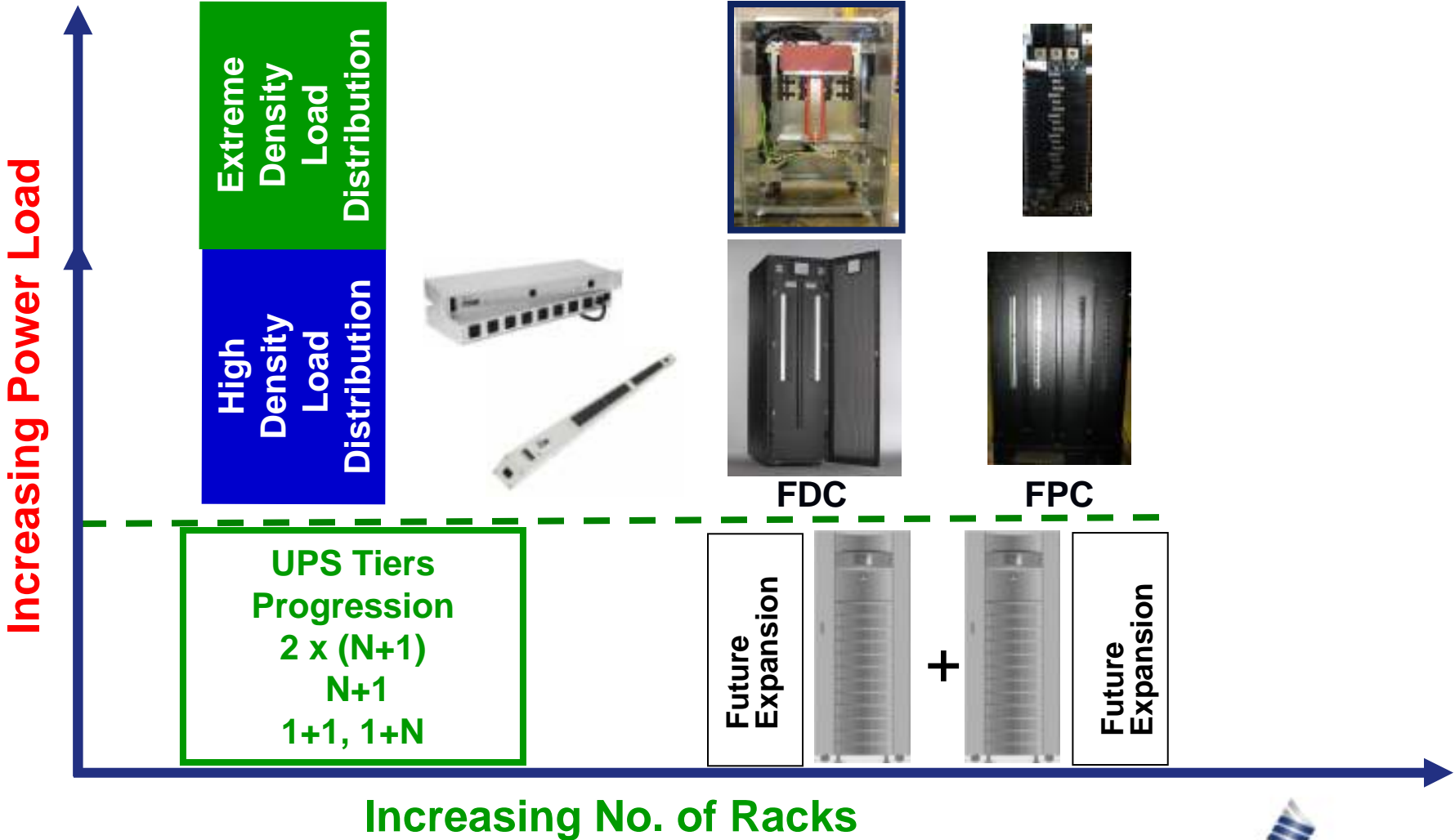
## *Manage distribution in the rack*

Adaptive rack distribution delivers control and visibility inside the rack to expand rack power requirements and support dual-corded devices



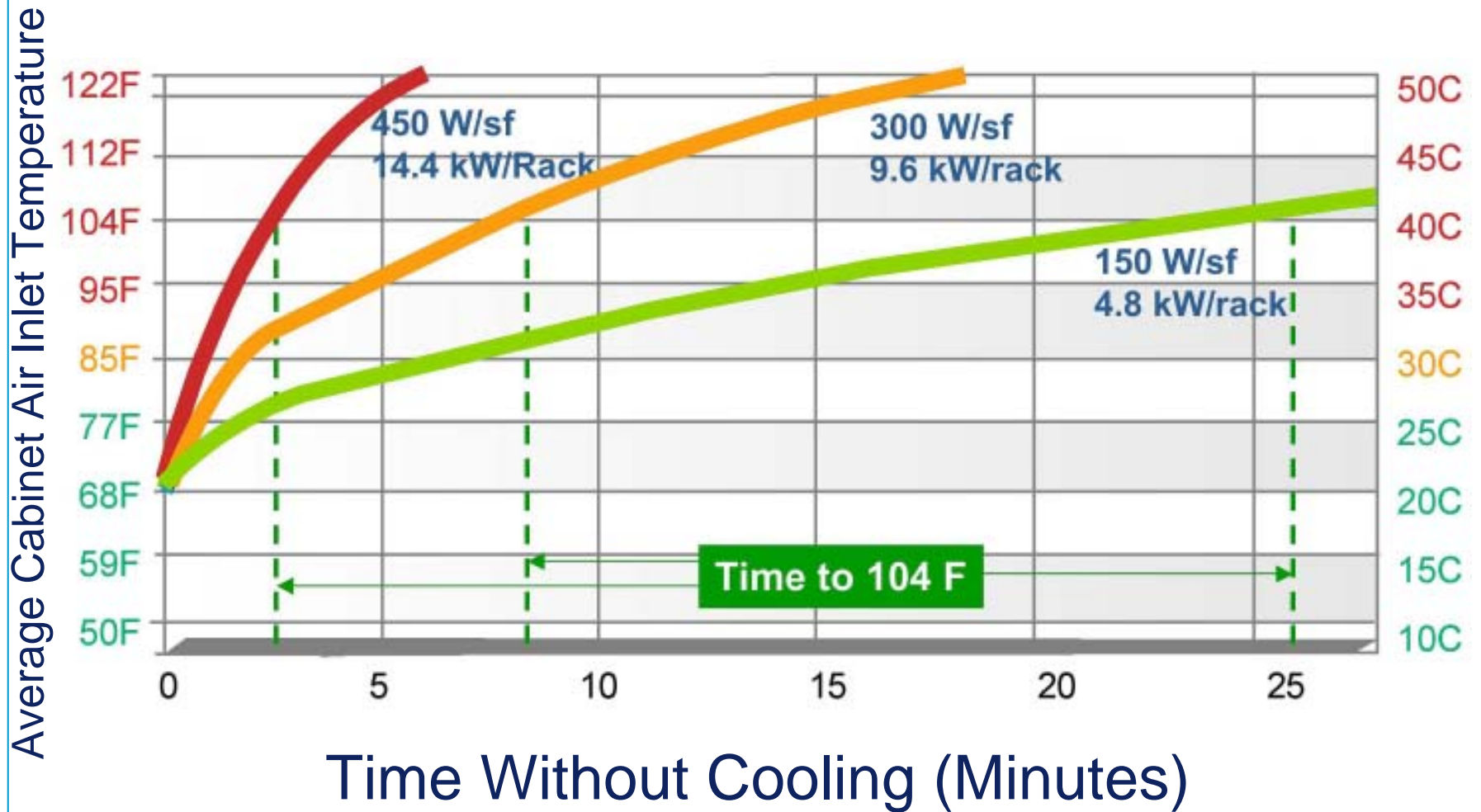
Adaptive In-rack  
Power  
Distribution

# Adapting to future power requirements

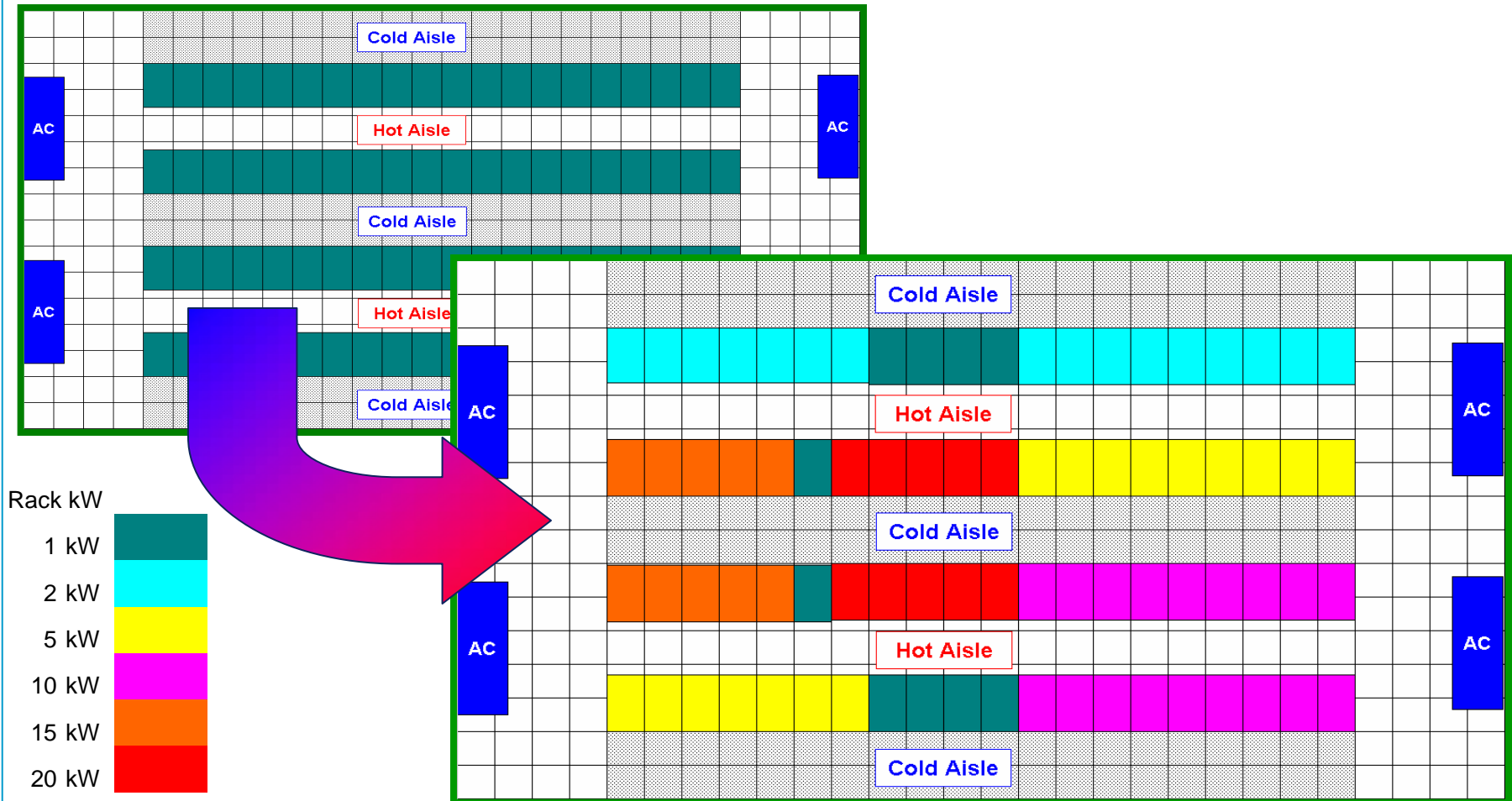


# *Cooling Trends*

# Cooling is becoming more critical as densities increase

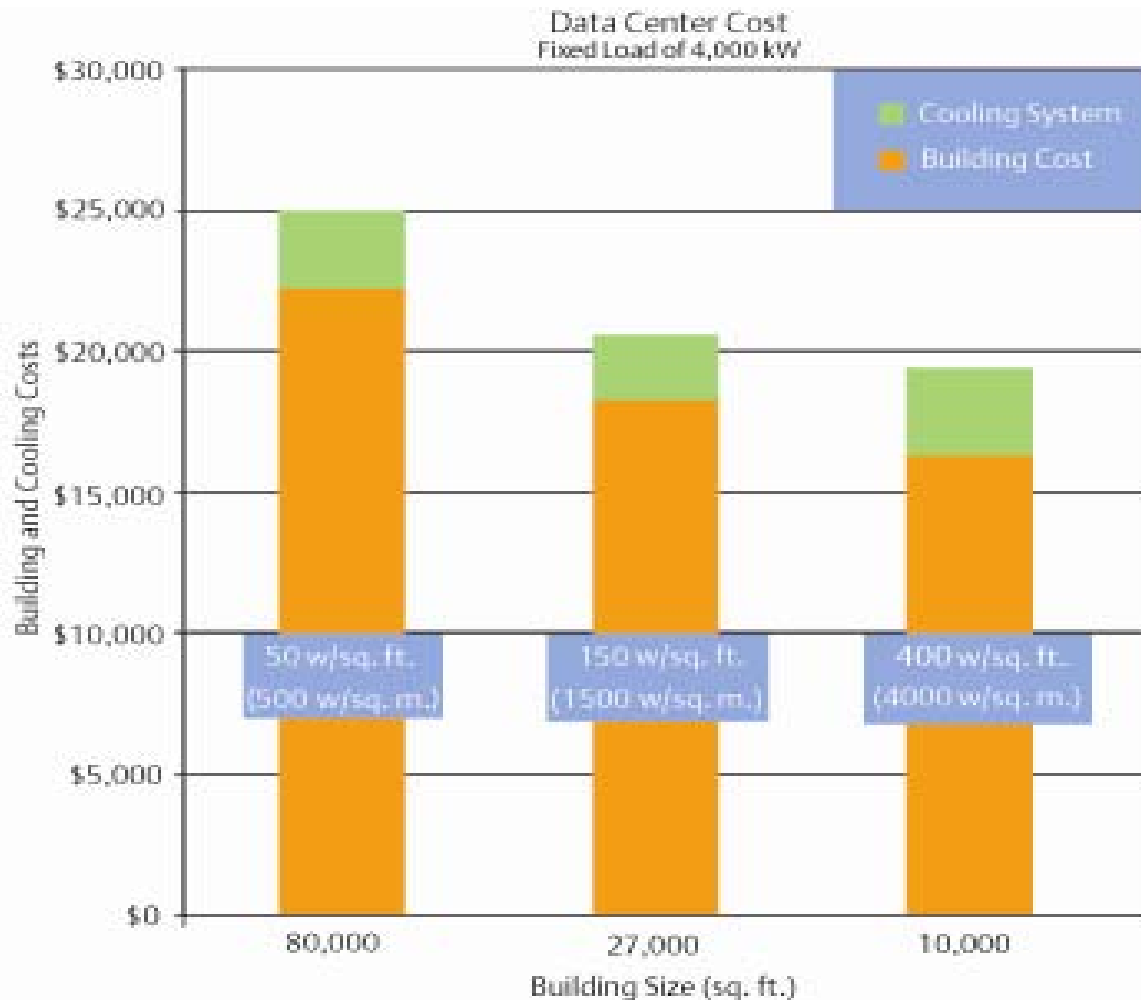


# Facilities are becoming more diverse

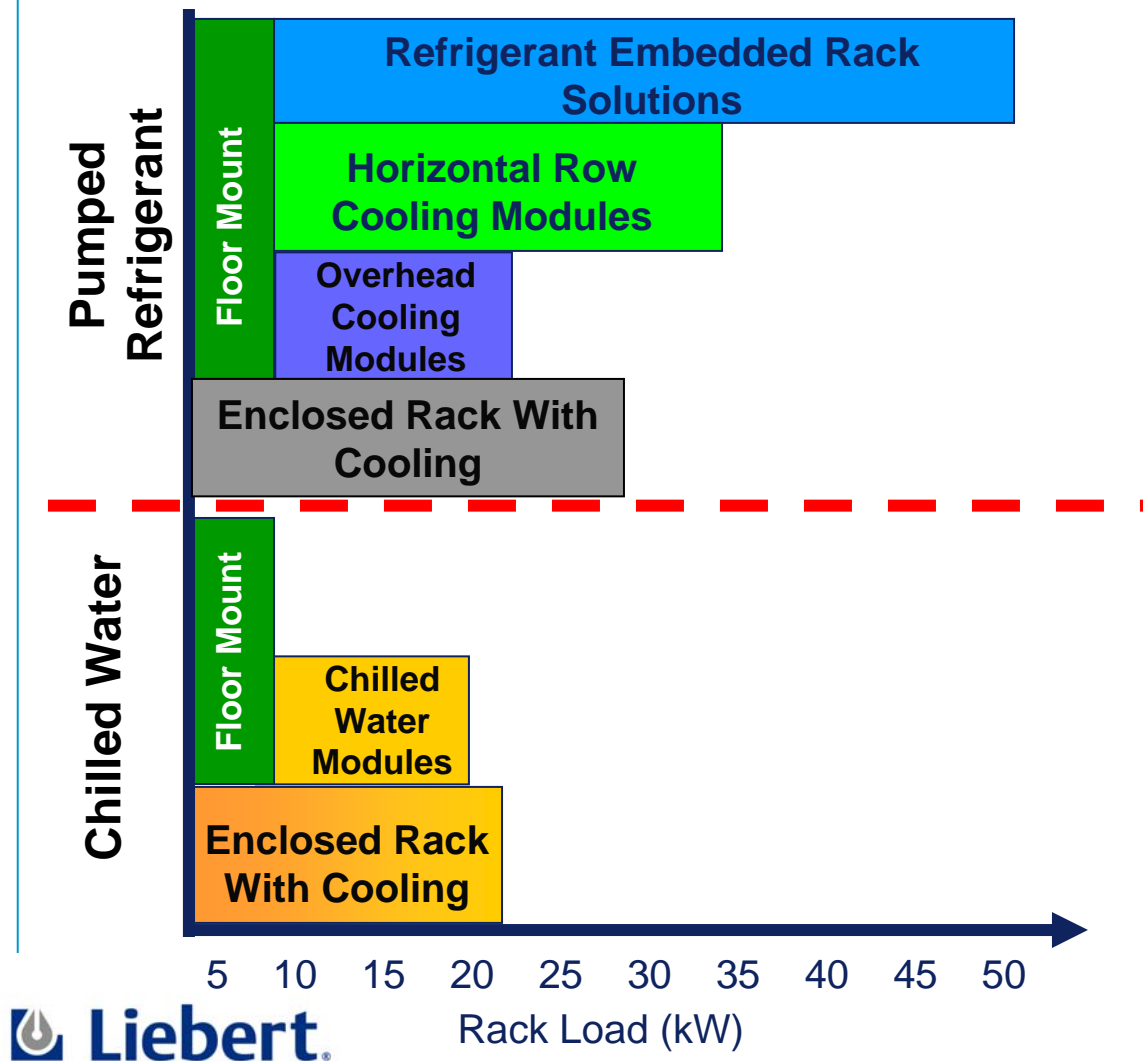


The average server replacement cycle is 3-4 years

# Investment cost advantage of higher density data center design



# Scalability of various cooling solutions

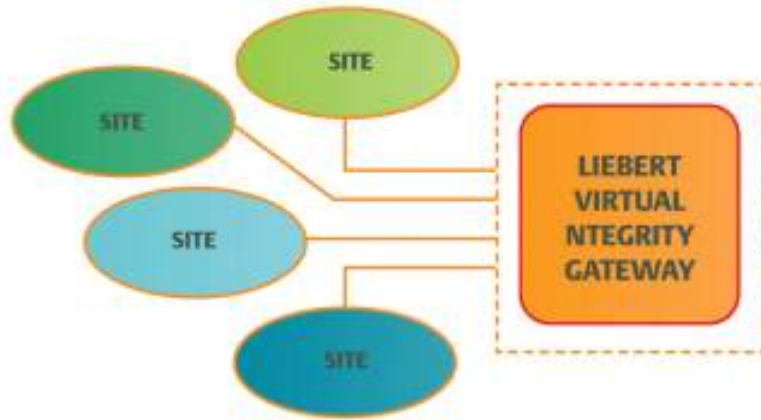


- Refrigerant-based options include cooling modules and the option to embed within the rack. Wide range and expansion capability (plug & play)
- CW modules are generally limited to the back of the rack
- On a standard rack footprint, CW enclosed racks are limited in coil surface

# *Monitoring Trends*

# *New monitoring technologies are emerging*

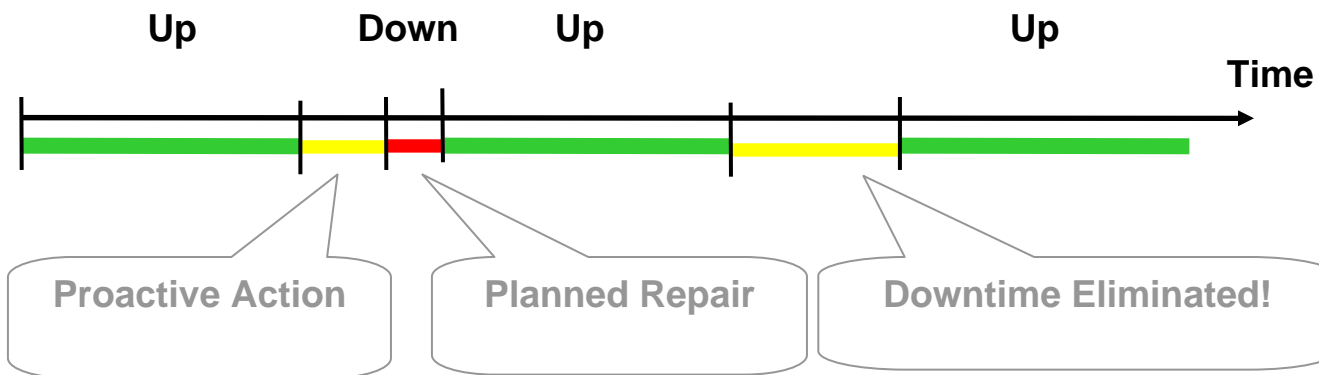
## Network-Enabled Monitoring



## Monitoring at the Outlet Level

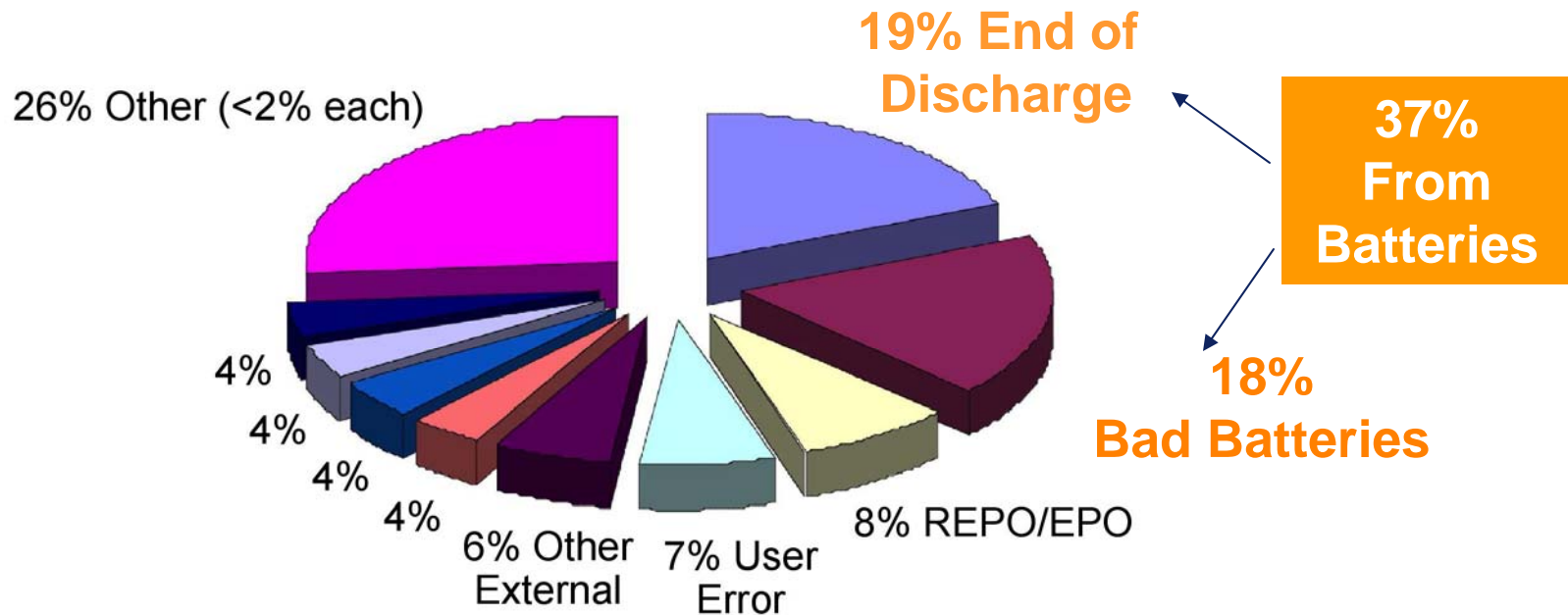


## Proactive Monitoring



# Batteries run the UPS, are yours healthy?

## Leading Causes of UPS Load Loss

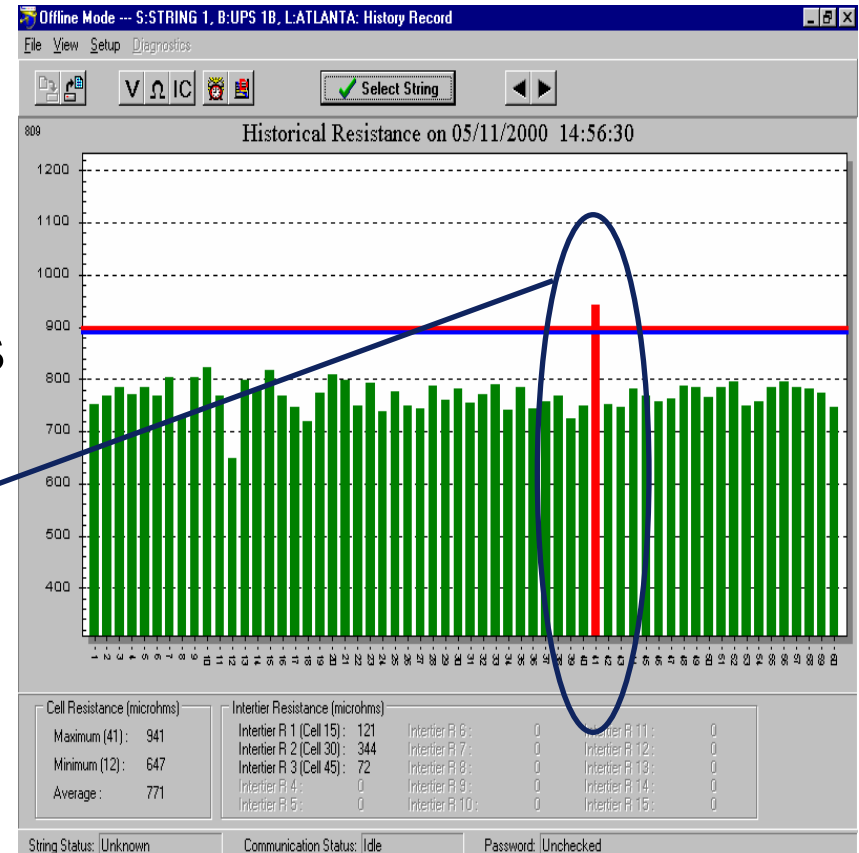


Source: Emerson Network Power Services



# Battery monitoring strengthens a weak link

- Problems fixed prior to failure point
- Reduce mean time to repair
- Improve purchasing decisions based on data

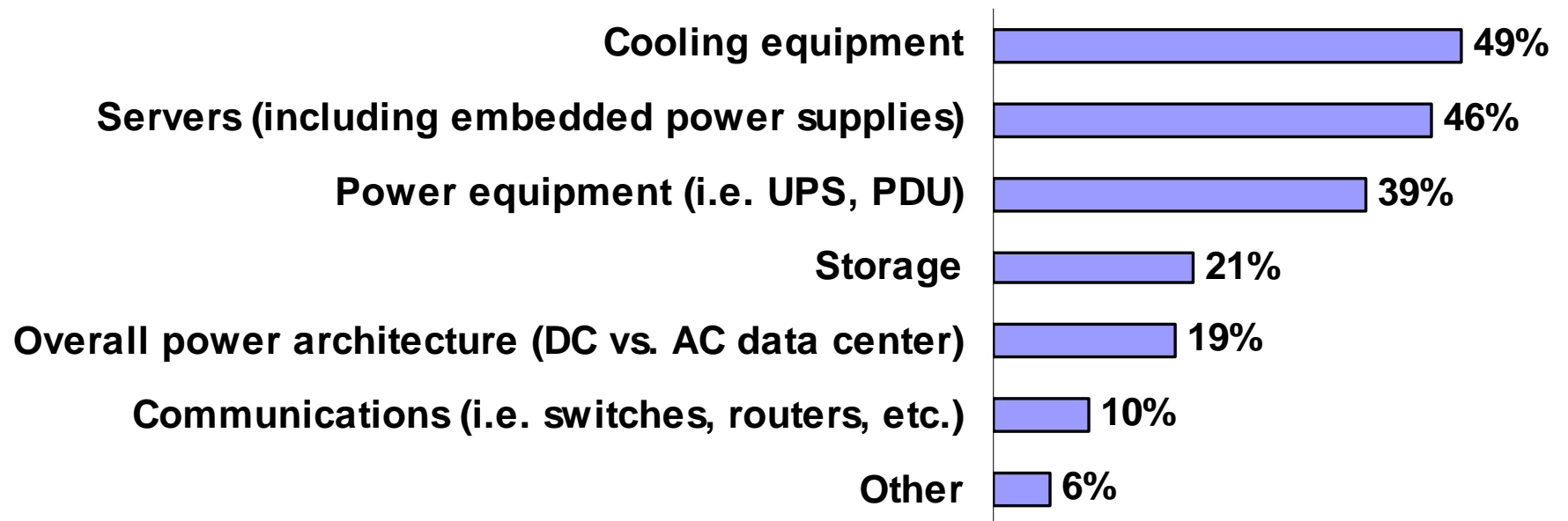


# *Energy Efficiency*

## *Energy efficiency is becoming a priority*

- 42% of survey respondents have either analyzed efficiency or are currently analyzing efficiency

### Respondents perceived the greatest opportunities to be:



***Thank you!***

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Questions?

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