

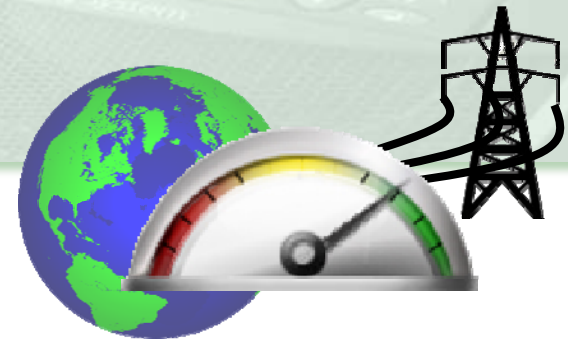


# Managing the Data Center to Profitability

*Are my current data centers efficient?*

*Reducing energy consumption*

*The ROI of efficiency improvement*



# Agenda

---

- Drivers of Inefficiency
- Which Infrastructure to Focus on?
- Complexity of Comprehensive Efficiency Management
- Helpful Tools for Design and Implementation
- Summary – Are you Optimizing Your Infrastructure?

# Key reference points

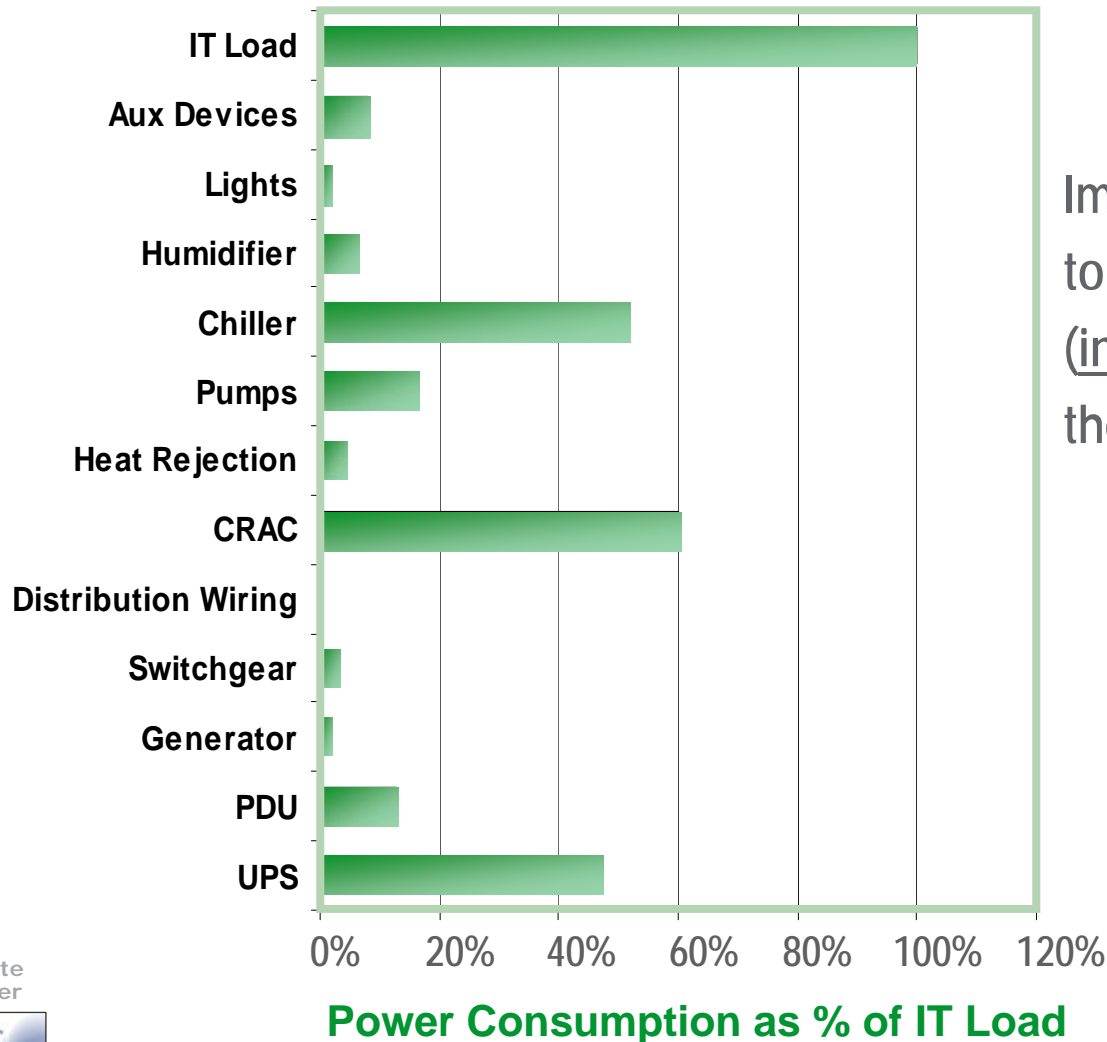
- **More than 50% of power** going into a typical data center goes to the power and cooling systems – **NOT to the IT loads**
- The typical 1MW (IT load) data center is continuously wasting about 400kW due to poor design (PUE = 2+, instead of best-practice 1.3-1.5)
- **Every kW saved** in a data center saves about **\$1,000 per year**
- A **1% improvement** in PUE corresponds to approximately **2% reduction** in electrical bills

# Primary drivers of inefficiency

---

- Oversizing of power and cooling equipment
- Pushing cooling systems to cool densities higher than they were designed for
- Ineffective room layout
- Ineffective airflow patterns
- Redundancy (for availability)
- Inefficient power and cooling equipment
- Inefficient operating settings of cooling equipment
- Clogged air or water filters
- Disabled or malfunctioning cooling economizer modes
- Raised floor clogged with wires

# Power consumptions compared to the IT load



Improving efficiency means working to reduce power consumption (increase efficiency) for each of these device categories

White paper

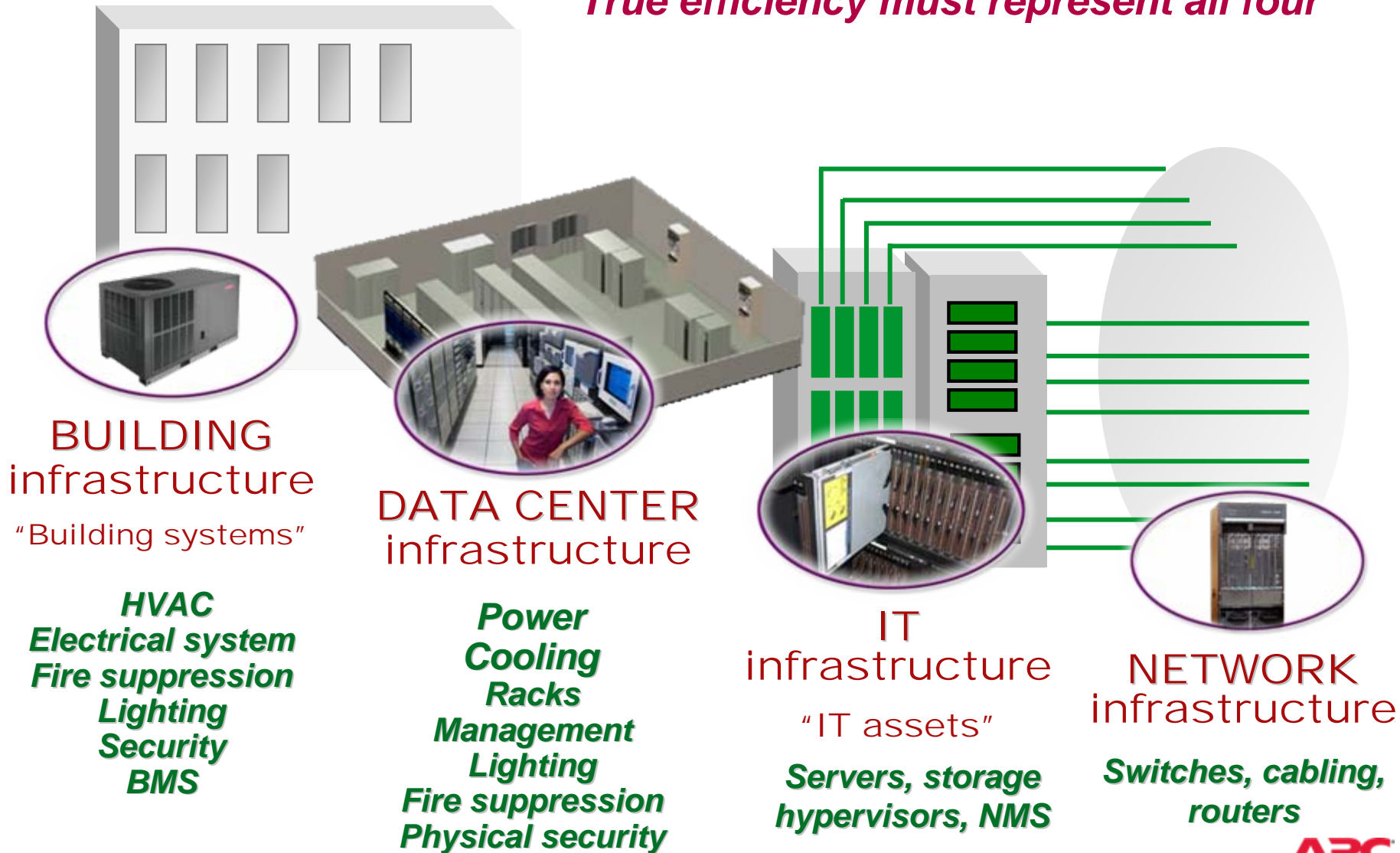


144

Data for a typical tier 4 data center operating at 30% of rated load

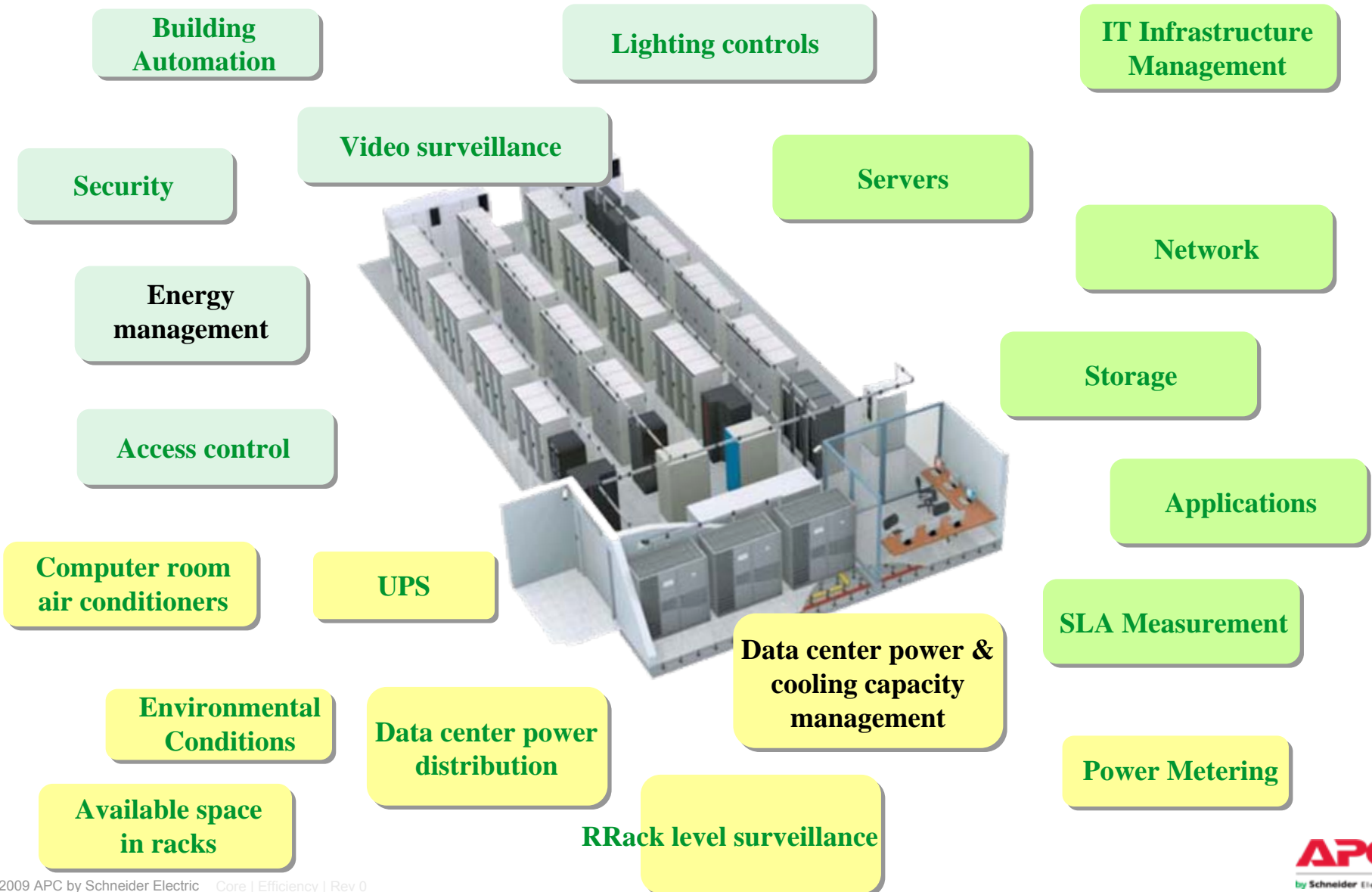
# WHICH infrastructure?

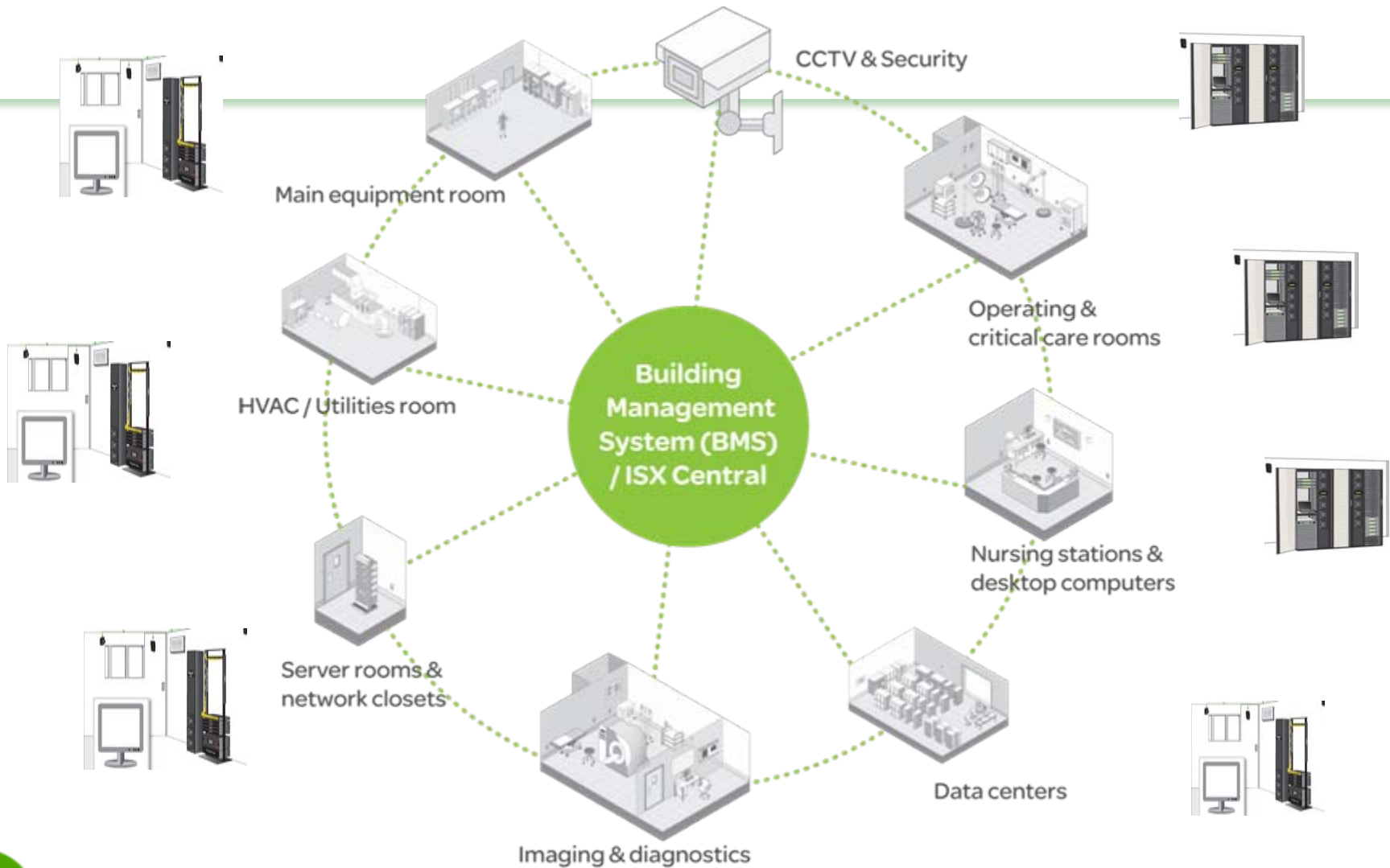
*True efficiency must represent all four*





# Data Centers Have Complex Management Issues





Health Care Example: Integrated management platform to achieve the highest availability and highest efficiency

# Impact of management from rack to the building

## > Thermal Issues

- Visibility of thermal issues from rack to row to room to building
  - Rack/Row – Row based cooling issues?
  - Room – Perimeter cooling issues?
  - Building – Chiller issues?

## > Power Issues

- Visibility of critical power distribution from the building to room to row to rack
  - Rack/Row – metered power distribution, capacity management issues?
  - Room – critical power distribution issues? Power overload issues?
  - Building – MV/LV Distribution issues? Generator issues?

## > Physical Security Issues

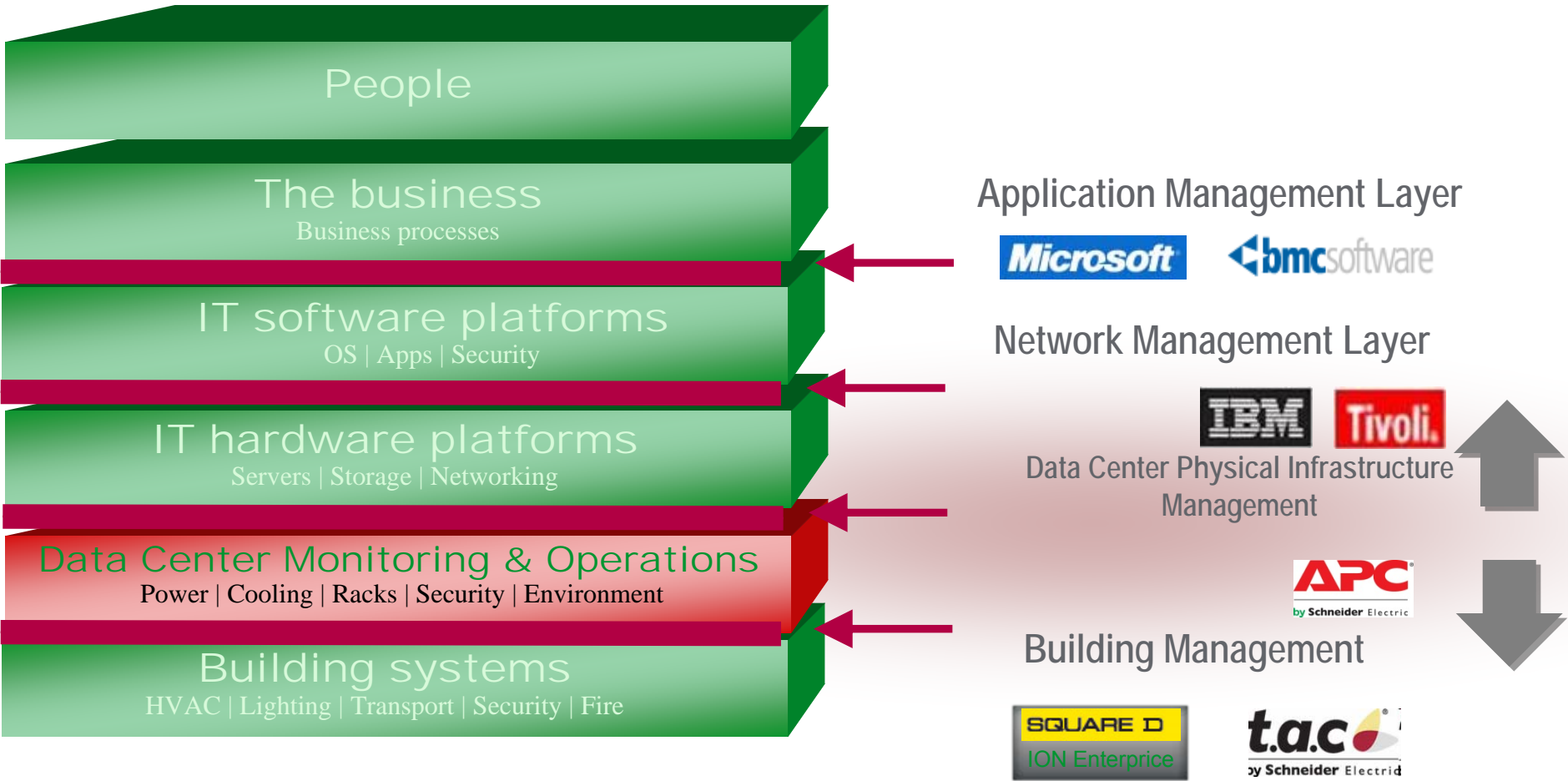
- Visibility of physical security from inside of IT space through the healthcare facility
  - Rack/Row/Room/Building – Access to rack/row/room/building issues?



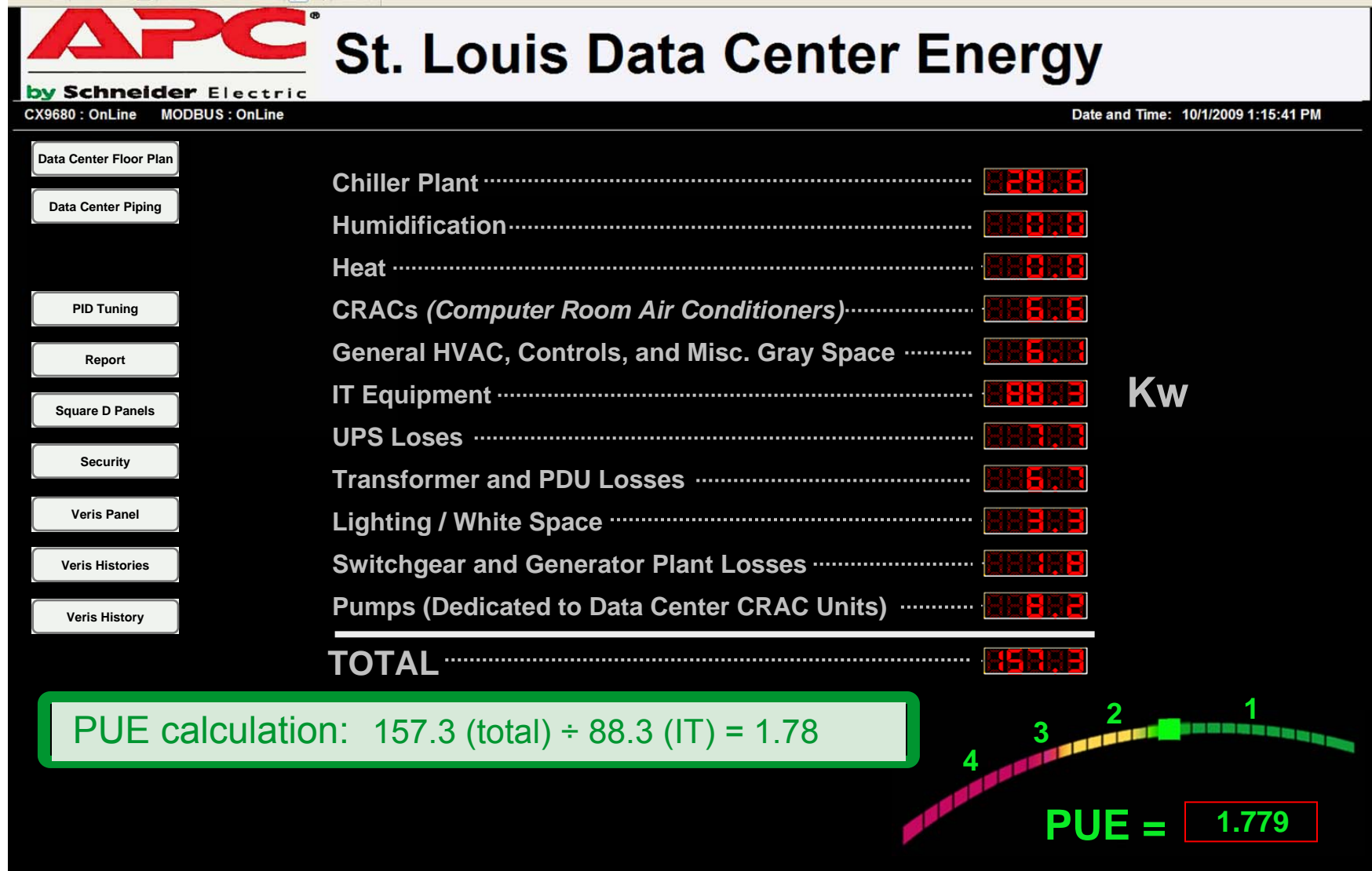
One integrated view of facility and IT physical infrastructure is the only way to non-stop digital management

# Integrations Up & Down the Stack

## Layers of management



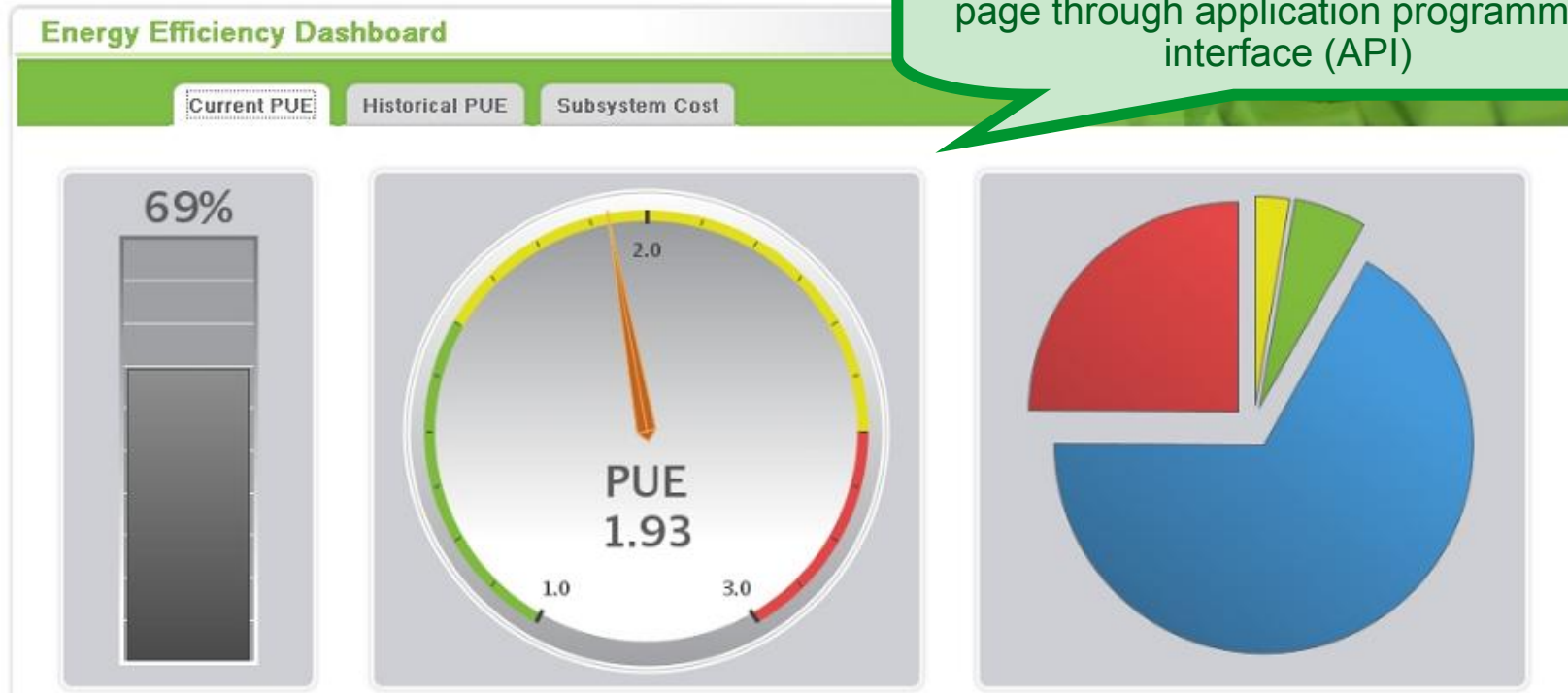
# BMS: Data center main screen- monitoring, control, overall energy use & PUE



# Efficiency dashboard

## Web-enabled interface

For easy integration with 3rd party web page through application programming interface (API)



### Your current IT Load

The IT load is expressed as a percentage of the full capacity rating of the physical infrastructure.

### Your Current PUE

This dial displays the infrastructure efficiency expressed as Power Usage Effectiveness (PUE). PUE is a measure which is expressed as the relationship between the total datacenter input power and the IT load.

### Your Current Losses by Subsystem

This pie chart displays the energy consumption by the infrastructure subsystems.

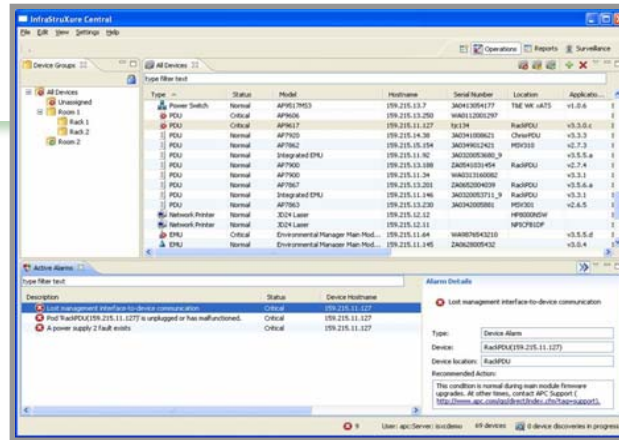
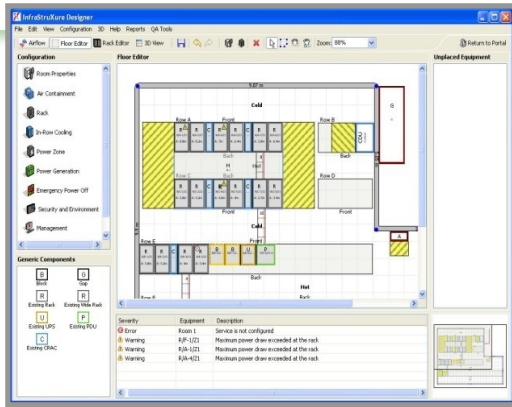
Power system	24.9%
Cooling system	66.8%
Auxiliary System	5.5%
Lighting	2.7%

## Energy efficiency calculation

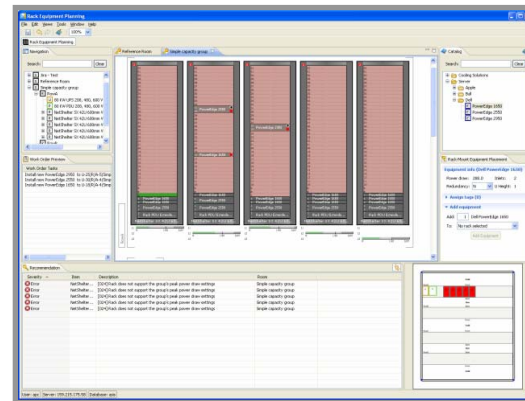
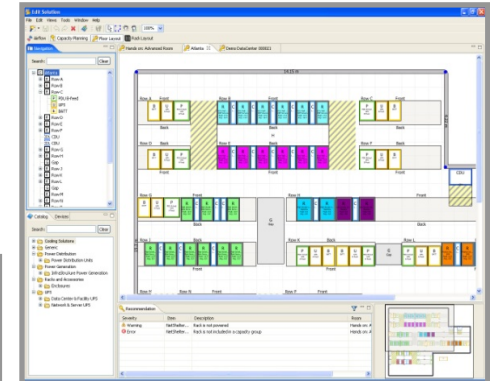
Current and historical PUE values based on the current IT load for a fact-based understanding of energy efficiency at the facility level

## Subsystem energy losses



Insight into energy losses and cost of subsystems, with details of which subsystem draws the greatest cost



# Comprehensive Data Center Physical Infrastructure Management



# Tools can provide help to manage data center carbon footprint

- ✓ Efficiency Assessment and Carbon Assessment services
- ✓ InfraStruXure Designer
- ✓ Standard data center specifications 
- ✓ Highest efficiency power and cooling equipment
- ✓ ISX Central data center management software
- ✓ Detailed power and cooling device efficiency data
- ✓ 

# Data Center Efficiency Calculator

Impact of alternative power and cooling approaches on energy costs



About this tool

## INPUTS

Data center capacity:

IT load:

Electricity cost per kWh:  \$

UPS system: Legacy

Power redundancy: Single path power

Cooling system: Chilled water

Chiller: Chiller with cooling tower

Air distribution: Perimeter cooling

CRAC/CRAH redundancy: Single Path CRAC/CRAH

Heat rejection redundancy: Single path heat rejection

Lighting: Typical lighting

- Standby generator
- PDUs without transformers
- Blanking panels
- Economizer
- Dropped ceiling return
- Deep raised floor
- CRAC/CRAH on UPS
- Coordinated CRAC/CRAH
- N/A VFD heat rejection pumps
- N/A VFD chilled water pumps
- Optimized rack layout
- Optimized tile placement

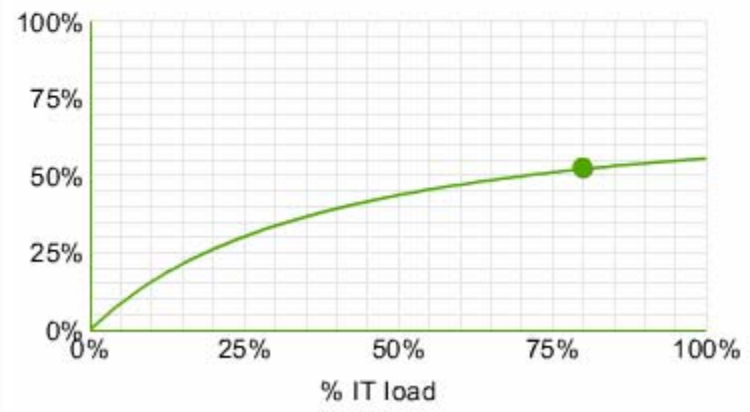
## RESULTS

### Data center infrastructure efficiency (DCiE)



Annual electricity cost: € 1,599,258

### Efficiency curve



Go to latest online version of this tool



Click to resume presentation mode

# Work with Utility or Energy Consultant to perform electrical efficiency assessment



## Table of Contents

- 1.0 Executive Summary
- 2.0 Features & Benefits
- 3.0 Details of Service
- 4.0 Deliverables
- 5.0 Assumptions
- 6.0 Scope of Responsibility
- 7.0 Project Work Details
- 8.0 Pricing

## 1.0 Executive Summary

The Data Center Electrical Efficiency Assessment provides an analysis of the Power and Cooling systems to determine the operating efficiency of the complete system. In addition, the system is benchmarked against the expected values of efficiency based on the inherent design, and against other similar data centers. The projected efficiency under changing IT loads such as a growth plan, is calculated.

Our service professionals will provide an accurate assessment of the factors that are limiting the achievable efficiency of the data center and will make recommendations for changes to maximize efficiency. This will include:

- Assessment and analysis of the data center's as-built electrical efficiency
- Breakdowns of losses into power, cooling, and lighting losses
- Breakdown of the cooling system losses into CRAH, humidification, and outdoor heat rejection losses.
- Breakdown of the power system losses into UPS and power distribution.
- Creating and providing a mathematical model of the data center that can be used for benchmarking or scenario analysis
- Comparing the actual efficiency to the efficiency that should be expected based on the design, and identifying any constraints that are preventing the system from achieving its expected efficiency
- Detailed recommendations for improving the efficiency of the data center, taking into consideration the constraints of the facility

## 2.0 Features & Benefits

# Data center efficiency Summary



Are my data centers efficient?

***Probably 5-20% less efficient than they could be; you can learn a lot from a data center efficiency assessment***

How do I reduce energy consumption?

***Identify the inefficiencies and correct them. Simple changes like temp settings can lead to remarkable improvements. Design new data centers and/or zones for high density. Use right-sized, high-efficiency power and cooling equipment***

Does efficiency improvement have a good ROI?

***Many improvements are essentially free during design of NEW data centers or zones. Most EXISTING data centers have significant quick-win opportunities that can be identified during an assessment***