Smart Work for a Smarter Planet:

Business Aligned IT Discovery Series 2009.

Get Instrumented, Intelligent, and Interconnected.
And Ready for a Smarter Planet.

Deploying a Dynamic Infrastructure

Energy Efficiency Priorities, Capabilities and Experiences

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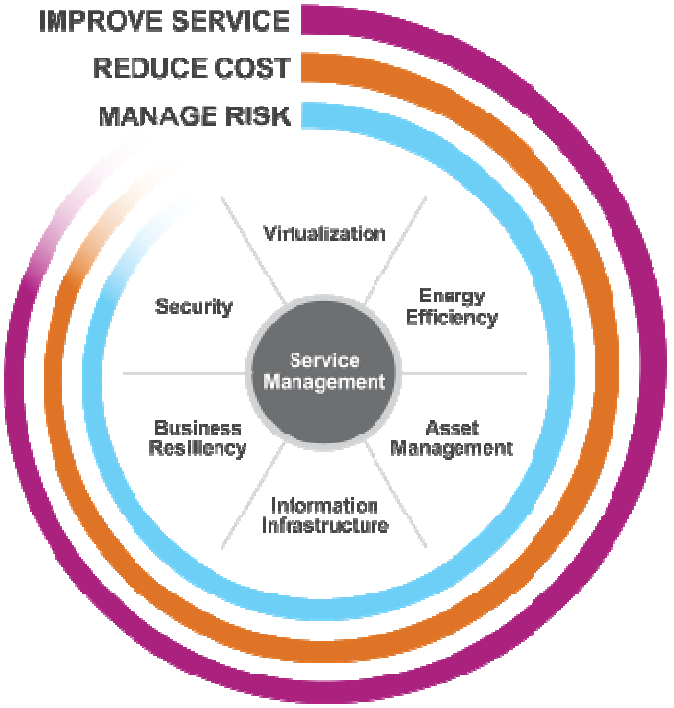
IBM ASEAN

Deploying a Dynamic Infrastructure

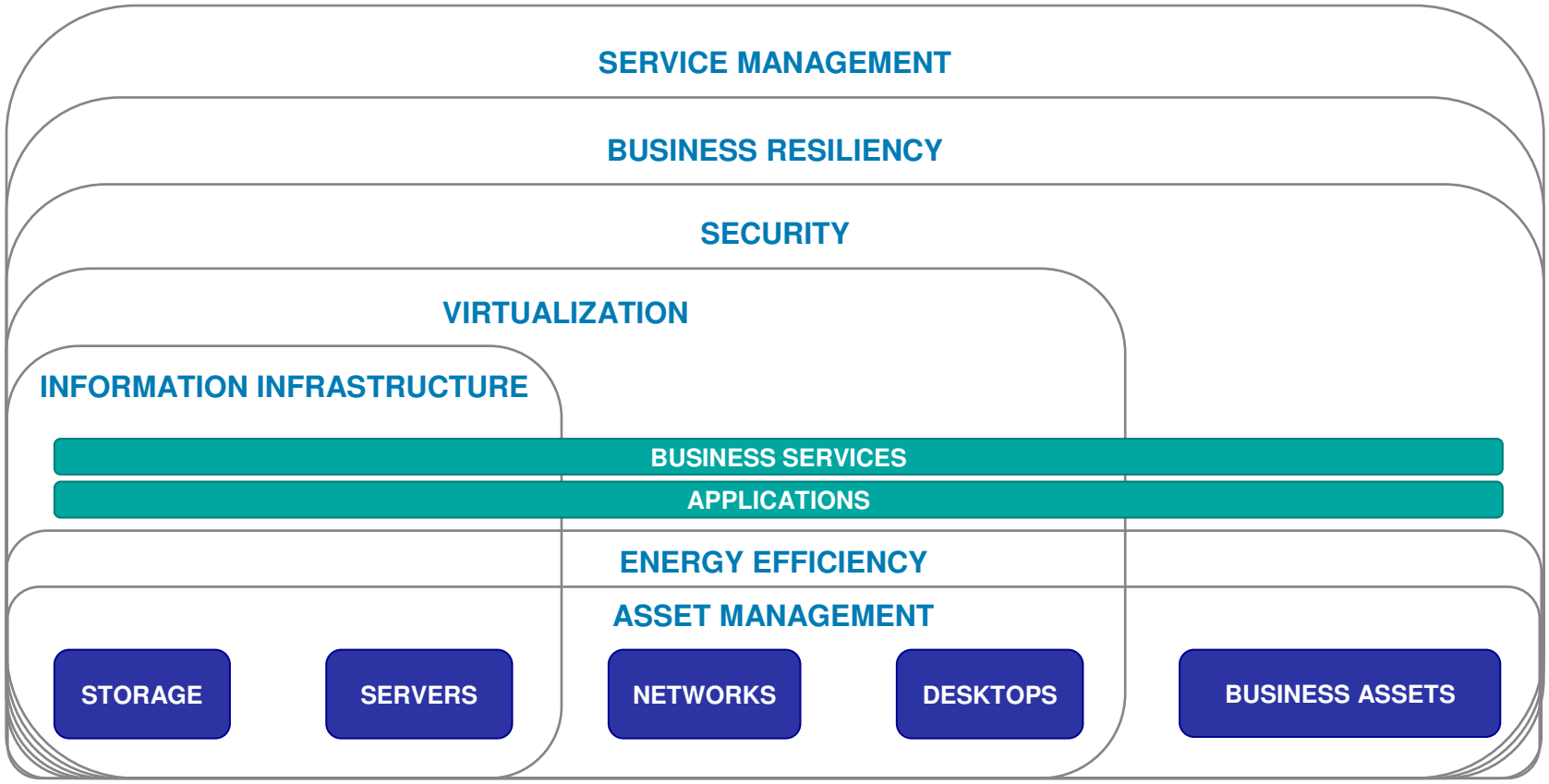
Energy Efficiency Priorities, Capabilities and Experiences

Agenda

- **An overview of Energy Efficiency**
- **How Energy Efficiency is being exploited in the market**
- **How ISM Group applies Energy Efficiency**
- **Business and IT priorities for Energy Efficiency**
- **How IBM is enabling Energy Efficiency with our clients**
- **Current Energy Efficiency capabilities**
- **Customer successes deploying Energy Efficiency**



Energy Efficiency delivers capability for a portion of infrastructure, applications and business services

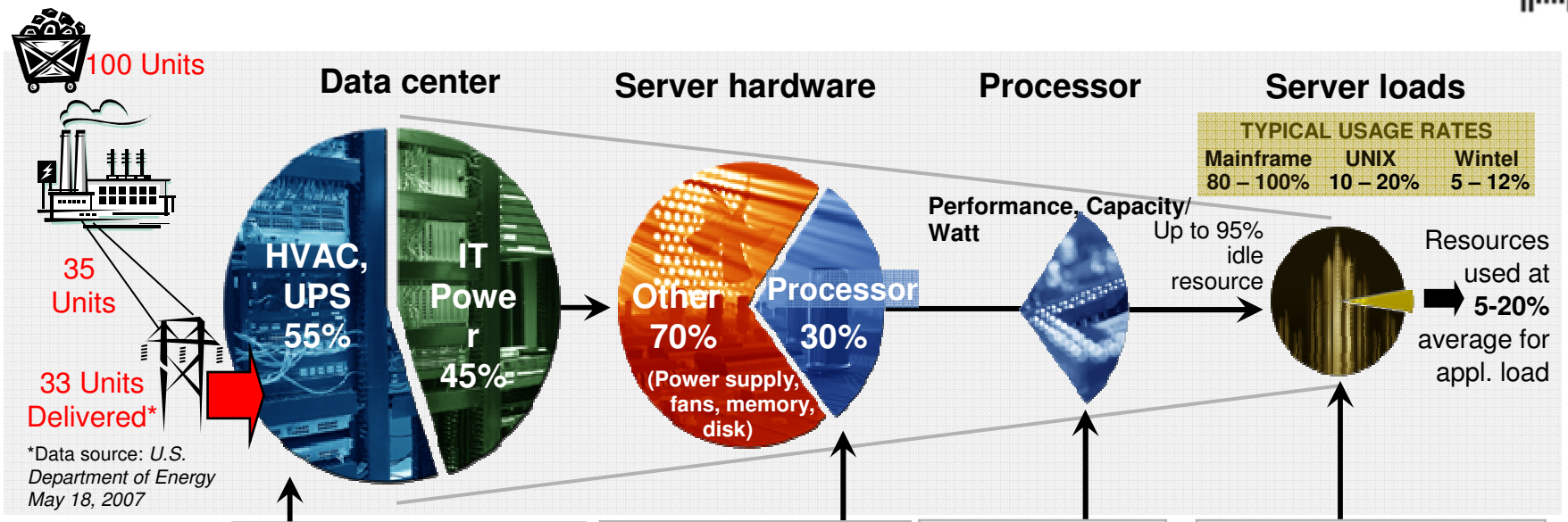


Energy Efficiency Overview

- **Lack of Sufficient Electrical Power**
  - **The University at Buffalo installed a $2.3 million Dell supercomputer**
  - Upon delivery, officials discovered there was only enough power for 2/3 of the system.
  - A $20,000 electrical-system upgrade was required
- **Escalating Energy Costs Eroding Profits**
  - **International Data Corporation (IDC - Doc #204904, Dec 2006)**
  - "Between 1996 and 2010, server spending is will remain flat, but energy costs are expected to increase **8X**
- **Lack of Sufficient Data Center Cooling**
  - **Pomona Valley Medical Center is a California hospital whose data center grew from 30 to 70 servers.**
  - The heat generated overwhelmed the A/C system, temperatures reached 92°, and machines behaved erratically.
  - In 2003, an air-conditioning unit broke down, sending the temperature over 100 degrees.
  - The event caused a shutdown of systems serving the hospital's laboratory, $40,000 in damage to servers and
    hard drives, and prompted a $500,000 retrofitting of the cooling system.
- **Government Regulations Driving Greater Energy Efficiency in Data Centers**
  - **The US Environmental Protection Agency (EPA)**
  - The EPA was directed by federal legislation (H.R. Bill 5646, now public law 109-431) to study and promote the use of energy efficient computer servers in data centers.
  - **Energy Conservation Center of Japan (ECCJ)**
  - Passed similar legislation to that of the EPA.

Energy Efficiency Overview

Data Center energy has become a significant part of the TCO, how is it consumed?



How to improve efficiency

Reduce cooling/UPS needs vs. energy going in servers, capture heat at source	Higher efficiency infrastructure, power management' (≥ 3yrs older is good target)	Reduce consumption @ chip level (Cap power usage)	Reduce idle/unused capacity which still consumes energy
More efficient cooling and energy supply	*Better server hardware design*	*Advanced processor design + process*	*Enhance resource usage rate (consolidation/virtualization)*

Significant potential to reduce energy and cost savings

At 40% annual energy savings for infrastructure alone

- **A typical, medium size data center of 25,000 square feet**
- **Savings at $0.12 per kilowatt hour = $735,000**
- **Savings at $0.18 per kilowatt hour = $1,103,000**
- **Or the equivalent of 850 cars off the road**

Optimizing across the enterprise yields dramatically greater savings

- **Very small data center of 3,500 square feet**
- **Yielded $7M operational savings**

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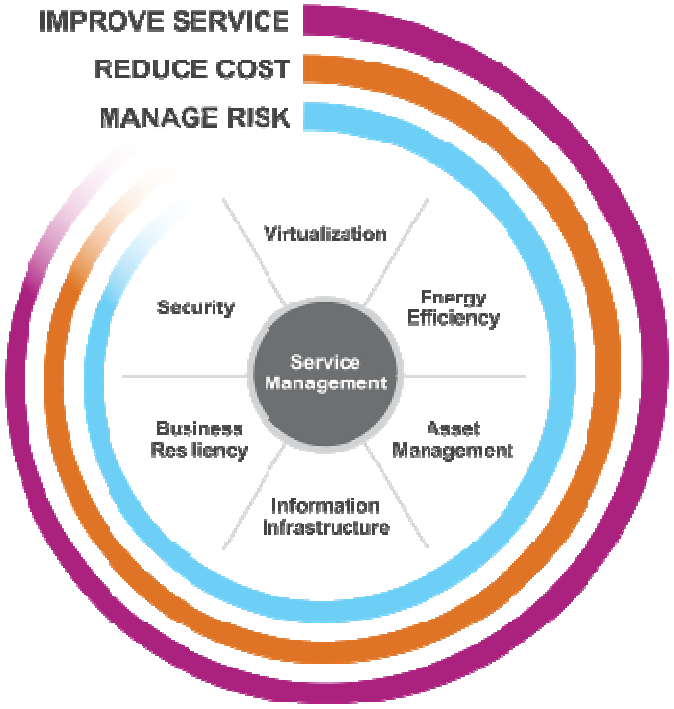
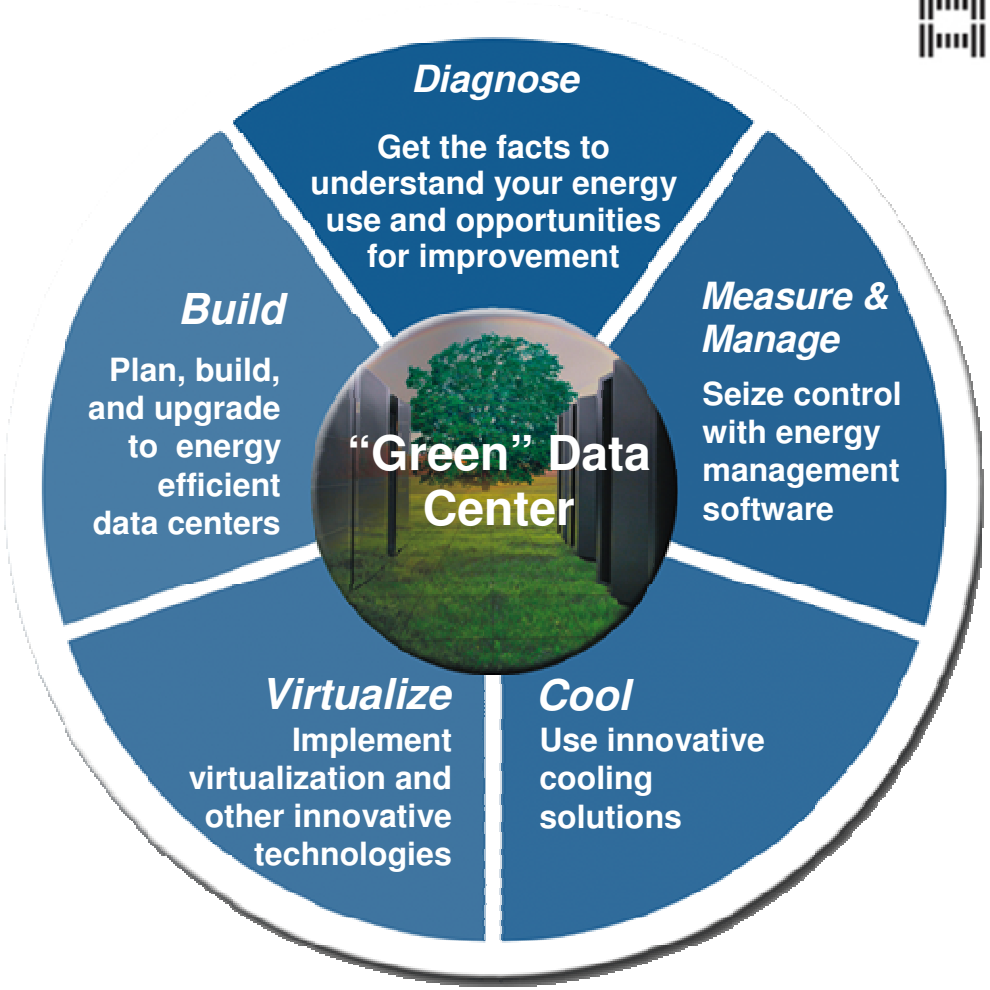


Through a five building block approach, energy efficiency is exploited to achieve various business priorities

- Double your IT capacity
  - Same energy footprint
- Reduce operational costs
  - Energy reduction
- Positive environmental impact
  - Reduce carbon footprint



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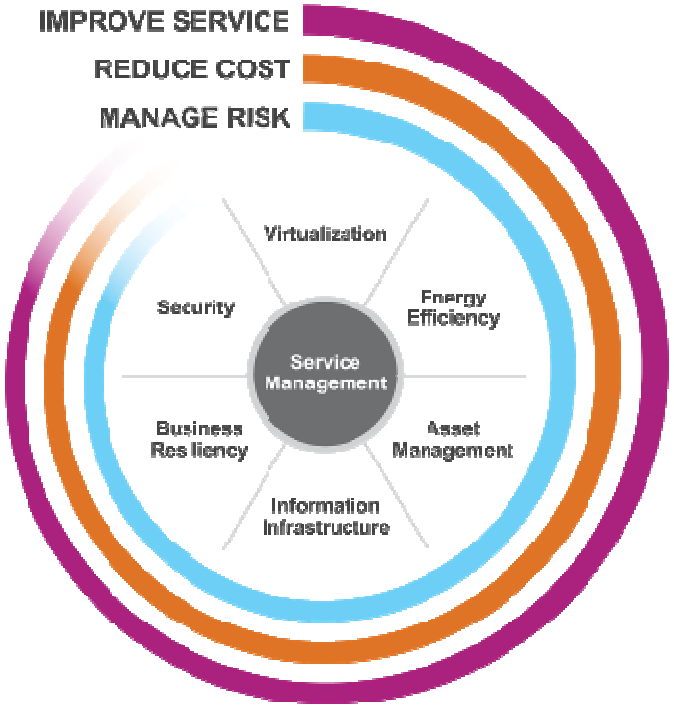
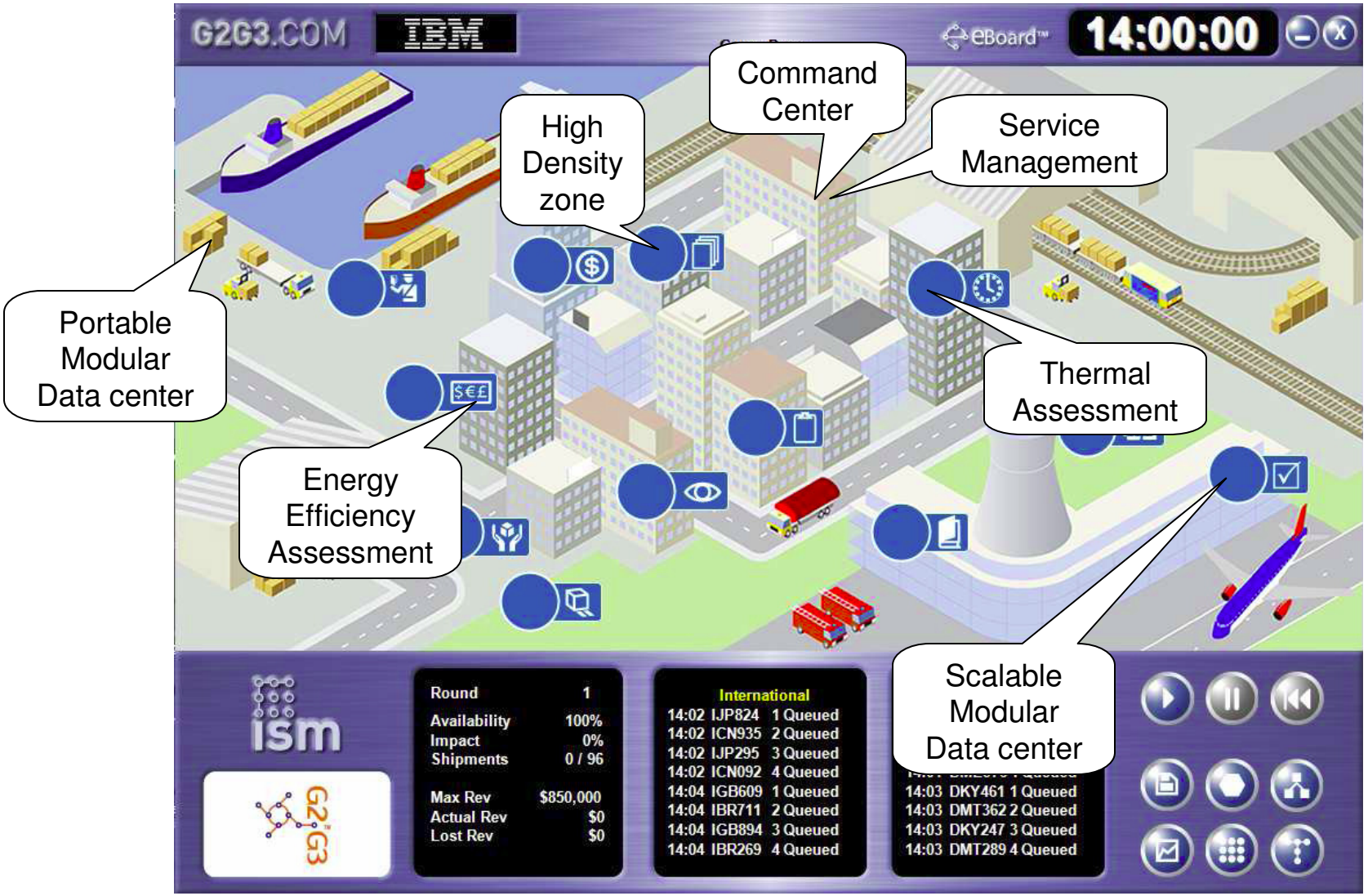


ISM Company: Energy Efficiency Implications



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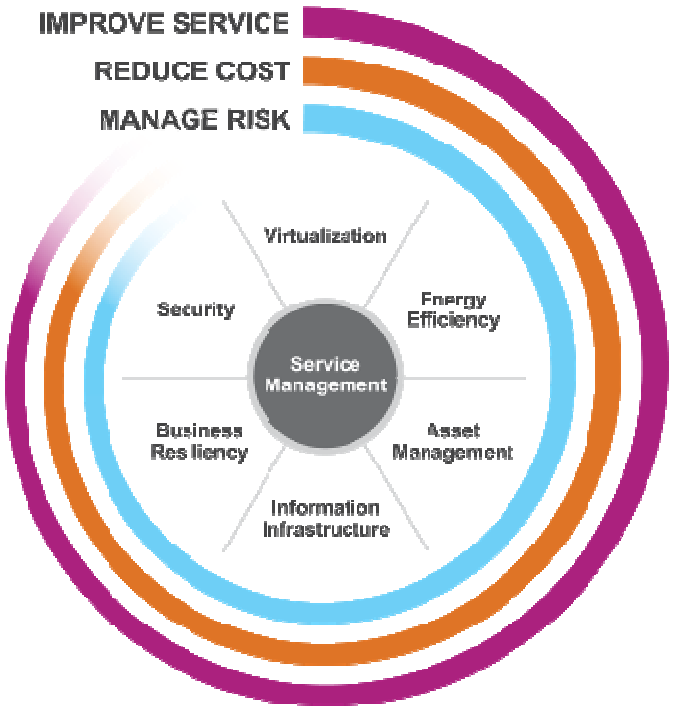

What is your top business priority around energy efficiency?

Select what is MOST important to your organization

1. Increase computing capacity with the same energy footprint

2. Save operating energy cost

3. My customers require my products and services to be “Green”

4. Our company views energy efficiency as a Corporate Social Responsibility

What is your IT priority around energy efficiency in your organization?

Select the most appropriate answer

1. No focus in achieving energy efficiency via data center action

2. I understand the benefits of energy efficiency and am exploring different solutions while planning budget to achieving it

3. Energy efficiency is strategic and I already have some action planned for execution

4. Energy efficiency is compelling and immediate results are expected

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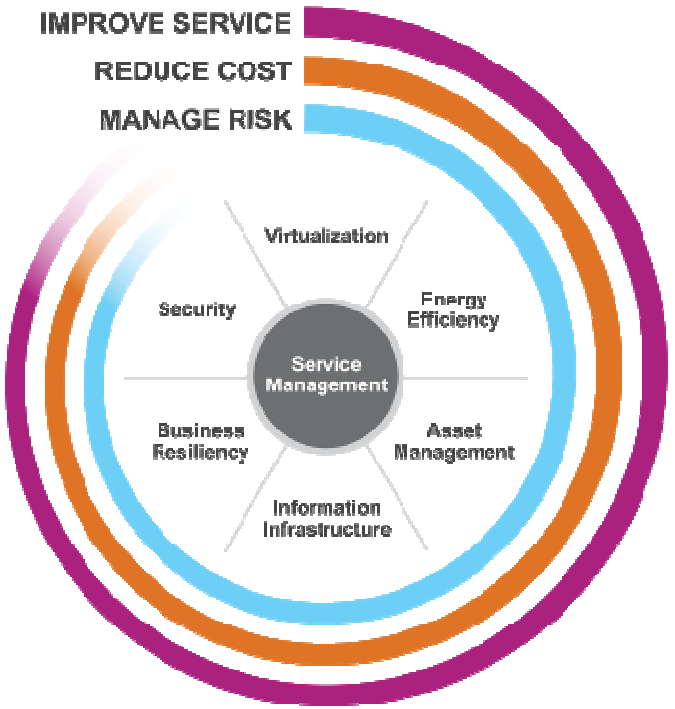
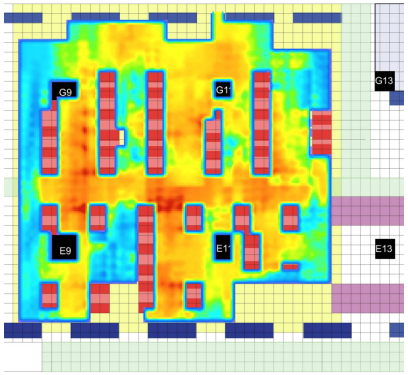
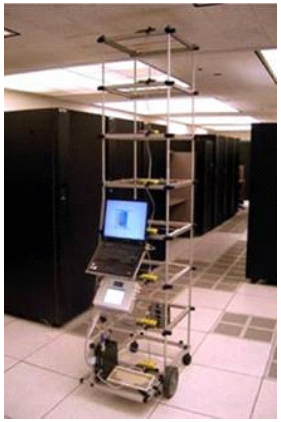
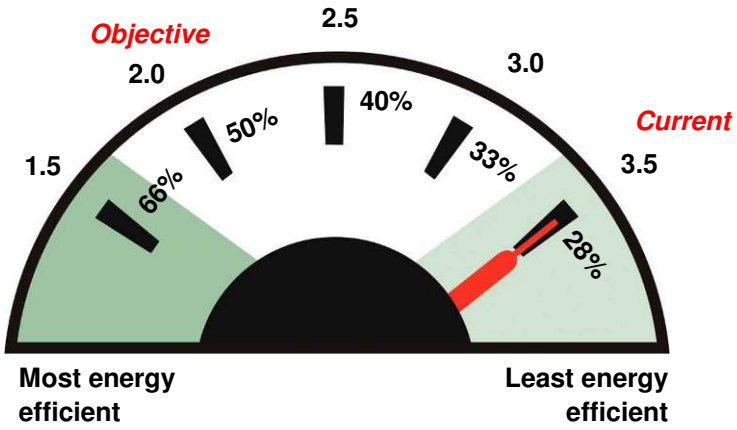


IBM works with our clients to assess their current energy efficiency situation

- Energy efficiency assessment
  - Electrical
  - Mechanical
  - Building and lightings
- Thermal analysis
  - Thermal simulation
  - Mobile Measurement Tool







PUE: Power Usage Effectiveness
DCE: Data Center Efficiency

Building Load
Demand from grid

Total Facility Power

Power
- Switchgear
- UPS
- Battery backup
- Etc.

Cooling
- Chillers
- CRACs
- Etc.

IT Equipment Power

IT Load
- Servers
- Storage
- Telco equipment
- Etc.

$$PUE = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}}$$

$$DCE = \frac{1}{PUE} = \frac{\text{IT Equipment Power}}{\text{Total Facility Power}}$$

Design for flexibility with modular data centers

IBM's Data Center Family™ solutions align to your business and cost objectives

Scalable modular data center

- Turnkey center for 500-2,500 sq ft
- 20% less cost than traditional center
- Implement in 8-12 weeks

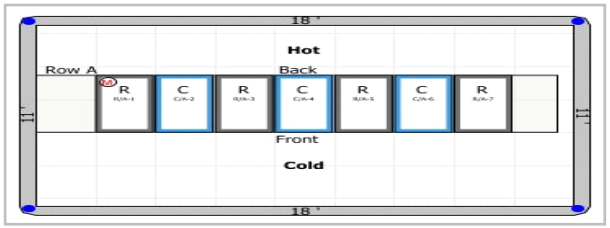
Enterprise modular data center

- Standardized design for 5- 20K sq feet
- Defer 40-50% capex and opex costs
- Save to 50% operational costs
- Level 3+ design for availability at 66% DCiE
- 25% faster deployment than custom approach

Portable modular data center

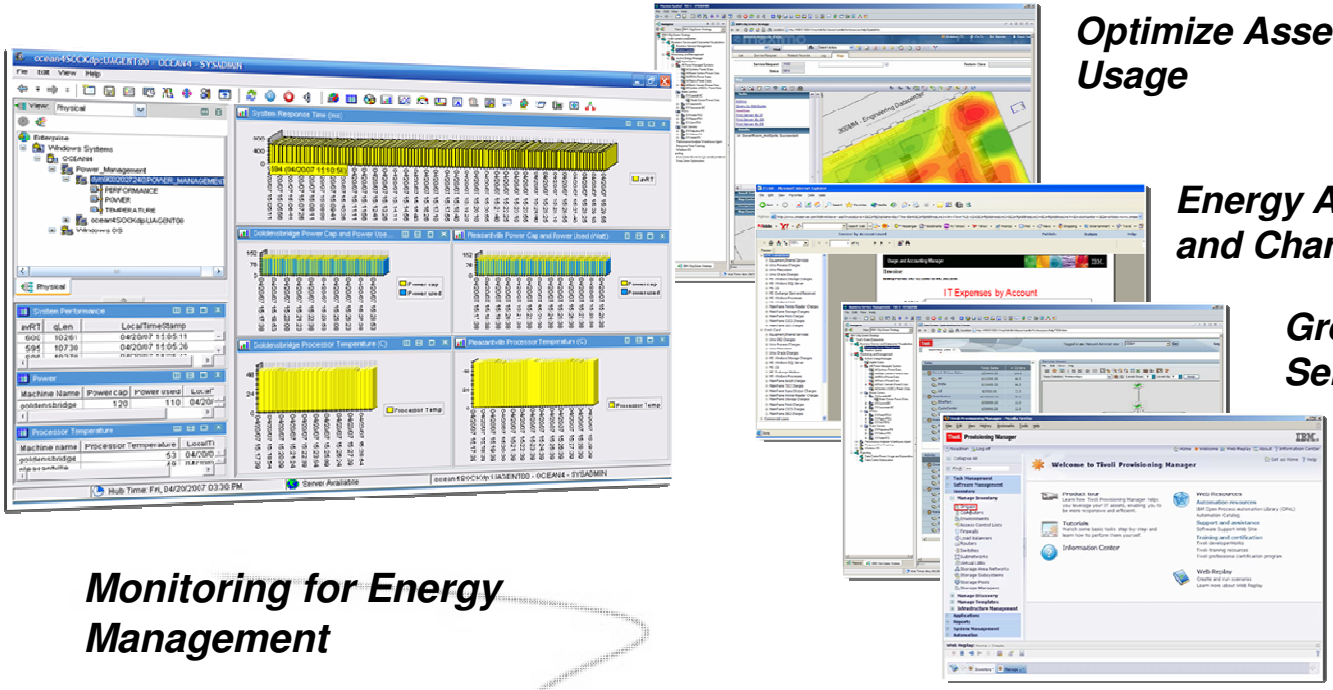
- Fully functional data center with multi-vendor support
- Rapidly deploy in 12-14 weeks
- Targeted for temporary and remote data centers

High density zone



- 35% lower cost than data center retrofit
- "Plug and play" infrastructure to support high density servers in existing data centers
- Non-disruptive implementation
- 80% lower cost than same capability in new data center

IBM Service Management solutions for energy efficiency



Optimize Assets by Energy Usage

Energy Accounting and Chargeback

Green Business Services

Energy Aware Provisioning

Monitoring for Energy Management

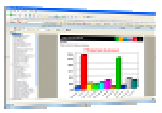
Integrated Energy Management

- Single interface for collecting energy data across IT, data center, and facilities assets

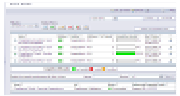
Industry Leadership

Service management capabilities to allow for intelligent *real-time and predictive* energy management decisions while maintaining IT service levels

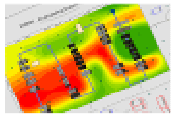
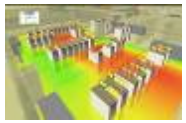
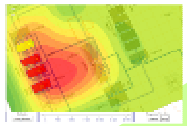
Tying It All Together:
End-to-End Energy Management




Energy Usage, Accounting, Reporting, and Chargeback – Incent users to use less! (TUAM)

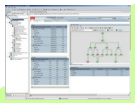



Automated Corrective Action – Shift workload to Cool Areas, or More Energy Efficient Servers (TPM and TAMIT)

Identify Hot Spots, Cool Areas (Maximo Spatial)





Capture Thermal Events (TEP, Netcool/Omnibus)
Shows Business Service Impact (TBSM Dashboard)


Monitor IT Assets (ITM, ITM for Energy Management)
+ Add Data Center Infrastructure - HVAC, PDU's, UPS, CRAC
+ Building Automation Systems - BAS

= "Solution that integrates monitoring, relationships, events across IT and facilities"

CCMDB

Save IT Asset Information (CCMDB), Power Consumption Ratings (TAMIT)


Discover IT Assets and Relationships (TADDM)

Collect Device Information (Active Energy Manager, IBM Systems Director)

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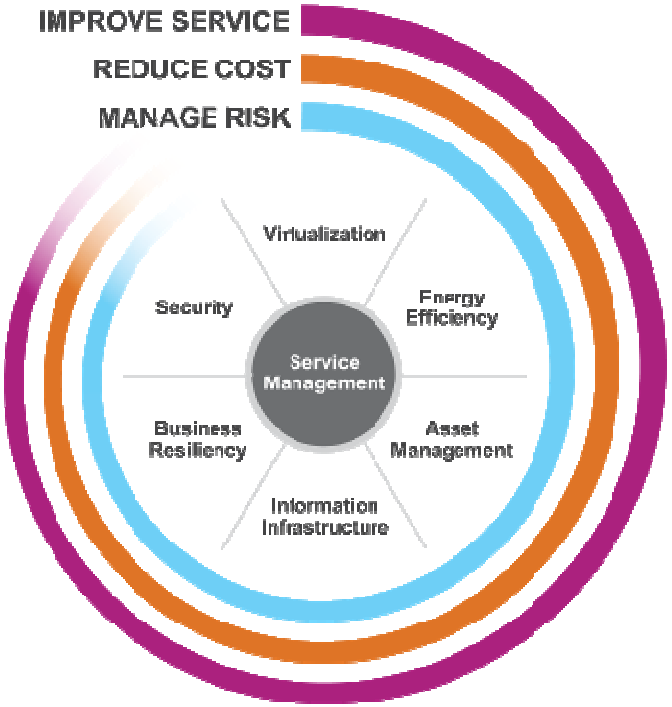

How would you rate your organization's data center energy efficiency capability?

Select what best describes your organization

1. I am least concerned about my data center energy consumption

2. I need help to identify my data center inefficiencies and how to fix them

3. I know where my data center inefficiencies are and I need help to fix them

4. I know where my data center inefficiencies are and I know how to fix them

Is your data center ready to support new high density technologies?

Select what best describes your organization

1. My facilities department has insufficient power and cooling for high density computing deployment

2. My facilities department will support, but will take a long time to prepare the data center for high density computing deployment

3. My facilities department coordinates efficiently with my IT department to promptly enable the data center for high density computing

4. My data center is well equipped to support new high density equipment today

Rate your organization's capability in assessing the energy efficiency of your data center

Select what best describes your organization

1. I do not have the processes, methods, tools nor skilled people to assess the energy efficiency of my data center

2. I have some skilled people in-house, but lack the processes, methods and tools to measure the energy efficiency of my data center

3. I depend on a trusted partner to help me assess the energy efficiency of my data center

4. I have all the processes, methods, tools and skilled people in-house to assess the energy efficiency of my data center

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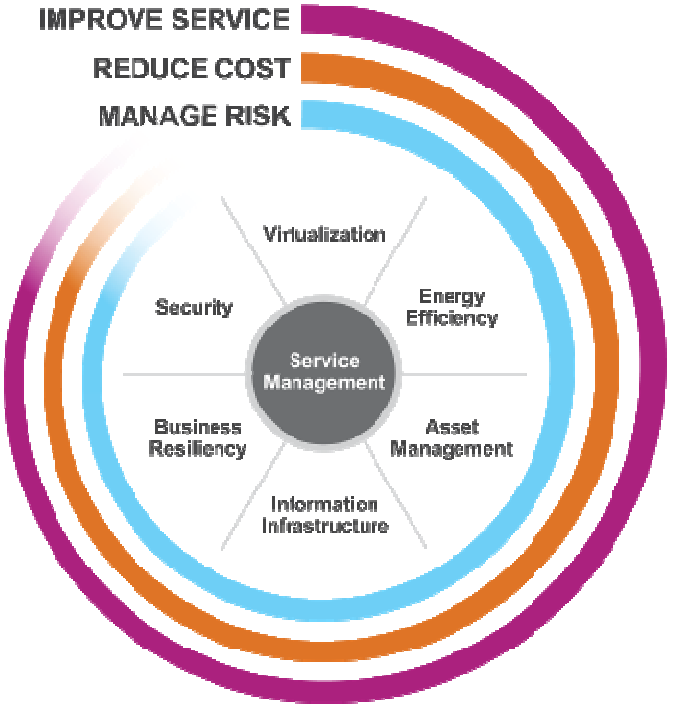


Extend the life of your data center infrastructure

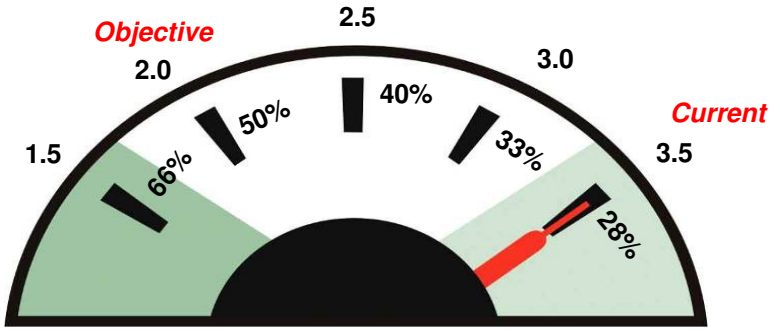
A US Utility saved 40% energy costs with an energy efficiency assessment

Solution

- Comprehensive, fact-based analysis
- Evaluate cooling, electrical and building systems
- Baseline MPG for data center energy efficiency
- Roadmap of cost justified recommendations

Benefits

- 40% annual savings on actions
- < 2 year payback
- Spend $14K to save $100K per year



Improvements	Cost ($K)	Payback
Reduce recirculation & bypass of cooling air	< 5	< 1 year
Increase CRAC air discharge temperature	< 5	<1 year
Adjust indoor temperature & relative humidity	< 3	<1 year
Turn off CRAC's where no IT equipment load	< 1	immediate
Improve UPS efficiency	40-140	1-2 years
Consider transferring IT loads to two PDUs	Varies	varies
Implement occupancy sensor light controls	< 5	1.5 years
Variable speed fans	200	6 years
Variable speed scroll compressors	300	18 years
Total	60 - 700	1 To 18 years

Scalable Modular Data Center, Kika/Leiner

One of Europe's top 5 furniture businesses goes Genuine

Client requirements

- Business expansion across Europe and Middle East
- Aging data center threatens growth
- Need for a rapidly deployable and Green data center concept on limited floor area

Solution

- **Implemented IBM Scalable Modular Data Center solution with advanced InfraStruXure® architecture from IBM Alliance Partner APC**
- **Standardized on IBM BladeCenter®**
- **Uses "green" design concepts such as free cooling, separate high density computing area, flexible expansion area for future growth**

Benefits

- **Supports corporate sustainability "Grüne Linie" (Green Line)**
- **Reduce electric power consumption by up to 40%**
- **Uses energy efficient servers which require 24% less energy than competition**
- **Improved security, reliability, and TCO**

"In IBM we have an IT partner who meets our ideal expectations for sustainable business"

- Dr. Herbert Koch, manager of the kika/Leiner group

Local university has implemented High Density Zone with Rear Door Heat Exchanger to reduce capex and opex

Solution

- iDataPlex high density computing
- IBM Rear Door Heat Exchanger (RDHx)
- Vette Coolant Distribution Unit
- Roadmap of cost justified recommendations

Benefits

- U$300K of capital expense saving
- U$800K operating expense saving in 5 years
- 33% space saving
- < 2 year payback

IBM Rear Door Heat eXchanger

Can now ***remove up to 100% of heat load***