



## *Data Centre Evolution*

### Managing a Data Centre for Energy Efficiency

**Tivoli** software

A decorative horizontal bar with a red background and various icons including a white asterisk, a woman's face, and a grid of circles.

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Green Computing Programme Manager  
IBM Software Group – UK, Ireland  
June 2008

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## What does an efficient, 'Green' data centre mean?

- Not everyone thinks 'Green'
  - More likely 'Virtualisation'
  - 'Optimisation'
  - 'Energy efficiency'
  - 'Out of Power or Space'
  - 'Reduce operational cost'
  - What does the message ultimately mean
    - ➔ Data centre optimisation and utilisation
    - ➔ Power & Energy efficiency (measuring, collecting, analysing, visualisation)
    - ➔ Data Centre Virtualisation
    - ➔ Effective management of the facility and IT as a holistic entity
    - ➔ Increased agility to meet business priorities and demands
- "We've only ever been told to perform, but never efficiently"***

# Multiple new factors are driving Organisations

## Costs



Oil reaches \$135 a barrel  
May 2008

## Regulatory Mandates

Increased regulatory scrutiny, with government regulations around water usage, carbon emissions etc



## Workload Growth



Growth in Application and Business workloads doubles every 2 years driving the need new servers, DASD, power and cooling

## Operational

Capacity shortages for data centre power and cooling are limiting ability to expand



## Social & People



Customers have started evaluating the green credentials of suppliers and products

## Cultural Shifts

Demographics changes and global teams require collaboration across cultural, generational and geographic boundaries

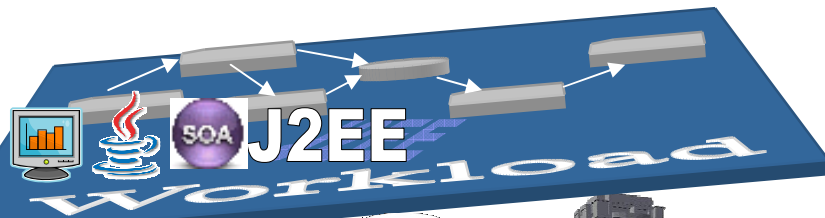


# Extended Attributes of a Greener Organisation

**People**



Optimised **People** resources and collaboration beyond boundaries to drive business growth while reducing travel and physical real estate costs



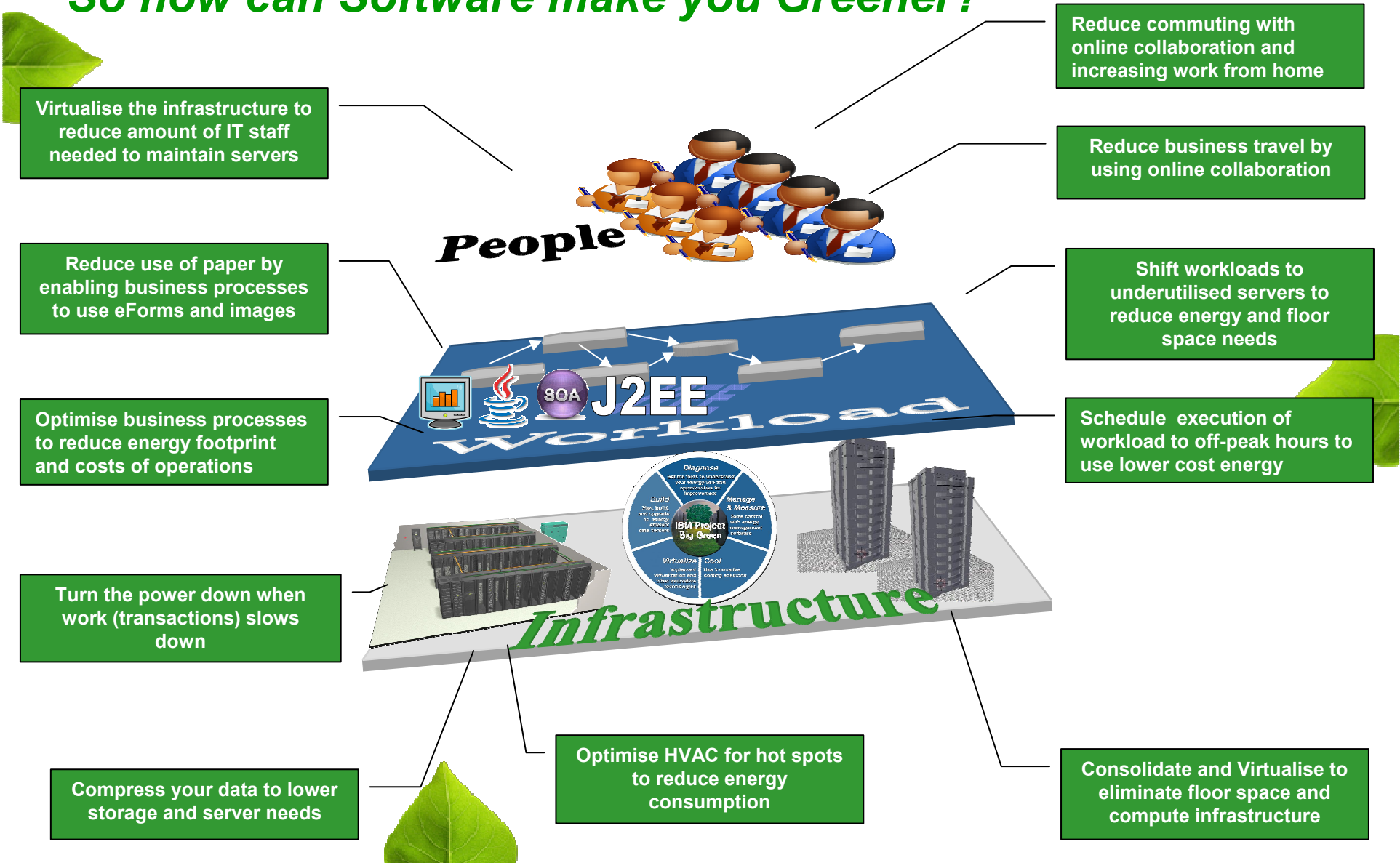
Efficient execution of business **Workloads** with processes and applications designed to maximise energy efficiency while meeting business needs.



**Infrastructure**

Visualisation, control and automation of **Infrastructure** to deliver a power efficient organisation. Leverage consolidation, virtualisation, and optimisation.

# So how can Software make you Greener?



# IBM Software for a Greener World



## People



### People

Lotus software  
Rational software

- Online collaboration (IM, Web Conference etc)
- Online learning
- Multi-site software development coordination

### Workloads



WebSphere software  
Information Management  
Tivoli software  
Lotus software  
Rational software

- Business process modeling and redefinition
- Processes with eForms and images
- Human task automation
- Dynamic workload distribution
- “Green” SOA efficiencies
- Application consolidation
- Energy cost allocation and billing

### Infrastructure

Lotus software  
Information Management  
Tivoli software  
WebSphere software

- Consolidate and Virtualise IT
- De-duplicate and compress Information
- Tiered storage
- Optimise IT and Facility energy use
- Maintenance schedule and status tracking
- Energy use measurement and reporting
- Secure, traceable, categorised and indexed information



# IBM Software for a Greener World

Cutting costs and carbon emissions and streamlining compliance with IBM



Improve carbon footprint by directly reducing travel for collaboration



Optimise processes to improve energy efficiency and comply with regulations



Consolidate, Virtualise, Compress and maintain to reduce energy costs



## People

**IBM** 42% of IBM's employees do not regularly come into an office

**Celina** Phone Calls Reduced 50%, Headcount reduced 30%

**Lotus software**

## Workloads

**citigroup** Reduced average process cycle time by 50%

**WebSphere** Using SOA to drive energy efficient processes

**IBM** Consolidated 3900 → 33 zSeries servers providing 80% annual energy savings

**ROHM&HAAS** Optimised policies and practices to enable regulatory and legal compliance

**Information Management** **WebSphere software** **Rational software**

## Infrastructure

**SunTrust** Achieved data compression rates of 83%

**Weber Automotive** Consolidated 11 servers down to 3

**GSH** Saved 90K tons of CO2 with resource planning

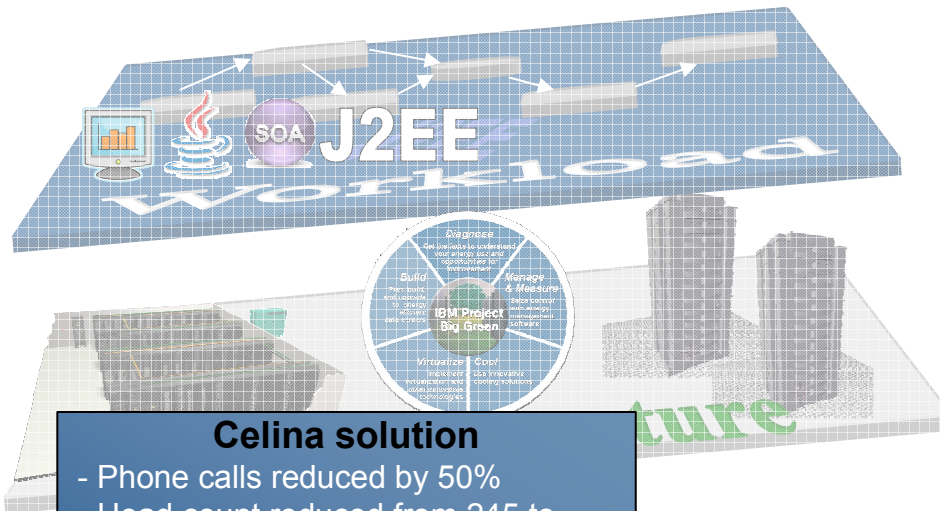
40 to 50% reduction in floor space, 30% reduction in power and cooling costs

**Tivoli software** **Information Management**



# IBM Software for a Greener World

## People



### Celina solution

- Phone calls reduced by 50%
- Head count reduced from 245 to 170
- Savings of more than \$3 million per year - Web based processing 90% of new business, 85% of claims received via web

## ■ People

- *Enable work force to be flexible and mobile with tools for virtual and home office*
  - **Lotus Notes and Domino Web Access, Lotus Sametime and Sametime Unyte**
- *Reduce travel, utilities and infrastructure costs for physical meetings, conferences and events*
  - **Lotus Sametime, Sametime Unyte**
- *Automate innovation process, leverage experts and communities to collaborate on projects*
  - **Lotus Connections**
- *Gain benefits of classroom training without travel, paper and physical infrastructure*
  - **IBM Learning Accelerator for Websphere Portal**
- *Enable multi-site software development and collaboration to reduce CO2 emissions from travel needs*
  - **Rational ClearCase, BuildForge, Functional tester and Performance Tester**

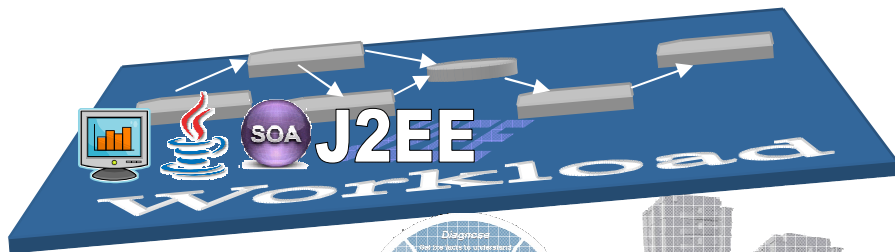


# IBM Software for a Greener World

**ROHM AND HAAS**

Optimised policies and practices for efficient and cost-effective management of ever-proliferating electronic data required for compliance with all regulatory and legal requirements

People



**citigroup**

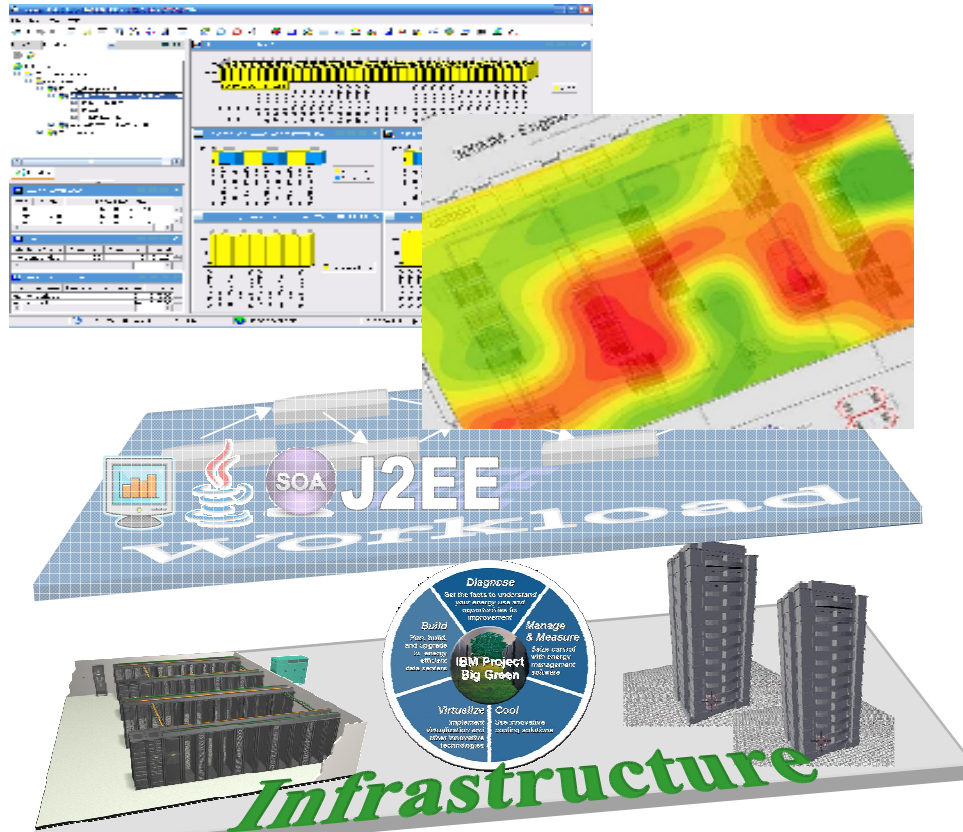
Reduced average process cycle time by 50%

Energy cost savings of 25 – 40%  
Hardware cost savings of 25 – 40%

## Workloads

- *Model and redesign business processes to significantly reduce energy consumption and cost*
  - IBM FileNet BPM 4.0 Suite, WebSphere Business Modeler, WebSphere Process Server, IBM Process Management with Cognos 8 BI
- *Reduce use of paper by enabling business processes to use eForms and images*
  - Lotus Forms
  - IBM Commonstore, IBM FileNet Records Crawler, Web Content Manager
- *Enhance energy efficiency of operations with increased automation*
  - Tivoli Process Automation (CCMDB, Service Request Manager, Release Process Manager, Provisioning Manager etc)
- *Gain deep understanding of application behaviour to identify opportunities for green improvements*
  - ITCAM, WebSphere Virtual Enterprise (J2EE)
- *Increase server utilisation for improved power efficiency*
  - Tivoli distributed Workload Manager, Tivoli Provisioning Manager, WebSphere Virtual Enterprise (J2EE)
- *Improve energy efficiency of applications by moving them to more efficient platforms*
  - WebSphere Asset Analyzer, Rational Transformation Workbench, Rational Business Developer, Rational Application Developer, WebSphere z Portfolio
- *Comply with environmental regulatory requirements with reduced risk*
  - Maximo Spatial, IBM Compliance Warehouse for Legal Control, Tivoli Business Service Manager, Portal Dashboard, WebSphere Modeler
- *Allocate energy costs to delivered services*
  - Tivoli Usage and Accounting Manager

# IBM Software for a Greener World



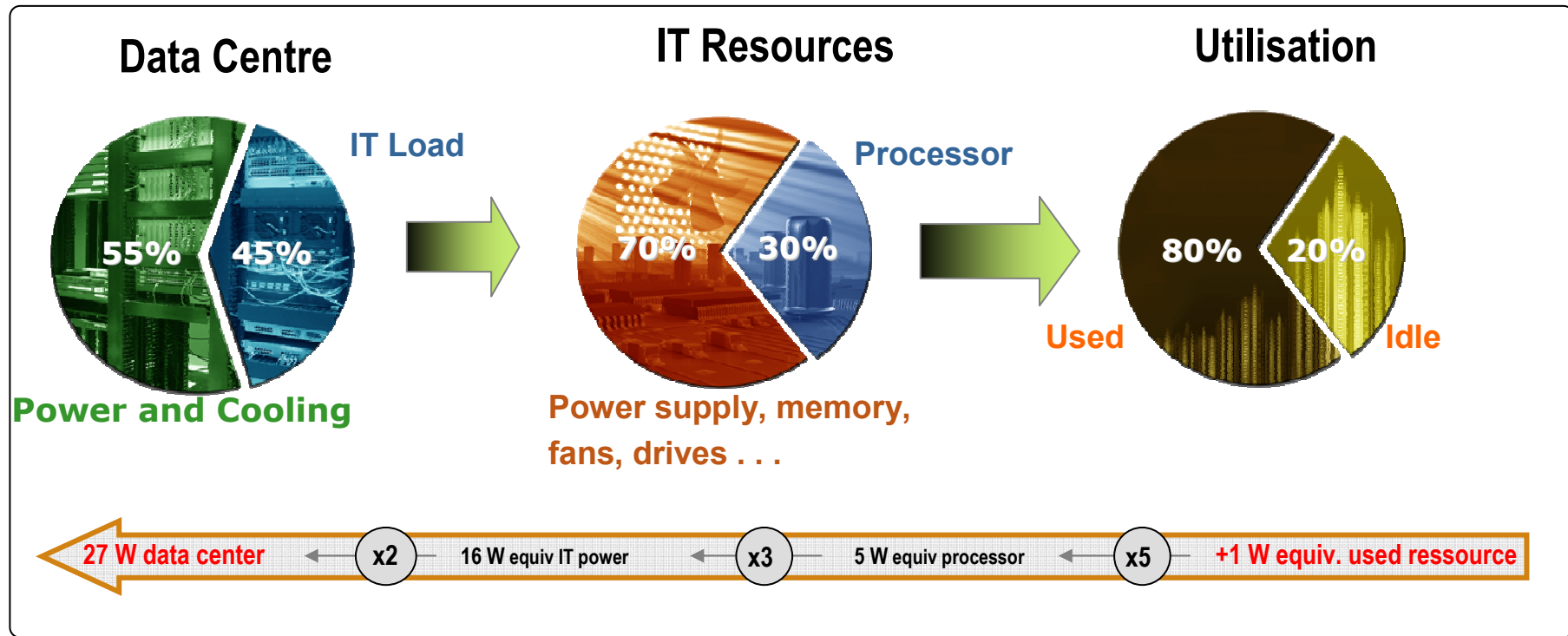
Up to 40-50% energy savings in typical data centres- \$1.3M / yr savings

Double your IT capacity in the same energy footprint

## Infrastructure

- *Maintain and Manage lifecycle of facilities and IT assets for energy efficiency*
  - Tivoli Enterprise Asset Management, Tivoli Asset Management for IT
- *Monitor, Report and Manage resource to reduce consumed energy*
  - Tivoli Monitoring for Green Energy, IBM® Systems Director Active Energy Manager, Tivoli System Automation, Tivoli Dynamic Workload Broker, WebSphere Virtual Enterprise
- *Decrease storage and server footprint with mail compression, file share, de-duplication and attachment reduction*
  - Lotus Domino, Lotus Quickr
- *Reduce data storage requirements with data representation*
  - DB2 9 with Storage Optimization Feature
- *Shutdown systems no longer in use*
  - TADDM, IBM Optim
- *Virtualise and consolidate servers, increase utilisation and reduce energy and floor space needs*
  - zSeries, TPM, IBM Director
- *Optimise DB queries to reduce server needs and save energy*
  - DB2

## How is Datacentre Power Consumed?



- Insufficient Cooling or Insufficient Power is the key datacentre issue
- Energy costs consume approximately 10-15% of most IT budgets and its rising

Source: Gartner, Springboard research

## Energy Service Management Capabilities

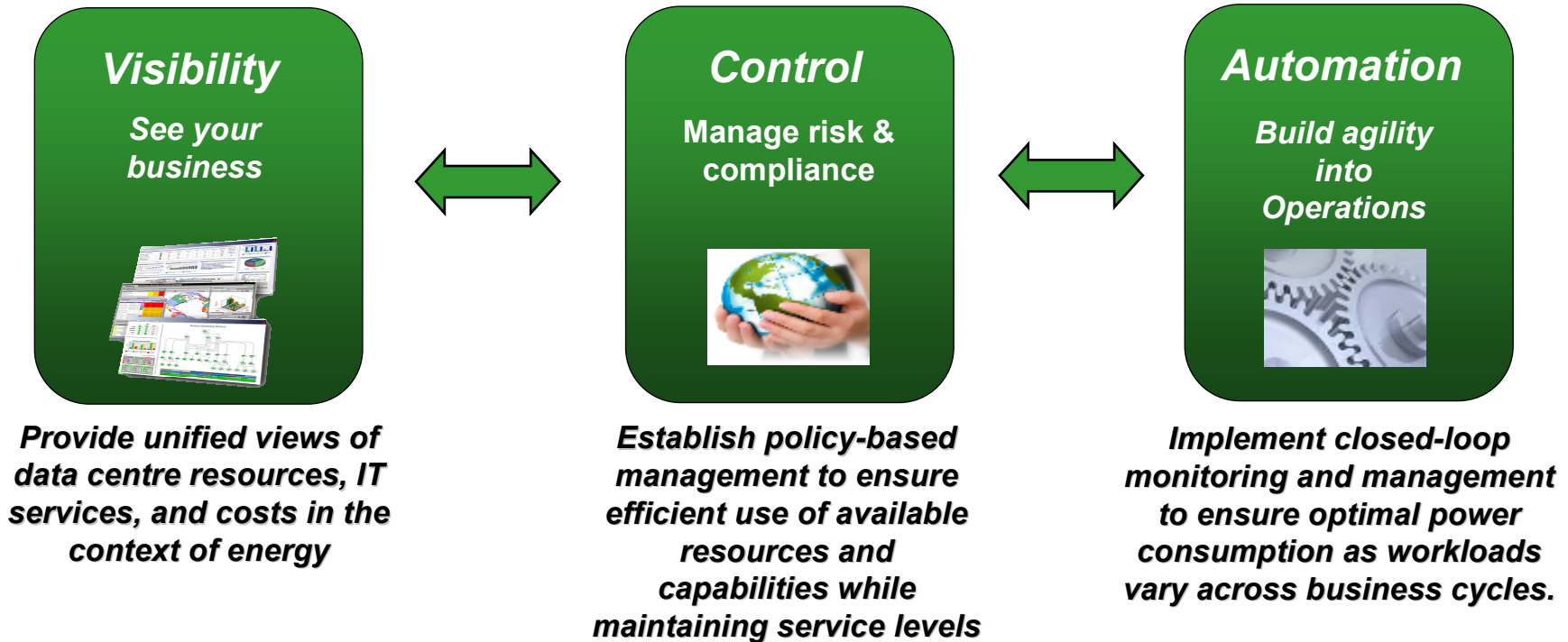
**Optimise your enterprise  
for energy efficiency**



- How much power am I using?
- How much money can I save by reducing power?
- What services are costing me the most in power consumption?
- Can I change and still meet my service level agreements?
- What should I do first?

# **Tivoli 'Green' Service Management**

## **An Integrated Approach to controlling energy costs**



## Seize control with Energy Management Software

### Measure & Trend Power use

- Measure actual energy usage and cooling requirements
- Provide energy billing metrics

### Manage Power Allocation

- Optimise usage of power and cooling resources

### Automate energy management

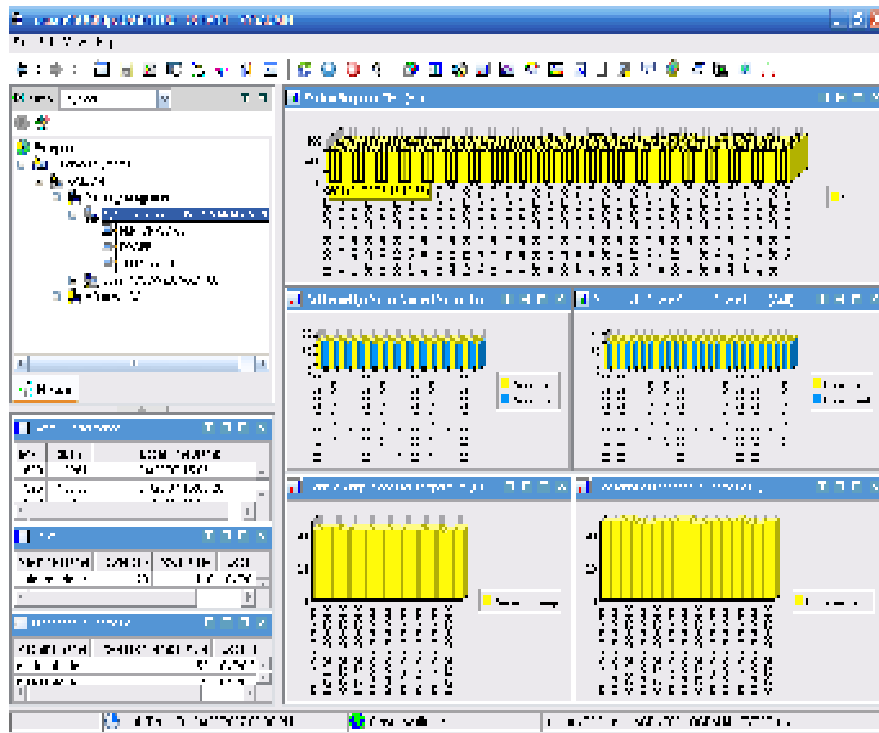
- Control power consumption
- “Cruise control” for power consumption of servers
- Service level automation

## IBM Systems Director Active Energy Manager



## Tivoli Monitoring for Green Energy

Now all your IT compute data plus all your facilities metrics in one spot !!!



- Visualise the power consumption and thermal signatures of data centre resources
- Alert operators and facility managers before servers reach critical energy and temperature thresholds
- Automate and control server's energy usage to optimal levels including triggers to 3<sup>rd</sup> party partners

New Partner Ecosystem Announced May 08:



# Gain Visibility to Energy Usage

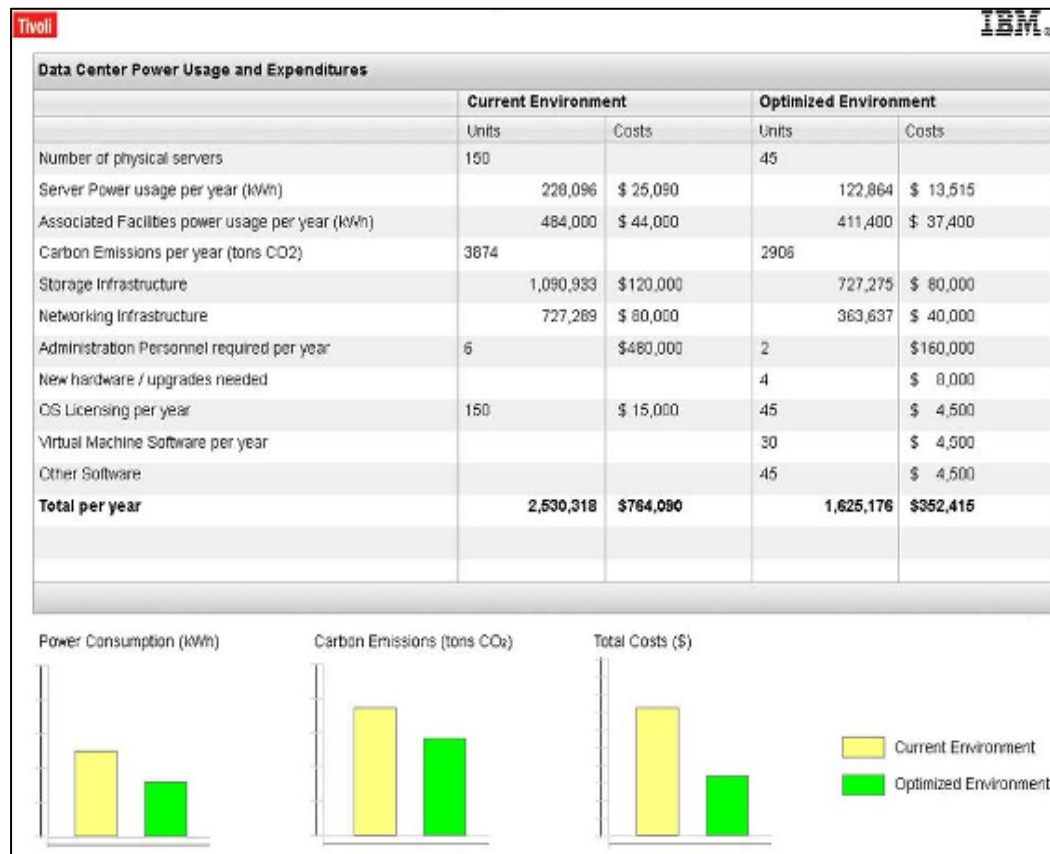
New energy Optimisation reports included in ITM Tivoli Monitoring



- Track and trend changes in energy usage over time
- Combine different data types and energy usage into a single report.
- Obtain information needed to qualify for power company or government rebates and incentives



## Advanced Control and Automation of the Data Centre's Energy Usage

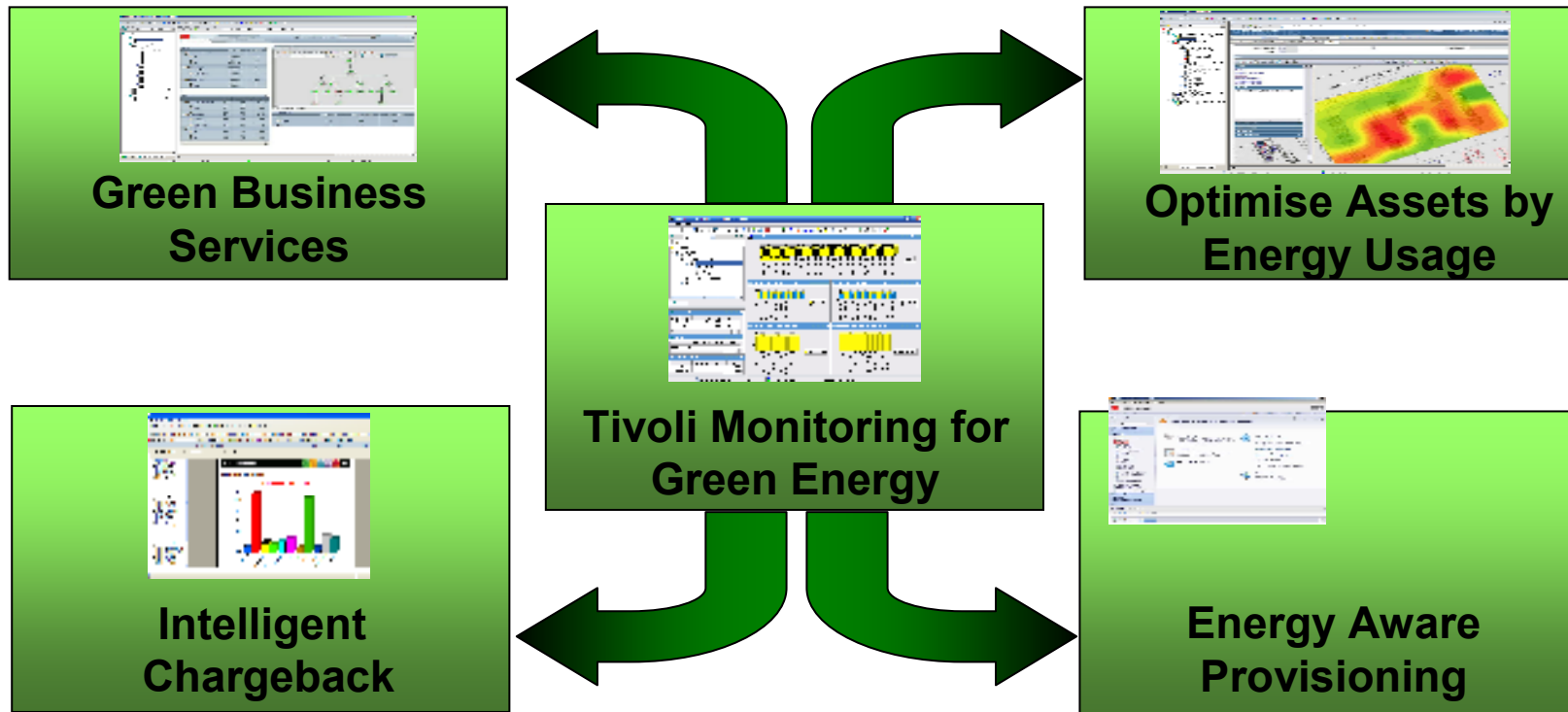


- Compare current power utilisation and costs to the optimal configurations
- Model incremental changes to analyse how the data center environment will change

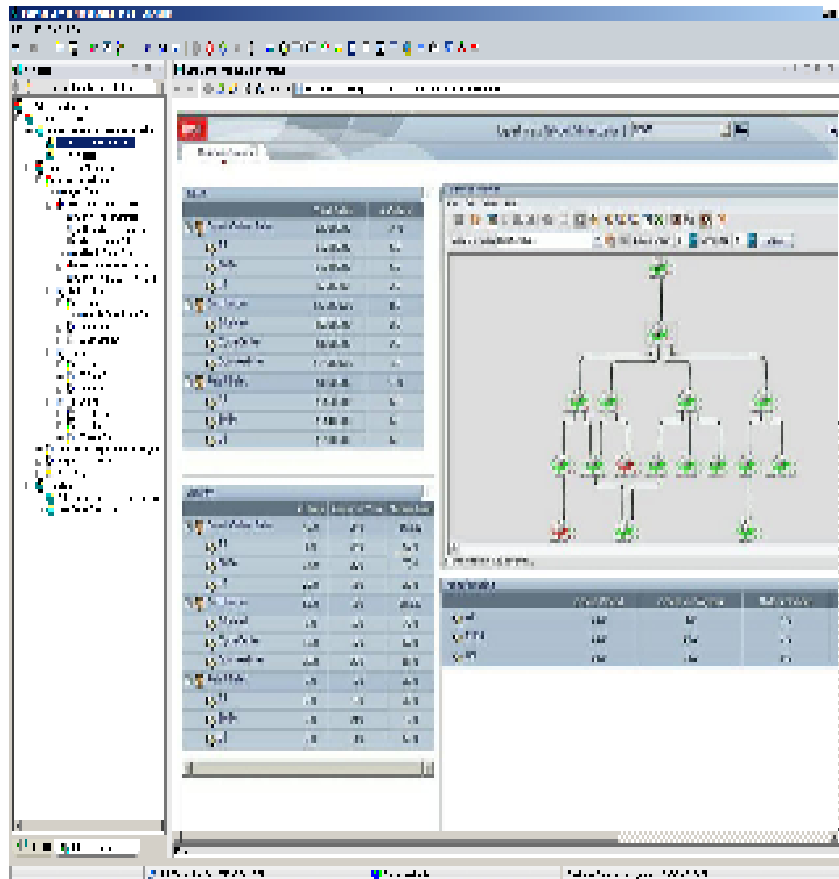
New energy Optimisation reports included in ITM Tivoli Monitoring

# IBM Service Management's Green Data Center

Using Green Data to accent Tivoli's existing event architecture and data model

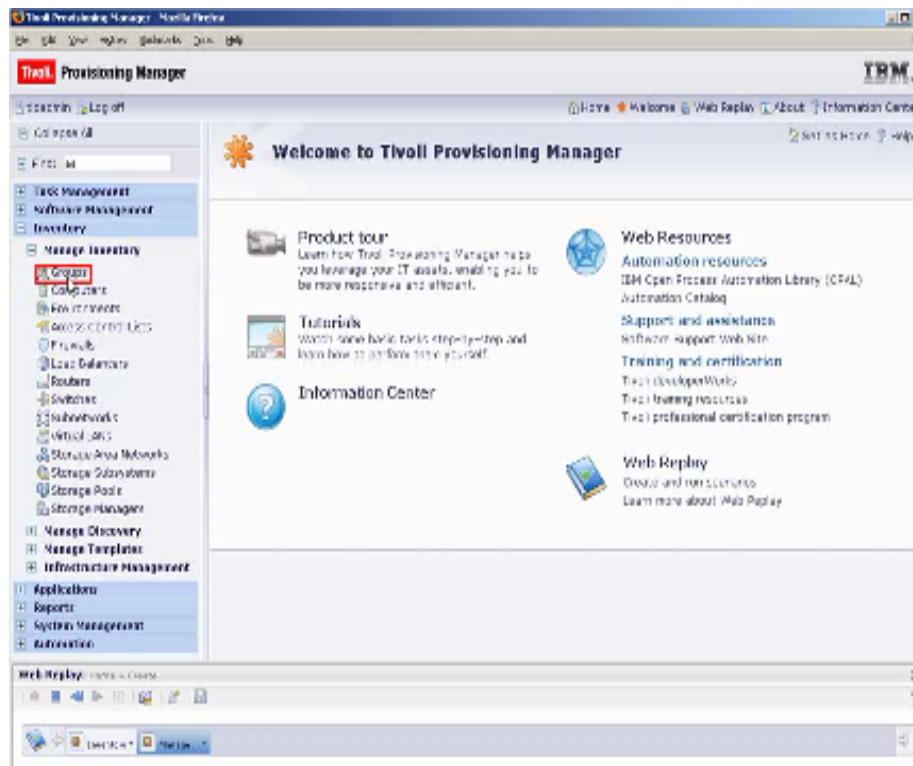


## Green Business Services



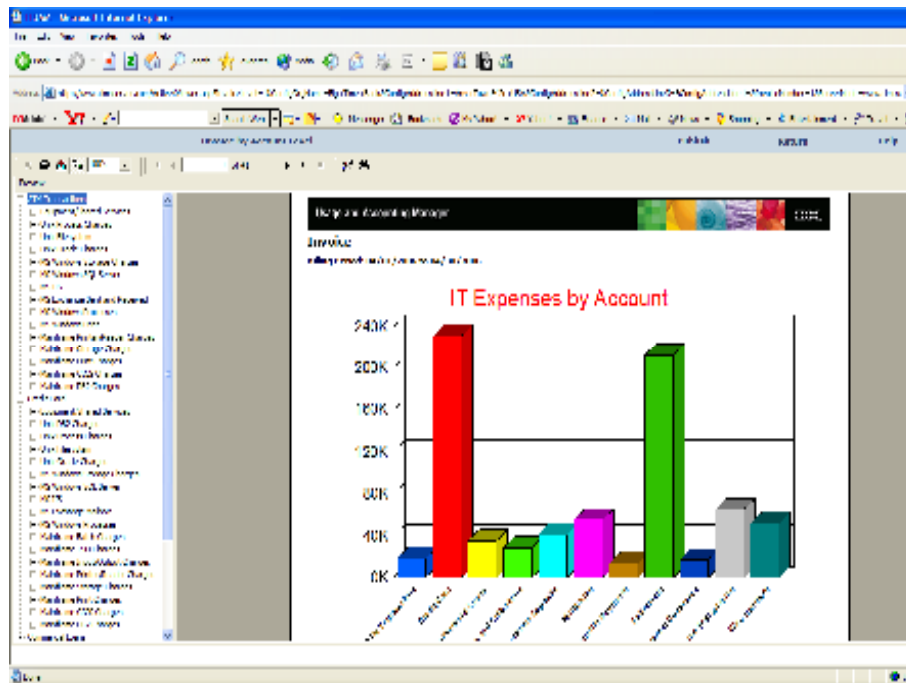
- Illuminates the impact of energy issues on the ***Tivoli Business Service Manager*** product dashboard
- Provides integrated business readiness across IT and the facility
- Meet and throttle energy usage based on service level agreements
- Alert and event on brownouts to move workloads based on thermal dynamics of the businesses data centres

## Consolidate, Virtualise, and Optimise by Provisioning with Energy Intelligence



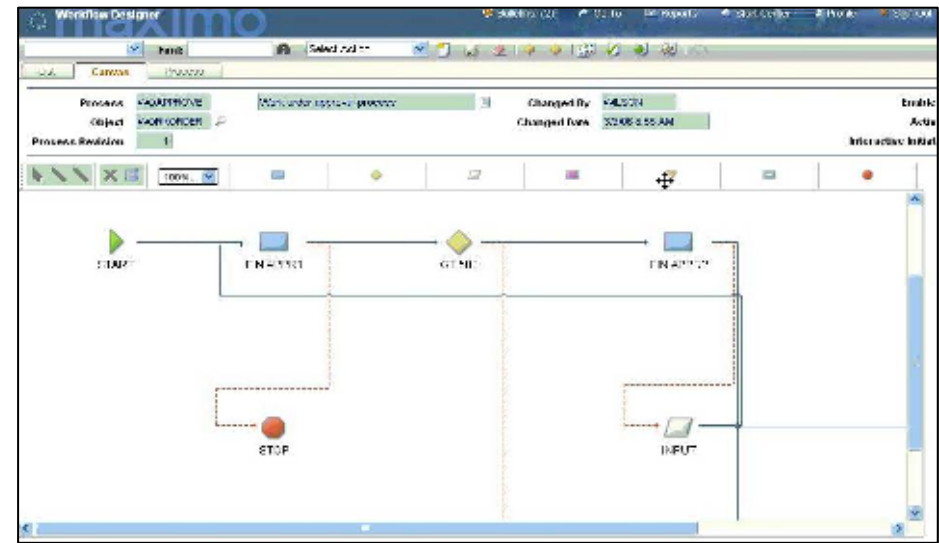
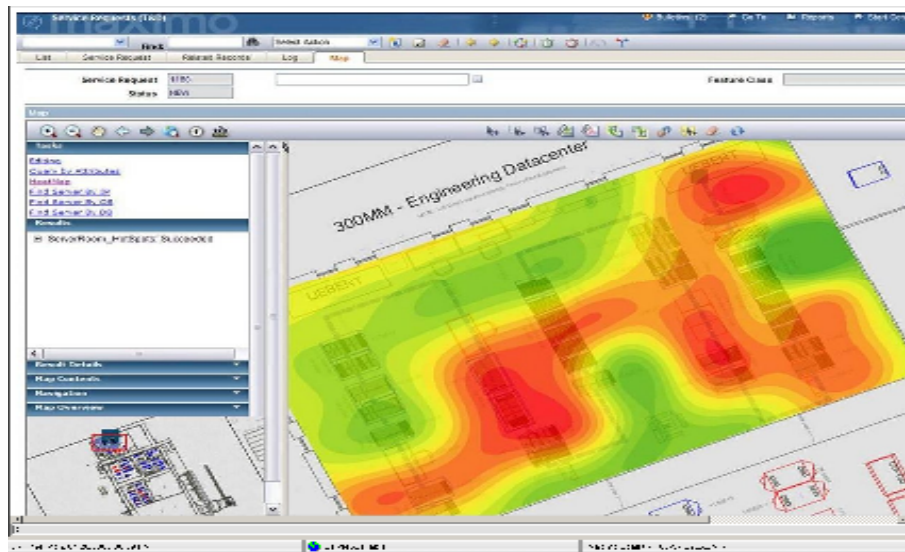
- Provision new servers as needed instead of keeping servers active in standby mode via **Tivoli Provisioning Manager**
- Utilise virtualisation to increase utilisation of individual servers and eliminate unneeded servers.
- Move workload to alternative data centers where energy is less expensive or less constrained.

## Chargeback by kW, Power trends and Thermal Metrics



- Aggregate power consumption data and determine cost of power via ***Tivoli Usage and Accounting Manager***
- Set a benchmark for energy usage to better track improvements
- Report on the amount of power consumed, when it was consumed, and which services consumed it
- Introduce power utilisation accountability

## Optimise assets by your energy usage

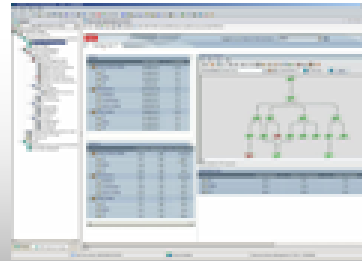


- Optimise the energy utilisation of your assets and extend asset life based on energy utilisation via ***Tivoli Maximo Enterprise Asset Management***
- Visualise the thermal dynamics of the data center and identify problem areas
- Alert source for Facility and DC “operators” of upcoming energy problems
- Enable workflows that allow you to create role based Automation of Asset lifecycles

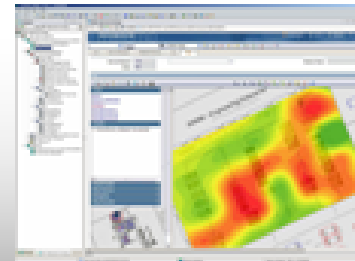
# Infrastructure Management from IBM Tivoli

Optimize your infrastructure by blending IT and Facilities capabilities

New IBM Tivoli Monitoring  
Green Energy Adapters



New IBM Tivoli Asset  
Management spatial  
visualisation



Data Centre  
Infrastructure Assets

Tivoli software



Facility  
Infrastructure Assets



Tivoli Green Management  
(Monitor, Measure and Manage)



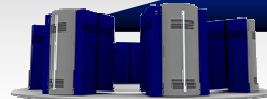
Tivoli Software  
IBM® Systems Director  
and Active Energy Manager



IT Assets



3rd Party Servers  
and Storage



IBM Systems

***Some examples ...***

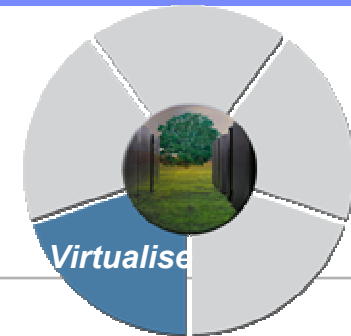
***saving money, space, energy, carbon***





## Virtualise - IBM Data Centres

**Improve operational efficiency and risk management while reducing energy usage by 80%**



### Client requirements

- Needed to reduce systems management complexity
- Needed to increase stability, availability, and provide world-class security
- Improve operational costs and energy efficiency

### Solution

- Consolidate 3,900 servers to 33 System z mainframes
- Migrate servers delivering largest savings first
- Eliminate assets with lowest utilisation first
- Aggregate by customer work portfolio to leverage strong customer buy-in
- Focus on freeing up raised floor space (30x office cost)
- Provision new applications to the mainframe

### Benefits

- Annual energy usage reduced by 80%
- Total floor space reduced by 85%

**Tivoli**

**Initial priority for consolidation to Linux on System z**

**DB2**

**Lotus**

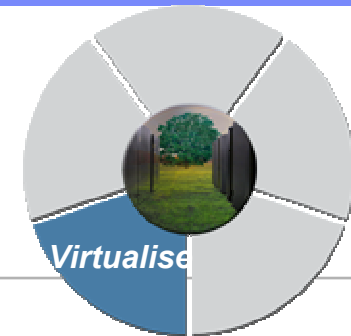
**WebSphere**

**SAP**



## Virtualise – Rationalization at UPMC

**Maximise service level and mitigate costs by saving \$18-22M over 3 years with Wintel, Unix and storage virtualisation**



### Client requirements

- Server growth 4x in 5 years – data centre chaos
- Centralise IT services and consolidate data centres
- Free up space to produce revenue – more hospital beds

### Solution

- Wintel and Unix virtualisation
- Reducing from 40 storage databases to two centralised SAN arrays
- Consolidating 1,000 physical servers to 300 IBM servers (multiple platforms)

### Benefits: \$18-22M savings over 3 years

- Virtualisation saved \$9.8M in first five months
- Utilisation rates increasing from 3% to 80% per server
- Server capacity increase by 150%
- Maintained flat infrastructure support staff
- Create hospital space

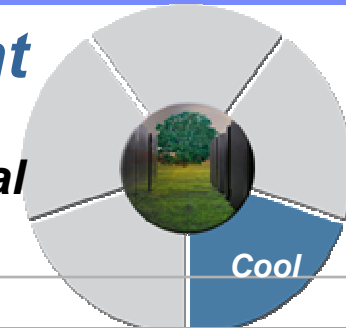


*“These accomplishments help position UPMC as a leader in the adoption of server virtualization technology among health care provider organizations...will fundamentally alter how IT is deployed and managed in the industry”*

*- Health Industry Insights, IDC, January 2007*

## Cool - Data Centre Stored Cooling - IBM Bromont

**Implement innovative cooling technology to reduce operational costs from the largest data center energy user by 45%**



### Client requirements

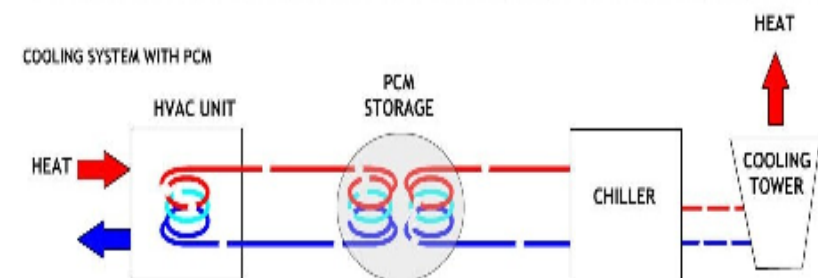
- Identify and attach the largest areas of energy consumption
- Reduce energy consumption and operating costs of chiller plant supporting Bromont (Quebec, Canada) site

### Solution

- Install “Cool Battery”
- Increase chiller utilisation by storing cold for use throughout the day
- Leverage environment - free cooling

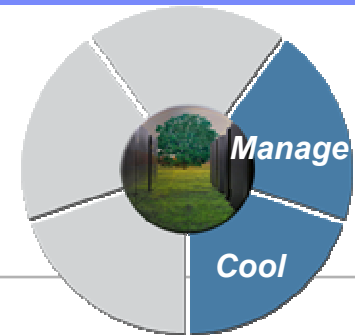
### Benefits

- Reduced chiller plant energy cost by 45%
  - Over 5.3 million kwhr per year
  - Demand reduction of approximately 1 MW
- Avoided need to install additional chiller
- Environmentally-friendly, non-toxic, no-maintenance



# Manage, Measure & Cool - IBM Southbury

**Implement IBM Energy Management Solution and IBM Rear Door Heat eXchanger for 10-30% energy savings**



## Client requirements

- Improve how to meter, control, and cap power usage
- Actively moving workloads and power up/down resources

## Solution

- Power density of 200 watts per square foot
- Use of 2-3 “Thermal Zones” for targeted power and cooling
- Power and thermal meters to measure baseline and changes
- Rack based thermal cooling

## Expected Benefits

- Integrated Facilities and IT solution
- Rack Level Cooling Improves Efficiency 20-30%
- Match Cooling Load to Heat Load: 10-30% Savings
- Combined Air and Water or Refrigerant Cooling
- Reduces Equipment Costs/More Flexible Facility



**IBM PowerExecutive**



# Environmental responsibility is a core IBM value

## Awards & Recognition

### New Goal Extension

Further extend IBM's early accomplishments by reducing CO<sub>2</sub> emissions associated with IBM's energy use 12% from 2005 to 2012 via energy conservation, use of renewable energy, and/or funding CO<sub>2</sub> emissions reductions with Renewable Energy Certificates or comparable instruments.



FORTUNE 500  
Top 20  
2004, 2005,  
2006



1998,  
1999,  
2001



The Climate Group  
2005



2005



2005

USEPA  
Climate  
Protection  
Award  
1998 and 2006



Green Power  
Purchaser  
Award 2006



Green IT Supplier of the Year 2008  
Green Infrastructure Project 2008 IBM & DEFRA

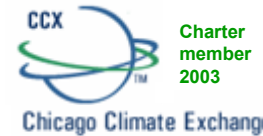
## Environmental Efforts



Computer  
Program  
Charter  
Member  
1992



Charter  
Member  
2000



Charter  
member  
2003



Business Environmental  
Leadership Council



Charter Member 2002



WRI Green Power Market  
Development Group  
Charter member 2000



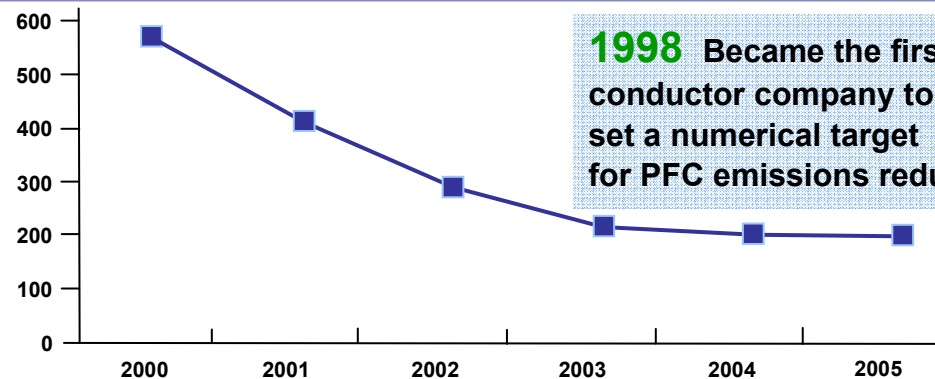
1605(b) voluntary  
emissions reporting  
since 1995

CARBON DISCLOSURE PROJECT Since inception

## Long History

40%

Between 1990 and 2005, IBM's global energy conservation actions reduced or avoided CO<sub>2</sub> emissions by an amount equal to 40% of its 1990 emissions.



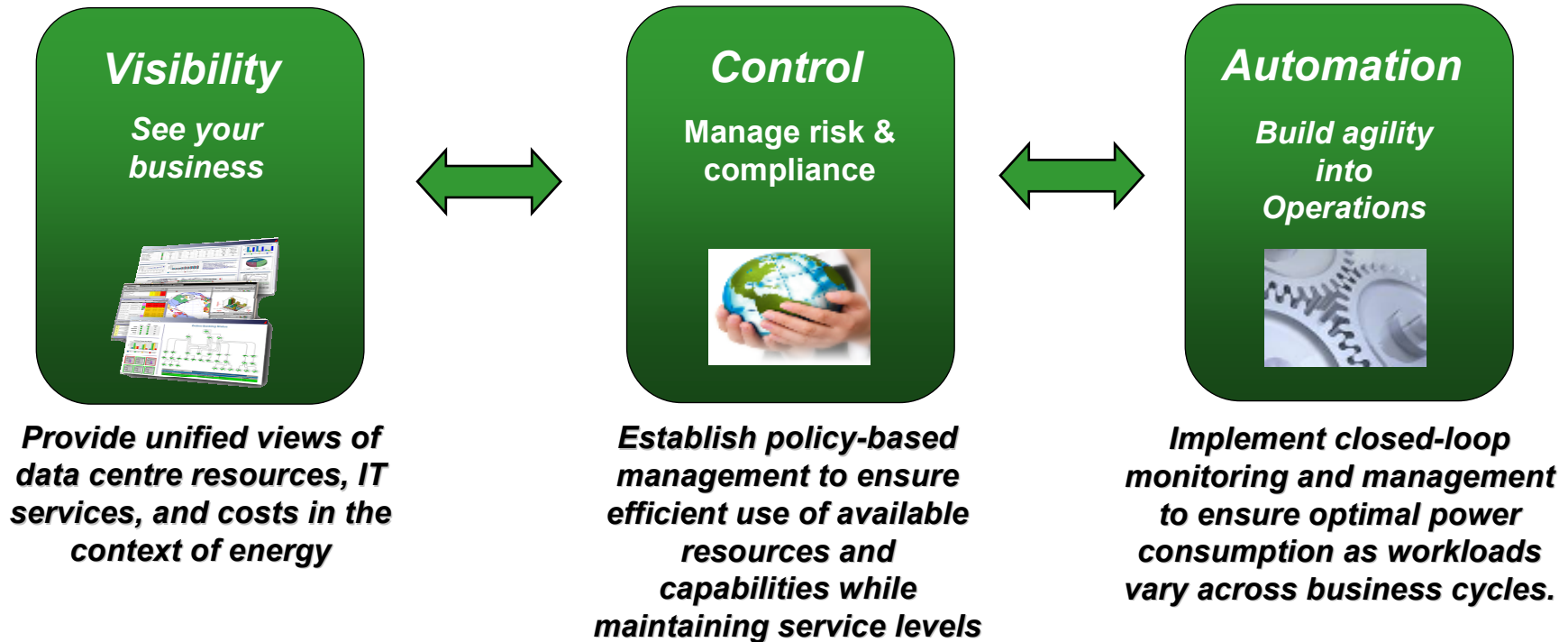
1998 Became the first semiconductor company to set a numerical target for PFC emissions reduction

58%

## Get Started now with today's benefits !!!

<p><b>People</b></p>	<ul style="list-style-type: none"> <li>▪ <i>Reduce business – client travel with online collaboration</i></li> <li>▪ <i>Reduce employee commuting</i></li> <li>▪ <i>Reduce energy for training</i></li> </ul>	
<p><b>Workloads</b></p>	<ul style="list-style-type: none"> <li>▪ <i>Replace paper forms with eForms in business processes</i></li> <li>▪ <i>Increase automation to achieve more with less energy</i></li> <li>▪ <i>Model, automate processes and workflows, and gain end to end process visibility</i></li> <li>▪ <i>Take advantage of “green” SOA to dynamically allocate and optimize workloads across servers and applications</i></li> <li>▪ <i>Charge Back Accounting for services consumed</i></li> <li>▪ <i>Comply with environmental regulatory requirements</i></li> </ul>	
<p><b>Infrastructure</b></p>	<ul style="list-style-type: none"> <li>▪ <i>“Smart” consolidation, virtualisation and optimisation</i></li> <li>▪ <i>Integrate management of your IT and Facility equipment</i></li> <li>▪ <i>Efficiently compress information to reduce storage requirements</i></li> <li>▪ <i>Model energy usage by Asset and Location</i></li> <li>▪ <i>Monitor energy usage against Thresholds</i></li> </ul>	

## Green Data Centre Software Summary



[www.ibm.com/software/green](http://www.ibm.com/software/green)