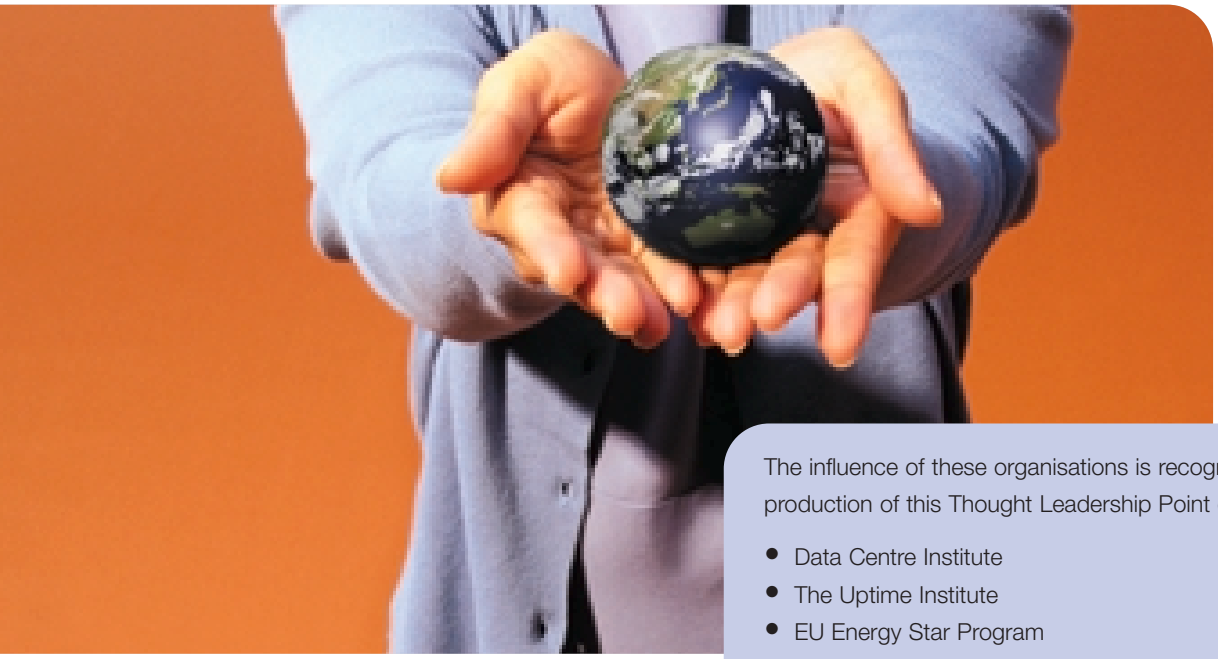
Thought Leadership Point Of View

Reducing Data Centre Costs and Simultaneously Implementing Environmental Policy



The influence of these organisations is recognised in the production of this Thought Leadership Point of View:

- Data Centre Institute
- The Uptime Institute
- EU Energy Star Program
- UN Natural Disaster Report
- Chartered Management Institute
- IT Infrastructure Library [ITIL] v3
- Business Continuity Management Survey
- Association for Computer Operations Management
- ISO 20000 IT Service Management System Standard
- BS 25999 Business Continuity Management Standard
- ISO 14001 Environmental Management System Standard
- Department for Business, Enterprise and Regulatory Reform

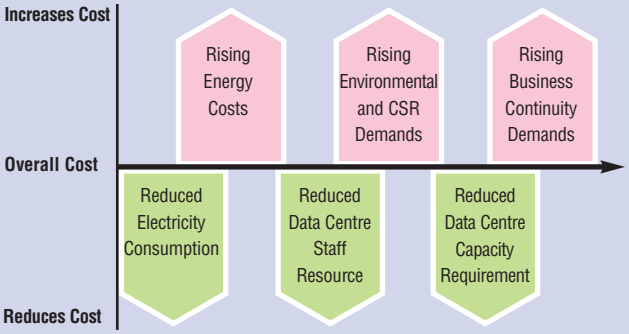
"the business case for greener IT systems will initially be found in the many other benefits that will result from improving efficiency, rather than by focusing exclusively upon environmental policy"

2008 Data Centre Scenario

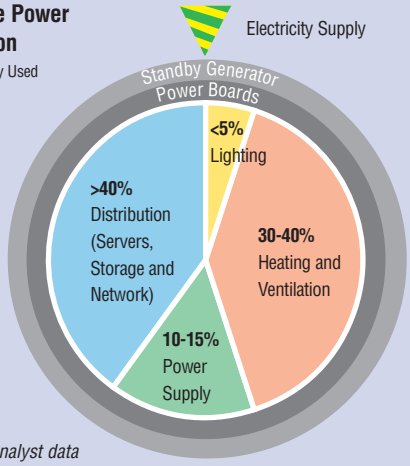
IT budgets in 2008 will be restricted, particularly in financial services. The sub-prime impact upon IT spending will have an undoubted effect, with the likely consequence that only the most compelling business cases will be funded. At the same time, environmental policy and the achievement of challenging carbon emission targets is being demanded by government, regulators, insurers and customers, as well as internally within organisations that wish to maintain a policy of corporate social responsibility.

When viewed in isolation, environmental policy can be seen as an expense with no immediate return, and as potentially unaffordable in the current economic climate. So how can business show an RoI on their environmental policy? Is there a means by which reducing energy consumption can generate cost reductions that will make a project affordable, even desirable? Illustrating how this scenario may be turned into reality is the purpose of this Thought Leadership Point of View.

Cost Reduction funding Environmental Policy and Continuity Policy



Data Centre Power Consumption
% of Total Energy Used



Source: IDL analyst data

IT systems in non-manufacturing environments are now responsible for as much as 40% of an organisation's total energy consumption. The Data Centre is the heart of the environmental challenge for IT, particularly in the areas of power and cooling for servers and storage. However, the business case for greener IT systems will initially be found in the many other benefits that will result from improving efficiency, rather than by focusing exclusively upon environmental policy.

Consequently, the focus of the business case is upon the gains in operating cost available through power reduction, improved space utilisation, higher staff productivity and more efficient business continuity, which will feed into measurements required by carbon emission targets.
As the economic business case becomes more compelling, then the more likely will be the early environmental gains.

In Q1 2008, IBM engaged analyst IDL to profile decision makers with responsibility for environmental policy and Data Centre operations to better understand how the need for a more energy-efficient enterprise is affecting UK organisations and their IT infrastructures. The IDL profiling study included a cross-section of medium and large public and private sector operations, including financial services, utilities, logistics, retail, higher education and local authorities.

"Certification to internationally-recognised standards is effective both in ensuring best practice is followed and also in demonstrating to stakeholders a commitment to the management of risk.

BSI Management Systems supports IBM's recommendation that certification to these standards offers a sound foundation for best practice in IT governance."

Flemming Norklit, Managing Director; BSI Management Systems

BSI Management Systems

Contents

This Thought Leadership Point of View is designed to demonstrate the business case for justifying IT investment to substantially reduce operating costs, and simultaneously to support reductions in carbon emissions without additional investment.

"The IBM Big Green project will reduce energy consumption in IBM's data centres by 80%"

#1. Environmental Policy Business Case

The business case for funding an environmental policy aligned with CO2 emission targets starts with economic gains through power reduction, improved space utilisation, and business continuity risk mitigation.

Data Centre Business Case

- Electricity cost reduction
- Higher Data Centre space utilisation
- Improved Data Centre staff productivity
- Lower risk from electrical utility penalties
- Improved business continuity and recovery processes
- And, efficient environmental policy execution

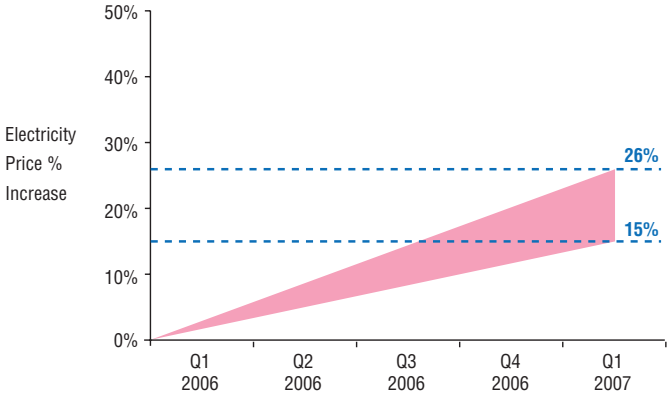
Cutting Electricity Cost

IT systems are the major consumer of energy for many organisations, with IT's electricity consumption in non manufacturing environments responsible for as much as 40% of an organisation's total electricity usage.

"To compound the problem, commercial electricity prices are growing significantly..."

To compound the problem, commercial electricity prices are growing significantly as described in the DTI [now BERR] Quarterly Energy Prices Report June 2007 "*average electricity prices for all non-domestic electricity consumers, excluding Climate Change Levy [CCL], increased by between 15% and 26% between Q1 2006 and Q1 2007*" [the inclusion of CCL typically adds between 2% and 6% to the electricity price].

Annual Electricity Price Rise

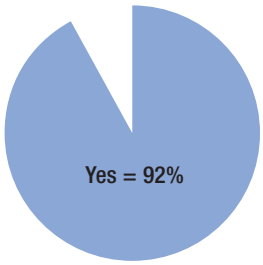


Source: Analysis of DTI Quarterly Energy Prices - June 2007

These price increases were in addition to the similar DTI reported trend in January 2007, where "*Average industrial electricity prices were 27.9% higher excluding CCL and 26.1% higher including CCL, in real terms, in Q3 2006 compared to Q3 2005.*" *Overall "the average price of electricity has risen by 19% in real terms since 1996, but has increased by 58% since 2001*." DTI Quarterly Energy Proces Report June 2007.

The urgency of addressing Data Centre energy consumption is apparent in the responses to the IDL study, where 92% of respondents reported this issue as a priority for their organisation in 2008.

Is reducing data centre electricity consumption important to your organisation for 2008?



Source: IDL Q1 2008 decision maker interview consolidated response

Over time, legacy systems become progressively more inefficient as their lifecycle extends and warranties expire or service contracts are renewed on a short-term basis. Legacy systems become more prone to failure with age, particularly when their workload exceeds the designed capacity, and excess heat causes wear on system components. In effect, therefore, the longer a legacy system remains operational, the higher its TCO, particularly when the energy costs of legacy systems are compared with newer and more efficient infrastructure technologies.

The challenges and inefficiencies associated with legacy systems are evident in the IDL study responses, where almost two thirds of respondents cite reducing the cost of maintaining legacy systems as an issue for 2008.

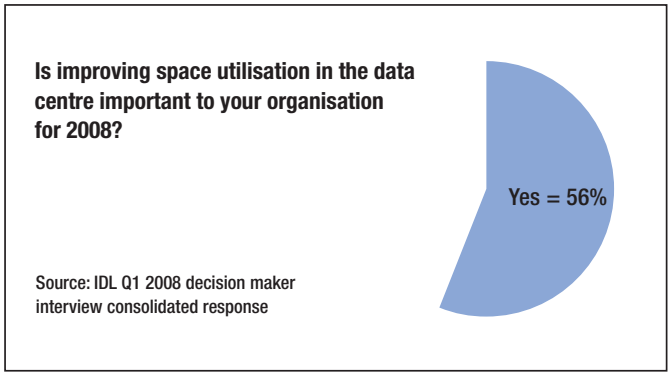
"since 1999...average power output has been growing 52% from 23 W/SF to 35 W/SF."

Improving Space Utilisation

The demand for Data Centre processing capacity is constantly increasing, and the means of funding these resources via different Service Level Agreements [SLA] can lead to silo-based infrastructure. Under these conditions, the utilisation of individual servers may be as low as 20%, while Data Centre space capacity is consumed by under-utilised systems with higher than necessary power consumption.

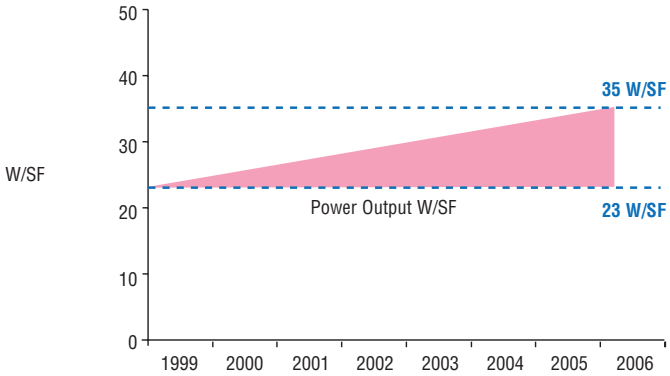
The increase in Data Centre density was highlighted in 2007 by the US Uptime Institute showing that Computer Power Density in Watts per Square Foot (W/SF) had increased by more than 50% on average since 1999 across a sample of 19 Data Centres, with average power output growing 52% from 23 W/SF to 35 W/SF.

The pattern is similar for the IDL study respondents, with 56% identifying better utilisation of space in the Data Centre as important for 2008, and with many of those *not* planning improvements having undertaken work to address physical capacity limits in the recent past.



Data Centres have been established and then grown in locations which have become costly in real estate terms, so by consolidating, virtualising and integrating servers and storage, the result is improved asset utilisation, power saving and improved space management. According to the Data Centre Institute, more than 50% of Data Centres will have to relocate to new facilities or outsource some applications, primarily due to business growth and aging facilities.

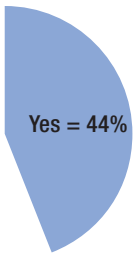
Average Power Output



Source: US Uptime Institute

"These legacy systems take considerable space, consume a disproportionate amount of time in administration and maintenance, and typically require 50% or more power and cooling than modern IBM infrastructure technology."

Is improving data centre staff productivity important to your organisation for 2008?



Source: IDL Q1 2008 decision maker interview consolidated response

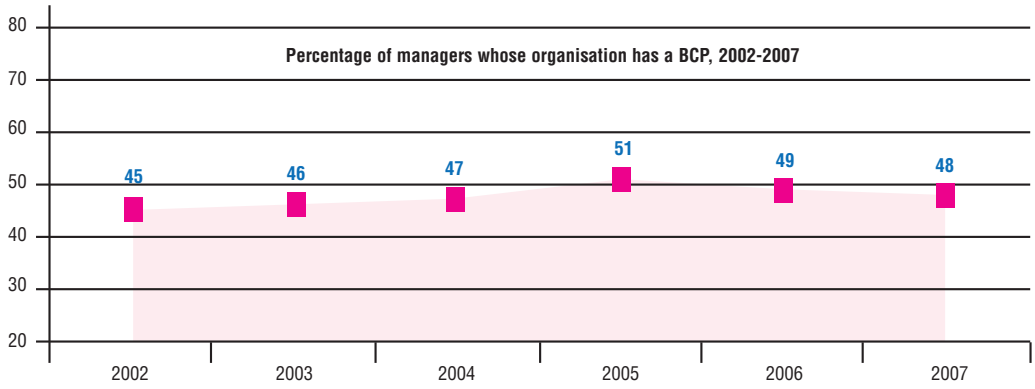
Increasing Staff Productivity and Availability

Many Data Centres still operate server and storage systems that were installed seven or more years ago, and these have a significant impact on operating costs. These systems take considerable space, consume a disproportionate amount of time in administration and maintenance, and typically require 50% or more power and cooling than modern IBM infrastructure technology.

Supporting legacy server and storage systems can consume 25% or more of IT staff capacity, at a time when staff availability is at a premium. In legacy Data Centres, a disproportionate focus on maintaining aging systems diverts IT personnel away from strategic tasks, for example aligning to IT Infrastructure Library [ITIL] v3. While over half of the respondents to the IDL study felt that their Data Centre personnel were currently allocated effectively, 44% identified improving Data centre staff productivity as a priority for 2008.

By implementing energy efficient systems in the Data Centre therefore, IT resource can be targeted upon more productive activities to generate significant improvements in service delivery and reductions in Total Cost of Ownership. This aligns with the increasing scarcity of IT staff and fewer graduates entering the IT profession, as highlighted by the US Data Centre Institute, which forecasted that by 2015, the pool of senior technical and management Data Centre professionals will "*shrink by 45%*".

Level Of Business Continuity Planning



Source: Business Continuity Management, March 2007

Reducing Business Continuity Risk

As businesses update their environmental policy, it will be advisable not only to consider the organisation's impact upon the environment, but to take into account the potential impact of the environment on the business. Natural disasters such as floods, and other extreme weather conditions, now present a significant risk of business interruption, as highlighted in a recent UN study, which reported that natural disasters had increased by 29% over the past 20 years [UN International Strategy For Disaster Reduction report]. In a 2007 Chartered Management Institute study, the Data Centre was seen to be the most significant concern for business interruption, and with service sectors having a large IT dependency, the solution for reducing power cost and implementing environmental policy can be combined with business continuity policy.

Increasingly, a business continuity and disaster recovery plan is mandated by regulators, auditors and key business partners. However, many organisations have yet to implement a robust business continuity policy and process due to the complexity of the existing Data Centre infrastructure, and the pressure of more immediate business requirements.

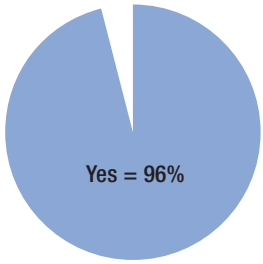
"A leading analyst estimates the hourly cost of business disruption ...which equates to more than $3.6M [£1.8M] per organisation."

There is a growing danger of systems failure due to excess heat in the data centre, and this risk will increase as the natural environment becomes more prone to extremes of weather and temperature. A leading analyst estimates the hourly cost of business disruption at $42,000 [£21,000] for large companies, and average 87 hours downtime per year, which equates to more than $3.6M [£1.8M] per organisation.

A Data Centre where critical systems and data are consolidated will be inherently more efficient to recover, or re-deploy to a fail-over location, than a Data Centre where systems are heavily fragmented and information silos prevail. The relationship between business continuity and environmental considerations is reflected in the complimentary nature of recent best practice standards for these subject areas: the ISO14001 Environmental Management standard, and the new BS25999 Business Continuity Management standard. Both of these standards are reviewed in more detail later in this Point of View.

The current level of urgency around this subject is overwhelmingly evident in the results of the IDL study, where 96% of respondents reported plans to improve their business continuity preparedness in 2008.

Is improving business continuity and recovery processes important to your organisation for 2008?



Source: IDL Q1 2008 decision maker interview consolidated response

"Over the next five years power failures and limits on power availability will halt data centre operations at more than 90% of all companies"

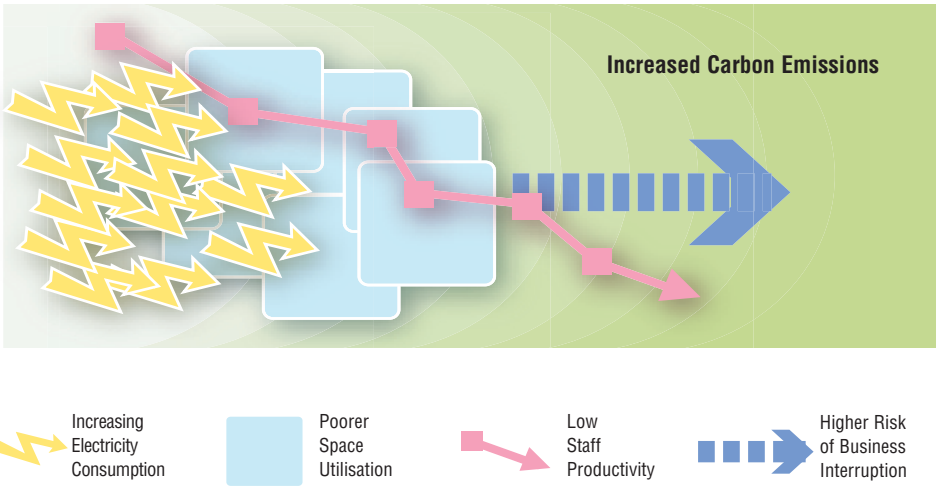
Association for Computer Operations Management [AFCOM] Data Centre Institute.

Reducing Power Utility Continuity Risk

Electricity suppliers impose fines when customers exceed supply targets, and these can be significant, which will negatively influence brand values and increase the risk of power cuts causing business interruption.

Power failures or limits on power availability from electrical utilities are expected to affect 90% of global Data Centres over the next five years, according to the US Association For Computer Operations Management [AFCOM] Data Centre Institute in 2006.

Increasingly, organisations are translating utility targets into internal objectives, such as a reduction of 3-5% in power usage per full time employee, which will influence targets set in SLAs between the business and IT functions, where power consumption is an important factor in the IT budget.

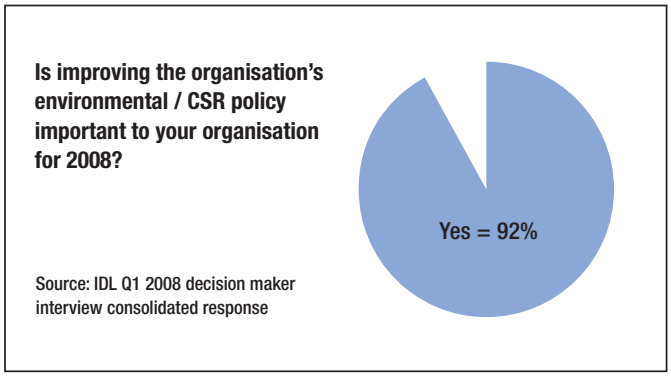


The business lines that fund IT are increasing their expectations in their SLAs for IT service delivery, yet also anticipate lower operating costs, and this forces a strategic rather than tactical approach from the IT department. Cost reductions or productivity improvements from a fragmented and silo-based infrastructure become progressively more difficult to deliver to an SLA fund holder, as they are often measured simply in terms of rack space, power consumption, service delivery objectives and processing needs.

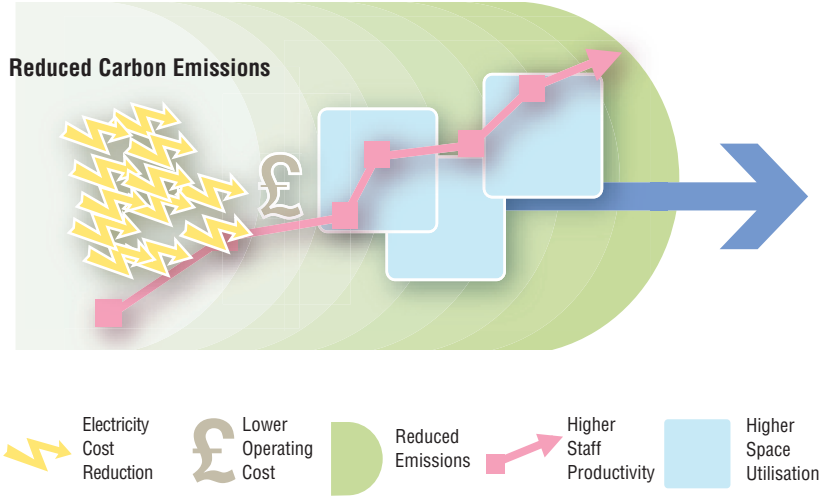
#2. Business Case Summary

By taking a strategic focus upon reducing electricity cost, improving space utilisation, increasing staff productivity and lowering continuity risk, the organisation will inherently take significant and immediate steps towards executing environmental policy.

With a striking 92% of the IDL study respondents reporting improving CSR and environmental policy as an issue for their organisation in 2008, an approach to the Data Centre that delivers both business and environmental value clearly offers significant benefits.



IBM itself has addressed these issues within its Big Green project. By consolidating 3,900 servers down to just over 30 mainframes, IBM will reduce its Data Centre energy consumption by 80%. This reduction is equivalent to the annual electricity consumed by a city the size of Paris.



That saving is "huge" according to a leading analyst, who estimates that for every £1 spent on computer hardware, another £0.50 is spent on energy, with this amount, expected to increase to £0.71 by 2010. This is the foundation of the business case calculation.

IT System Power Savings

Item	Value
Electricity Consumption For 3 IT Data Centres	12 to 15 GWhrs
Cost per KWhr Extra Large User	£0.065 per KWhr
Annual Electricity Cost For 3 Data Centres	£780,000 to £975,000
Annual Saving at 80% Reduction [IBM Target]	**£624,000 to £780,000**
Average Electricity Cost Increases	15% to 26% Between Q1 2006 and Q1 2007
Significant Additional Benefits	Carbon emission reduction, lower administration cost, increased floor space; improved staff productivity; lower continuity insurance premiums

Source: IDL analyst data

#3. Impact Of Standards

When transforming IT system productivity and enabling environmental or continuity policy, there are a series of best practice standards that create an important low risk foundation for ensuring that policy, practices and procedures are well founded, and that the supporting IT processes and controls are efficiently implemented.

Standards are a vital element of policy execution, as they provide independent verification of robust implementation, and, most importantly, a continuous improvement process to ensure the policy continues to be productive as conditions change, which is inevitable for environmental subjects such as climate change and the need to reduce electricity consumption.

"Standards are a vital element of policy execution, as they provide independent verification of robust implementation, and, most importantly, a continuous improvement process to ensure the policy continues to be productive as conditions change"

ISO 14001 Environmental Management System

The internationally recognised foundation for environmental policy is the ISO 14001 Environmental Management System Standard, which is the basis for best practice in setting objectives between the business and IT systems.

In financial services, for example, UBS has adopted ISO 14001 as a foundation for environmental policy, and for the group-wide 2012 target for CO2 emission reduction to 40% less than 2004 levels. UBS achieved the ISO 14001 standard certification in 1999, and has reported significant success, including a 25% reduction in CO2 footprint per Full Time Employee [FTE] over the three year period 2004 to 2006 [UBS Environmental Performance Indicators In House Operations]. The ISO 14001 standard takes an integrated and sustainable approach to policy execution, which is therefore dependent upon an integrated and highly responsive IT support system.

BS 25999 Business Continuity Management System

The new BS 25999 standard for business continuity was launched in November 2007, and is the first standard to offer independent certification of continuity policy execution using best practice. Influential organisations participated in the drafting of BS 25999, including the Cabinet Office for all government departments, Financial Services Authority [FSA] covering all regulated firms, the Institute of Internal Auditors, the Institute of Risk Management and the Association of Insurance Risk Managers.

For most service organisations, such as finance, retail, logistics, travel, legal or government, there is a complete dependency upon an integrated IT system covering business continuity, particularly for processes with very short Recovery Time Objectives [RTO] and where environmental risks indicate that business interruption needs a robust recovery process.

ISO 27001 Information Security Policy

Environmental incidents pose a number of security and continuity risks that can be effectively mitigated using the ISO 27001 Information Security Management System Standard, which has been adopted widely by government and commerce.

Security relies completely upon integrated IT support for robust policy execution, and particularly within government and commercial services who have major IT dependencies for delivery now that an increasing amount of consumer and business services and transactions are Internet based.

ITIL v3

The adoption of ITIL v3 creates a continuous lifecycle model for IT service delivery, and a potential foundation for directing Data Centre staff to higher value tasks, as well as reducing TCO by up to 48% according to one analyst, and improving responsiveness as would be required for continuity and environmental incident response. ITIL v3 is being integrated into the ISO 20000 IT Service Management System Standard to provide independent verification of execution and sustainability.

The benefits of lower TCO and higher responsiveness are being achieved by automating IT service delivery, which a recent study indicated was now being applied by 82% of enterprises. However, legacy systems can be very difficult to reliably integrate within ITIL, preventing the value from service automation being achieved, and thus inhibiting efficient execution of environmental and continuity policy.

Energy Star Program

Energy Star is an energy efficiency ratings program developed by the US Environmental Protection Agency, which has been promoted in Europe under the EU Energy Star Programme, where server and storage products qualify if they meet the required energy efficiency criteria. Whilst mainly a consumer program at present, its principles can be applied in commerce, and the IBM products that meet Energy Star are available now in the United Kingdom.

Overall therefore, an organisation can reduce risk and cost by integrating risk management policy execution using best practice standards, which will include the IT system, and the nature of the standards model is to sustain risk mitigation rather than consider it as an isolated event.

#4. IBM Green IT Solutions

"*Large companies are facing a large crisis around energy*" said Mike Daniels, Senior VP IBM Global Technology Services. "*This issue is surfacing in a number of different ways, whether it's the capital required to build a new Data Centre because people are out of capacity, or where people are out of power or trying to manage that power. We think this is an issue where we can provide leadership for the industry and our clients*".

IBM solutions to accelerate CO2 emission reduction and performance gains from lower power demand are delivered in phases – diagnosis, building, virtualisation, provisioning, cooling – by integrating IBM server, storage, cooling and technology services into a scalable best practice solution set.

"Large companies are facing a large crisis around energy."

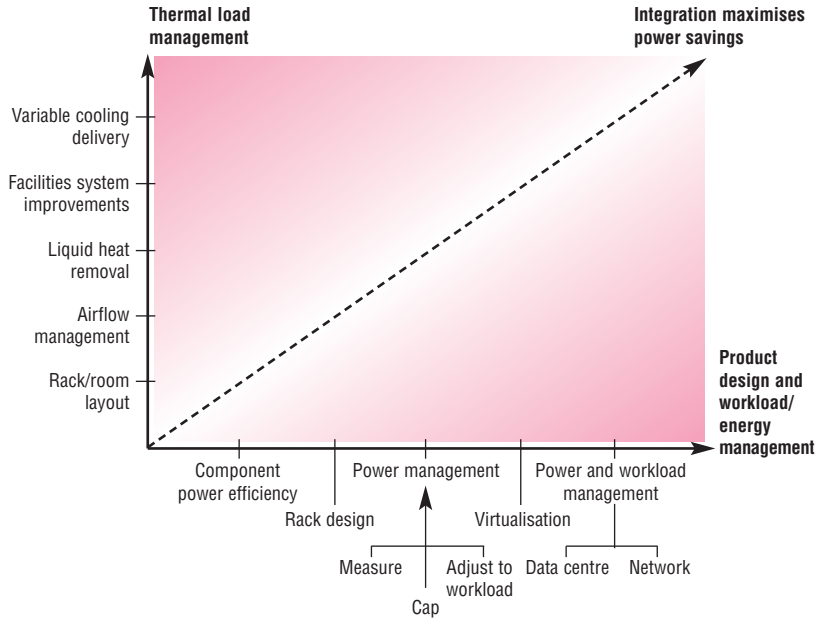
Mike Daniels, Senior VP, IBM Global Technology Services.

IBM Green IT Product Strategy

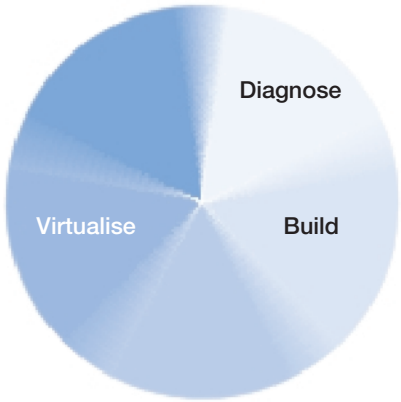
IBM's offerings for more energy efficient Data Centres reflect the range and depth of IBM's expertise. At the server level, IBM's cross-platform virtualisation capabilities enable existing hardware assets to become significantly more productive, while freeing up capacity for re-deployment, and significantly improving the speed and flexibility with which resources can be allocated. IBM's virtualisation technologies have helped organisations to boost server utilisation levels from 10% up to 80%, with a significant resultant saving in energy consumption.

At the storage level, with many organisations continuing to experience a dramatic growth in storage requirements, IBM is able to help organisations to prioritise their data more effectively, and then to use the most cost effective and energy efficient storage media dependent on the speed and frequency with which data will be required. And at the infrastructure level, IBM's power management technologies enable improved monitoring and allocation of energy across the entire Data Centre environment.

Data Centre Energy Efficiency Opportunities



Accelerated Environmental Policy Execution Using Energy Efficient IT



Of course, many vendors offer solutions that can contribute to creating a more energy efficient Data Centre. However, IBM's five stage engagement model ensures that an organisation's investment provides maximum return, by addressing each key element where efficiencies can be realised, to create a sustainable platform for immediate and longer term benefits.

Engagement Step #1: Diagnose

The project starts with IBM Global Technology Services' diagnosis of the existing IT system, and includes an energy assessment, using a three-dimensional power analysis and thermal analytics. A diagnostic component called the IBM Energy Efficiency Assessment rates the efficiency of the IT system and creates a plan to improve it. This includes Mobile Measurement Technology to identify temperature distribution in the IT system, and to gather thermal data on "hot spots", air leakage and other inefficiencies. IBM presents a detailed output report with recommendations.

Engagement Step #2: Build

The initial Diagnosis phase creates the foundation for IBM Global Technology Services' plan, build or update of the IT system. To accelerate benefits realisation, IBM can pre-configure 500 or 1,000 square feet Scalable Modular Data Centres, which can be implemented in only eight to 12 weeks, thereby further accelerating emission reduction and cost benefits. This can include cabling recommendations for improving airflow beneath system centre floors, and reducing cabling cost.

Engagement Step #3: Virtualise

IBM's class-leading virtualisation technologies can be applied across the major platforms, mainframes and storage environments, thus improving system utilisation, reducing energy consumption, and simplifying Data Centre management. Where it is determined that replacing servers themselves is the most effective means of reducing energy consumption, for example where systems are reaching the end of their lifecycle, servers such as the IBM BladeCentre have been proven to use 50% less energy than conventional rack systems, whilst still delivering the space-saving benefits of a virtualised environment.

Engagement Step #4: Manage

Provisioning software can reduce server power consumption by 80% simply by switching systems to standby when they are not in use. IBM's Tivoli management software allows system use – and thus energy use – to be allocated at a departmental level within an organisation, thus improving accountability and providing the necessary insight for improvement. IBM's PowerExecutive software provides unrivalled energy monitoring options, and can allocate, match and cap power and thermal limits in the Data Center at the system, chassis or rack level.

Engagement Step #5: Cool

IBM's cooling solutions, including the Data Centre Stored Cooling Solution and Rear Door Heat eXchanger, can make dramatic contributions to cutting overall Data Centre electricity costs, for example by using chilled water to reduce heat output from servers by up to 60%.

#5 Case Studies

Case Study: IBM
IBM will internally benefit from executing environmental policy and power reductions by re-designing 8million square feet of Data Centre space worldwide, to reduce electricity consumption by 5 billion kilowatt hours per year, whilst doubling Data Centre computing capacity! Therefore the translation of IBM internal piloting into a pragmatic solution has been proven and is creating similar responses elsewhere with major clients:

"The real key to us is on energy efficiency and reducing the demand for energy both for us and our customers."

Case Study USA: Pacific Gas and Electric Inc.
Initially the corporation used IBM diagnostic technology at three Data Centres to measure and identify "hot spots", air leakage and other inefficiencies across 40,000 square feet of Data Centre space. If Pacific Gas and Electric Inc. had surveyed this space manually it would have taken several weeks instead of a few days.

"*The real key to us is on energy efficiency and reducing the demand for energy both for us and our customers*" said Brad Whitcomb PG&E VP, Customer Products & Services.

By applying virtualisation technology to consolidate 300 Unix servers into 6 IBM System p servers, PG&E expects to reduce energy consumption by 80%, and PG&E will deploy IBM Rear Door Heat eXchanger water-cooling to reduce heat in the Data Centre by as much as 60%.

Case Study Europe: T-Systems Inc.
T-Systems, the business customer branch of Deutsche Telekom is an early adopter of IBM Green Processing. "*The main benefit is reduced electricity costs*", said T-Systems Head of Systems Stefan Bucher.

'Power is an increasingly large proportion of our data centre costs and so consolidating our servers is a must,' said Herr Bucher. *'It is now key to our success to drive down IT costs so we have to operate those data centres on less power'*.

#6. Next Steps

To help organisations to determine the optimum approach to addressing the issues examined in this Point of View, IBM has a series of initial offerings designed to provide a roadmap for a more efficient Data Centre. These offerings vary in depth according to the level of insight required.

IBM Offering #1: Energy Efficiency Interview
A 0.5 day consultation using elements of IBM's Zodiac Environmental Study methodology, including identification of opportunities for improved system utilisation and reduced energy consumption in the Data Centre.

IBM Offering #2: Cobra Environmental Study
A 1 day evaluation of an organisation's existing infrastructure, again using aspects of the IBM Zodiac Environmental Study, to identify potential areas where efficiency improvements may be realised.

IBM Offering #3: Zodiac Environmental Study
An approximately 10 day engagement which produces a detailed analysis of an organisation's current infrastructure environment, along with recommendations for improvements and the business benefits which will result, including projected RoI. The Zodiac study is flexible, and is tailored to each organisation's individual requirements to deliver the required depth of insight, while the deliverable includes an analysis of both 'hard' and 'soft' savings, plus server and application inventory, and the supporting business case for new investment.

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