



A Greener UK Public Sector

The Critical Role of ICT



“... remember this: the UK’s public sector has a bigger carbon footprint than the entire waste industry; if we do this (meet our targets), we’ll cut the Government’s energy bills by hundreds of millions of pounds.”

David Cameron

Speaking to DECC staff, 14th May 2010

“The recently published ‘Greening Government: ICT Strategy’ (2011) signals the continued need for the Public Sector to focus on energy efficiency.

The new strategy has a much broader base than its predecessor, explaining how to deliver energy efficient ICT and how to exploit ICT for energy efficiency in business operations and public service delivery.

Cisco has a wealth of capability that we wish to make available; as a green technology supplier; as an advisor on how to use our products for energy efficiency; and as a business seeking to meet our own obligations under the Government CRC Energy Efficiency Scheme.

We have created this paper to share our recommendations for energy efficiency. They are based on experiences within the Cisco business and on project work with our customers and partners.

We look forward to the opportunity to discuss the contents with you.”

Rod Halstead
Managing Director
Cisco UK Public Sector
Cisco Systems

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Introduction

The United Nations Climate Change Conference, held in Durban in November 2011, once again brought green and sustainability topics to our television screens. This is the latest in a series of steps that, over a period of five years, has seen unprecedented action internationally to mitigate the potential impact of climate change through reduced greenhouse gas (GHG) emission.

As part of that international action, industry has been set the challenge of harnessing technology to create energy efficiency and so reduce GHG emissions. In meeting the challenge through investment in technology, it is hoped that industry will be able to drive global economic growth. The approach Cisco has taken is set out later in this paper.

There has already been considerable activity by national governments. In 2007, the UK Government passed the Climate Change Act which, for the first time, placed energy reduction obligations on organisations in both public and private sectors. The first league tables – for 2010 / 2011 – were published by the Environment Agency in November 2011 to show the ranking of organisations participating in the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme established by the Act. Public Sector organisations can be found at both the top and the bottom of the rankings showing that, while much has already been achieved, there is still much that can be done to improve energy efficiency.

UK Government has now published two green strategies. The first, in July 2009, was entitled 'Greening Government ICT' and made practical recommendations on how Public Sector organisations should procure,

ICT has a key role both in reducing energy use and in cost saving

use and dispose of ICT to increase energy efficiency. That first strategy made three key recommendations: embrace the substantial benefits of virtualisation, exploit energy management, and assess the energy use of products over their whole life-cycle – from manufacture to disposal – not just the in-use phase.

The second strategy, published in October 2011, is entitled 'Greening Government: ICT Strategy'. The subtle change in title emphasises the much greater role of ICT in creating energy efficiency for business operations and for public services.

Recognised as one of the key users of energy in a business, it is estimated that ICT is responsible for between 2% and 10% of total energy use within typical organisations and for up to 25% in particular buildings. ICT also has a key role to play in transforming business processes and shaping service delivery so that overall energy use, and thus GHG emissions, can be reduced.

Cisco has done work both on energy efficiency and cost saving in the Public Sector and has published guidance on the use of ICT to drive cost saving and efficiency. This makes it clear that ICT has a key role both in reducing energy use and in cost saving and that they are directly linked. In fact, we would categorically state that Cost = Carbon and Carbon = Cost. In other words, an ICT project to increase energy efficiency will also lower costs, and an ICT project to reduce costs will also increase energy efficiency.

Cisco has produced this paper as a response to the very latest Greening Government strategy. It provides guidance on how to deliver energy efficient ICT and how to use ICT to create energy efficient business operations and public service delivery. The paper provides a series of recommendations for action and includes selected case studies to demonstrate benefits.

We look forward to being able to meet with you to discuss this guidance and the recommendations contained in this paper. We hope to have the opportunity to work in partnership to achieve your green and sustainability targets.

Background: Climate Change Science

Climate change is generally defined as 'long term changes to the Earth's weather patterns caused by fluctuations in the Earth's energy balance and in associated global mean temperature'.

The Earth's energy balance and global mean temperature are determined by the amount of incoming solar energy from the Sun and how much of that energy is reflected or absorbed by the Earth's surface and our atmosphere.

The properties of the Earth's surface and our atmosphere have been, and will continue to be, affected by the actions of mankind. In particular, the emission of GHGs, as a result of energy use, impacts the ability of our atmosphere to reflect solar energy, so changing the Earth's energy balance and increasing global mean temperature.

Climate scientists now believe that a 2°C rise in global mean temperature will be a very significant threshold for climate change. If this threshold is exceeded, climate change would become very dramatic and possibly impact on our ability to inhabit the Earth.

The most serious effect of climate change is anticipated to be sea level rise. It is estimated that a global mean temperature rise of between 1.8°C and 4°C would cause sea level rise of between 28cm – 43cm largely through the disappearance of summer polar sea ice. Changes to polar sea ice would also lead to a major increase in heat waves and more frequent and more intense tropical storm activity.

The relationship between global mean temperature and sea level, however, is not linear. Climate scientists now understand non-linear climate feedback loops whereby relatively small changes in global mean temperature can lead to much larger changes in sea level. Non-linear climate feedback loops are created when higher levels of GHGs increase global mean temperature, causing loss of polar ice. This releases GHGs trapped in polar sinks which in turn increases global mean temperature. A 2°C rise in global mean temperature is believed to be the point at which these non-linear feedback loops start to become highly significant.



A 2°C rise in global mean temperature will be a very significant threshold for climate change

The Global, EU and UK Responses to Climate Change

Global Response

The United Nations has taken the global lead on climate change. It established the Framework Convention on Climate Change in 1992, as an international treaty, to consider what could be done to limit global mean temperature change and consequent climate change.

By 1995, countries realised that GHG emissions reduction provisions in the Convention were inadequate and launched negotiations to strengthen the global response. Two years later the Kyoto Protocol Treaty was adopted to set binding emission reduction targets for thirty-seven industrialised countries and the European community, and to establish market mechanisms for carbon trading. Overall, the reduction targets add up to an average of 5% emissions reduction compared to 1990 levels over the first five-year commitment period, 2008 to 2012.

The most recent United Nations Framework Convention on Climate Change (UNFCCC) Conference in Durban in November 2011 exceeded many people's expectations.

Both developed and developing countries agreed to work towards a new treaty, with 'legal force', under which they would take on new emissions targets. In addition, it was agreed to extend the life of the Kyoto Protocol Treaty beyond 2012 and to set up the Green Climate Fund, a major new climate finance facility. Significant progress was also made on Reducing Emissions from Deforestation and Forest Degradation (REDD) through offering greater incentives to slow deforestation.

However, much detail is still to be clarified and many believe that currently agreed emissions reduction commitments are still inadequate to prevent global mean temperature rising by more than the 2°C threshold.

Many believe current commitments are inadequate to prevent global mean temperature rising by more than the 2°C threshold



EU Response

The European Union (EU) has established regional policies that it hopes will lead the world in the development of low-carbon economies.

The EU had a strategy of raising its emissions reduction target for 2020 (compared to 1990) from 20% to 30% and aimed to steer businesses (both in-and-outside of the EU) onto a low carbon trajectory. There had been broad agreement that an aggressive 30% reduction target would focus businesses and be large enough to stimulate the necessary economic and technological investment. Stimulating that initial

investment was seen as essential if technology were to provide the platform for even greater levels of emissions reduction in the future.

In support of that strategy, the EU established a number of key policies and programmes:

- An Emissions Trading System to cap and reduce emissions with a 2020 trajectory (a longer term 2050 trajectory is also required)
- Standards to increase the CO₂ efficiency of passenger cars

- An Ecodesign Directive setting a broad base of standards for the design of new buildings
 - An Energy Performance of Buildings Directive promoting retrofits for energy efficiency and renewable energy projects
- When the strategy for a 30% reduction was put to the vote in 2011, it was rejected. However, recent figures suggest that the EU has already reduced emissions by 17%, making it likely that there will be a new vote, in 2012, for a 30% reduction by 2020.



UK Government Response

UK Government policy on climate change is being led by the Department of Energy and Climate Change (DECC).

Estimates of the total UK investment necessary to achieve emissions reduction targets range from £100 – £200 billion; investment that must be made in the face of reduced Government spending, economic uncertainty and higher primary energy costs.

The UK has adopted an ambitious, legally binding Climate Change Act that reached the statute book in 2008. The act commits the UK to reducing GHG emissions by at least 80% from 1990 levels, by 2050. At this time, the UK is the only EU country with such a legally binding, long-term commitment to reduce GHG emissions by such an amount. It is

proposed to do this by setting carbon budgets in 5-year increments and having them independently reviewed by a 'Committee on Climate Change'.

The Climate Change Act, for the very first time, places energy reduction obligations – the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme – onto individual organisations.

The scheme applies to organisations (and their subsidiaries) with at least one half-hourly electricity meter (HHM) settled on the half-hourly market, and which have consumed more than 6,000 megawatt-hours (MWh) per year of half hourly metered electricity during 2008. Qualifying organisations are obliged to participate and must register with the Environment Agency, who administer the scheme.

Organisations that do not meet the 6,000 MWh threshold have to make an information disclosure of their half hourly electricity consumption. Organisations have to comply with the scheme or face financial and other penalties. In total, the scheme is believed to apply to organisations which contribute up to 10% of all UK emissions. It obliges them to report energy emissions and to surrender Carbon Reduction Commitment (CRC) allowances for each compliance year.

The scheme, however, has been changed significantly since its inception and is now, essentially, a carbon tax with revenues going to the Treasury instead of to scheme participants. Amendments in 2011, extended the introductory phase of the scheme, and postponed Phase 2, to allow more evaluation of the scheme

and removed the original obligation on non-qualifying organisations to make 'information disclosures' on energy use.

Many Public Sector organisations have been obliged to take part in the scheme, including Government Departments and Agencies, Local Authorities, Healthcare Trusts and Universities. The first scheme league tables – for 2010 / 2011 – were published in November 2011 and show the ranking of participating organisations. Public Sector organisations can be found at both the top and the bottom of the rankings indicating that, while much has already been done to improve energy efficiency, there is still much that can be done.

The Climate Change Act places energy reduction obligations onto individual organisations



The Greening Government ICT Strategy

ICT, of course, contributes substantially to energy use both within businesses and within the home. It is estimated that ICT is responsible for 2% of energy utilisation worldwide and up to 20% in developed countries, such as the UK.

UK Government has realised the critical nature of ICT – both as a significant contributor to energy use and as an enabler of energy efficiency – and in October 2011, published its new Greening Government: ICT Strategy. The new strategy expands on its predecessor by promoting both energy efficient ICT and its use in making Government operations and the public services more energy efficient.

At the same time a set of valuable supporting resources were made available for Public Sector stakeholders, including the following:

- A set of forty five case studies describing energy efficiency projects in Government, Local Government and Higher Education and their outcomes

- A Green ICT Roadmap that defines fourteen key outcomes, extracted from the Green ICT Workbook of Best Practices, to allow organisations to map progress on energy efficiency
- A Green ICT Maturity Model that allows a stakeholder organisation to demonstrate progress in embedding Green ICT into its business processes and practices

Cisco welcomes this new approach from Government which accords very well with our approach set out in the section 'The Cisco Approach to becoming a Greener Organisation'. This paper has been developed to respond to the delivery and implementation recommendations contained within the new strategy.

Departmental Initiatives

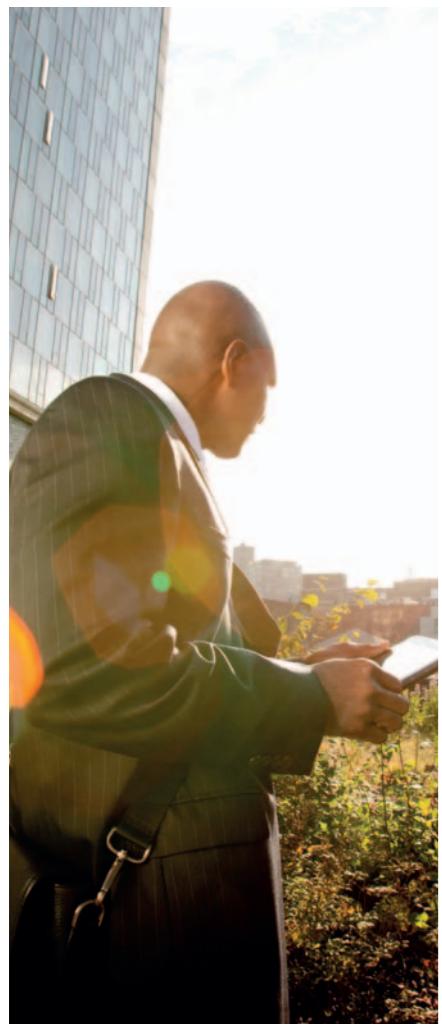
Individual departments have also become active promoters of energy efficiency. Some of their case studies are outlined in the supporting resources to the Greening Government Strategy.

A good example of this is the lead taken by the Department of Health and the NHS. An NHS Sustainable Development Unit (SDU) was established to provide resources and guidance, including a 'route map', to support the staged development of a sustainable healthcare organisation. In 2010, the NHS SDU updated the NHS carbon footprint for England. This is now estimated at 21 million tonnes of CO₂e (carbon dioxide equivalent), broken down into three main categories: building energy (24%), travel (17%) and procurement (59%).

One of the key themes in the SDU route map is the use of technology. Examples are provided to explain low carbon technologies and how to exploit enabling ICT-based solutions, such as Telemedicine.

Why Become a Greener Organisation?

Today, it is generally accepted that organisations should strive to be sustainable and to have a positive impact on their communities and on the wider environment.



In order to achieve these objectives, a focus needs to be placed upon the development and implementation of business strategies that go beyond obligation and regulation and demonstrate a true commitment to a healthy and sustainable future. Organisations should adopt principles, policies and practices that will help improve the quality of life for their customers.

To do so, of course, makes sound business sense as customers (and citizens) are becoming increasingly aware of sustainability and, for many people, it affects employment and purchasing decisions. Environmentally conscious business practices can help to attract and retain the best employees and have been shown to increase employee satisfaction and pride in the workplace.

According to the Workplace Insights Survey, conducted by Adecco in the USA: "American workers are paying growing attention to companies' environmental policies and an increasing number report that they would be more inclined to work for 'green' companies."

A recent poll on green employment by MonsterTRAK.com found that 80% of

young professionals are interested in securing a job that has a positive impact on the environment, and that 92% would be more inclined to work for a company that is environmentally friendly. Engagement programmes that empower employees by giving them easy ways to support causes they care about, such as the EarthShare workplace-giving programme, are also proven morale boosters.

Green business strategies also signal reduced business risk and progressive business practice. Investors, partners and other stakeholders are becoming more knowledgeable on green strategies and understand that they can improve performance and profitability.

In the past there has been the feeling that these objectives apply only to private sector businesses. Government strategy, however, makes it clear that they apply equally to all organisations – irrespective of whether they are in the public or private sectors. Cisco believes that UK citizens do expect the business of Government to be conducted in a sustainable and environmentally conscious manner, and that Public Sector organisations should be as interested in green business benefits as any private sector company.

Greening the Provision of Government ICT

The recent Greening Government: ICT Strategy covers three distinct areas: how ICT can be made more energy efficient, how ICT can enable energy efficient Government operations, and how ICT can enable energy efficient public service delivery.

This section deals with the first of these three areas – how ICT can be made more energy efficient. It suggests general principles that should be adopted and makes specific recommendations covering the key areas where energy is used within typical ICT infrastructure, namely:

- Data centres: that act as the 'service delivery points' for applications, services and data repositories of business information
- Interconnecting network infrastructure: that provides the reach and range to connect applications, services and business information with end-users; known as the Borderless Network in Cisco terminology

- End user devices: that allow users to access information and services, delivered from the data centre, over the Borderless Network

All Public Sector organisations should have an ICT strategy to explain how ICT can be implemented at lower cost and how it should be made available as a platform for business and service transformation. That strategy should also explain the general principles for implementing ICT in an energy efficient manner.

The Greening Government strategy sets out clear principles by which ICT can be implemented in an energy efficient way

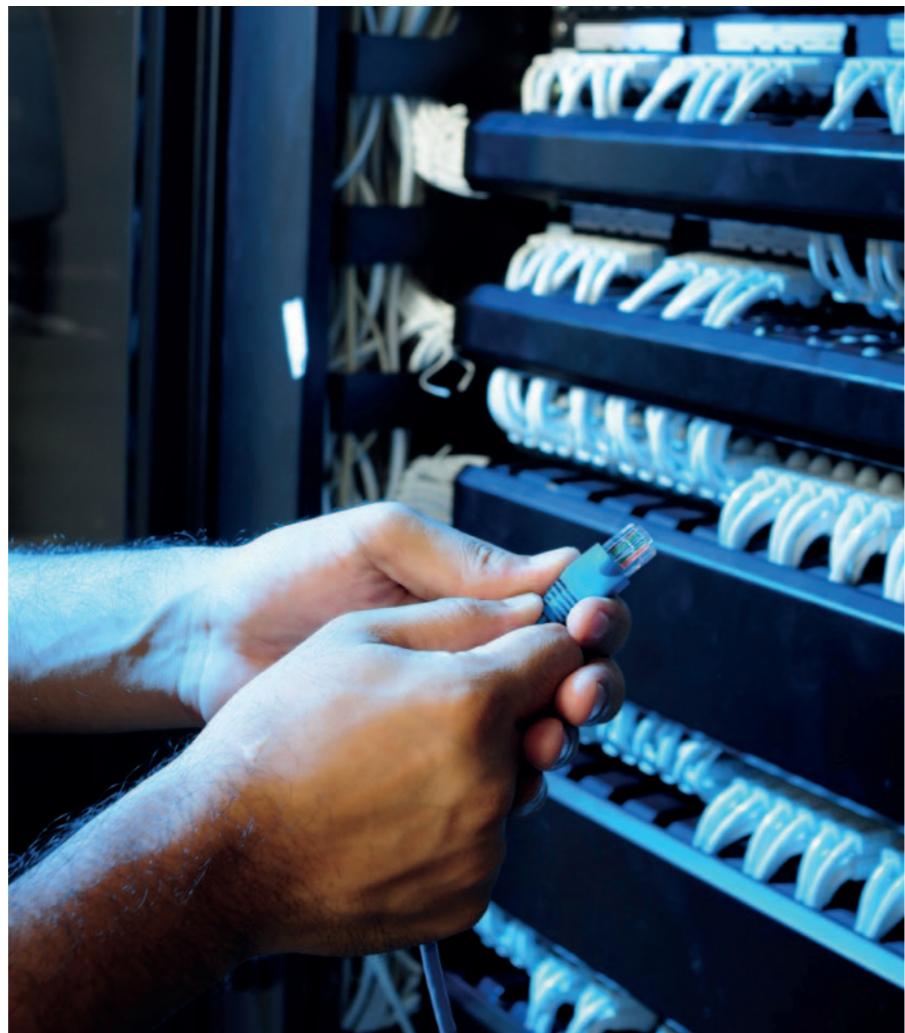
General Principles

The Greening Government strategy sets out clear principles by which ICT can be implemented in an energy efficient way. The principles apply to all aspects of ICT infrastructure including data centres, interconnecting network infrastructure and end-user devices. The three key principles are:

- Consolidate and virtualise ICT infrastructure to increase asset utilisation and reduce device counts
- Implement power management to ensure that devices do not draw power when not in use
- Understand the energy used by equipment across the whole life-cycle from manufacture, through use, to disposal and reuse, because each stage contributes significantly to overall carbon footprint

The first principle requires the consolidation of all ICT assets and the use of virtualisation technology where possible. Virtualisation technology is now available for most elements of ICT infrastructure including compute, storage and networks within data centres; local and wide area networks through the use of VLAN and VPN technologies; and security devices including firewalls. This approach can dramatically increase energy efficiency by reducing device counts and ensuring asset utilisation is maximised for deployed devices.

The second principle requires that power management be deployed wherever possible within ICT infrastructure.



Normally this is applied to end-user devices including PCs and printers. Cisco has pioneered the use of intelligence within network infrastructure to power manage network-attached devices including phones, wireless access points, PCs and printers.

The third principle requires engagement with technology vendors to fully understand energy use over the whole life-cycle of ICT devices. While it is easy to focus on energy consumption of a device in the use phase,

very often a significant amount of energy is also used in the manufacture phase. So, it is important to carefully assess the optimum length of service for a device to ensure the impact of high-energy use in the manufacture phase is balanced against in-use energy consumption.

The following sections translate the above principles into practical recommendations in each of the three main areas of ICT infrastructure.



Case Study: Cisco's Enterprise Data Centres

Cisco operates seven data centres totalling some 230,000 square feet and supporting over 66,000 staff plus partners and customers.

Within our data centres we have moved to a 'service-oriented' approach, focusing on operational flexibility, to address the following key business issues:

- Utilisation of data centre resources – typically 10% – 25% utilisation for servers

- Requirements for storage – growing by an average of 50% p.a.

- Rising energy costs – typically 50% of total costs

- Lack of physical space in congested data centres

A storage architecture project migrated single tier, often directly attached, storage to multi-tier, networked storage. This has brought about:

- An increase in storage utilisation from 20% to 70%

In addition, a server virtualisation project has migrated one-per-application servers to modern Cisco Unified Computing platforms. This has brought about:

- A reduction in power consumption of 33%

Data Centres

Data centres are central to modern ICT infrastructure. They are the service delivery points for the wide range of applications and services used by modern Public Sector organisations.

Data centres, however, are among the top users of electrical energy within ICT infrastructure and, in some cases, even within an overall business. A rack of servers may consume 20 kW while a large data centre can consume up to 15 MW. Large data centres may be responsible for up to 45% of total ICT energy utilisation.

Many data centres have grown organically over extended periods with individual applications, and their associated compute and storage capacity, developed within business silos. This silo effect has resulted in very poor asset utilisation (estimated at

Large data centres may be responsible for up to 45% of total ICT energy utilisation

less than 5% for Government data centres), and those underused assets being unavailable to increase capacity for other applications. Underused assets still occupy physical rack space and require power and cooling. They make a significant impact on an organisation's capital and operational costs and on its overall energy efficiency.

Cisco recommends that these inefficiencies be addressed through asset consolidation and virtualisation at a data centre,

application and infrastructure level. Modern data centre architectures, such as Cisco's, offer consolidation and virtualisation for compute, storage and network infrastructure. This permits previously siloed applications to share data centre infrastructure, resulting in fewer physical devices and higher utilisation of individual devices.

Cisco took just such an approach to its own data centres. It consolidated compute and storage assets so increasing storage utilisation from 20% to 70% while reducing power consumption for compute by 33%.



Interconnecting Infrastructure – The Borderless Network

Cisco's Borderless Network Architecture provides a blueprint for the secure, reliable interconnecting network infrastructure required by modern businesses.

The architecture covers wired networks (both WAN and LAN), wireless networks and security infrastructure. Well designed Borderless Network infrastructure allows staff to access their applications, services and critical business data at any time, from any location and via any appropriate device. Such infrastructure will support all data, voice and video applications for a business, permitting existing networks to be converged and virtualised. This can significantly reduce the amount of physical network equipment and overall energy use.

The Public Services Network (PSN) programme seeks to create a Borderless Network for the whole of the Public Sector suitable for handling data, voice and video traffic. PSN will replace separate data, voice and video networks and act as an effective shared service resource for all Public Sector organisations. We recommend that organisations embrace PSN, as it will directly drive down overall energy use and act as a platform for further energy savings through shared service deployments.

End-user Devices

End-user devices, such as PCs and printers, account for a significant proportion of total ICT energy utilisation within an organisation.

Government guidelines, associated with the Greening Government: ICT Strategy, provide advice and guidance on practical steps that can be taken to increase the energy efficiency of PC and printer estates.

One key piece of guidance is to deploy virtual desktop infrastructure (VDI) – using 'VDI' or 'thin' clients – rather than use conventional desktop and laptop PCs. In the VDI model, applications and data no longer reside on end-users personal PC devices but, instead, are hosted centrally on large servers accessed over interconnecting network infrastructure.

The VDI approach can have a very significant effect on energy use for a combination of reasons:

- Thin client devices are far simpler than traditional PCs and consequently consume less energy
- Applications and data are hosted on centralised virtual servers which typically have much higher asset utilisations than desktop devices

Case Study: VDI Deployment using Cisco Vblock Infrastructure Packages

- Cisco Vblocks reduced data centre components by 56% when compared with legacy 4 processor rack servers, 69% compared with legacy 2 processor rack servers, and 54% compared with legacy 2 processor blade servers
- Cisco Vblocks lowered power, cooling and space requirements, resulting in 11kW power savings and 5 racks worth of space savings compared with 4 processor rack servers

This approach was taken within a major global bank and has proven to deliver the following benefits:

Key Cisco Recommendations

- Consolidate and virtualise data centre assets. This reduces energy use through smaller numbers of physical devices and through increased asset utilisation
- Converge all data, voice and video networks onto a single wired and wireless Borderless Network to reduce the number of network devices. Embrace the PSN programme as a route to achieve consolidation and convergence and as a platform for greater shared services energy savings
- Deploy VDI infrastructure using thin clients as end-user devices for appropriate stakeholders. This reduces the energy use of end-user devices and increases device life-cycles
- Life-cycle manage all ICT assets. This lets you balance longer device lifetimes with new product provision and benefit from the latest devices offering the lowest energy footprints

Greening Government Operations

This section deals with the second of the three areas covered in the Greening Government: ICT Strategy – namely how ICT can create more energy efficient business operations.



According to the SMART 2020¹ report, GHG emissions attributable to ICT are estimated at, on average, 2% of global totals. GHG emissions attributable to ICT are, of course, much greater for typical UK organisations but still represent no more than 20% of all energy-related emissions.

Business operations account for the remaining 80% of emissions and solutions must be sought to drive energy efficiency in every aspect of the workforce, the workplace, production and logistics.

Cisco believes that ICT is a critical resource for helping to reduce energy use in every aspect of business. But Cisco's experience is also that cost saving and energy use are very closely related. In fact we would assert that Cost = Carbon and Carbon = Cost. So, a programme that saves costs will also save carbon and, equally, a programme that saves carbon will also save costs.

Cost = Carbon Carbon = Cost

Cisco has focussed on the use of ICT to reduce energy within our own business operations and this enables us to make recommendations in three key areas:

- Development of a modern flexible workforce
- Creation of energy-efficient, smart and connected buildings
- The use of ICT infrastructure for power management

Development of a Modern, Flexible Workforce

Public Sector organisations should focus on developing modern, flexible workforces.

Such workforces will contribute significantly to reducing emissions because:

- They will work regularly from remote locations
- They will have less dependence on office systems
- They will permit reductions in the number and size of buildings

In addition, a much lower overall carbon footprint may be expected because of reduction in the use of motor vehicles and other forms of travel.

Cisco recommends that organisations put in place a Workforce Strategy to explain the cost and energy saving benefits of a modern, flexible workforce and the role of ICT in its delivery. Cisco has already published a recommended four-phase approach to explain how ICT can help realise such a modern, flexible workforce in a paper entitled 'Operational efficiency in the public sector - 10 recommendations for cutting costs in 2011 – 2012'.

The first, and critical, phase is to build a Borderless Network. The network offers the reach and range that permits applications and data to be accessed from any location. Subsequent phases of ICT deployment provide the rich, collaboration toolsets necessary to support location independent workers;

unified communications to optimise internal and external voice communications; web collaboration toolsets to enhance virtual meetings and virtual information exchange; and pervasive video to enrich all remote communications and collaboration toolsets.

The first, and critical phase, is to build a Borderless Network

Smart and Connected Buildings

The Public Sector operates by far the largest estate of offices and buildings in the UK. Many are old and energy-inefficient. The majority do not exploit modern ICT to automate building operations and regulate the use of energy and resources.

Cisco uses the term 'Smart Connected Building' for an intelligent building where all building management functions – from heating, ventilation and air conditioning (HVAC), to energy consumption, closed circuit TV (CCTV) and access control – are monitored, controlled and supported over a robust, well-administered IP network.

We recommend that Public Sector organisations develop an Estates Strategy to explain the smart, connected approach to managing the buildings used by their workforce. Such an approach will embrace centralised, policy-based monitoring and

control of all building functions. This will include HVAC and energy consumption permitting business process and policy changes that will minimise energy use.

A further benefit of the smart, connected approach is the ability to establish intelligent 'cause and effect' relationships that tailor how building systems react to building occupancy. For example, when an individual member of staff enters a building and uses the access control system, that fact can be detected by the building management system. The building management system then activates those systems and devices required by that member of staff or by his work area. The activated systems and devices (for example lighting, heating, telephony and network access) would remain in that state while the member of staff was in the building, so optimising energy use.

Power Management

One of the key recommendations of the Greening Government: ICT Strategy is that organisations use power management to ensure that unused devices do not draw energy.

The strategy encourages the support of industry to develop innovative new technologies so that power management can be implemented, at scale, by businesses.

Cisco has responded to this need by developing a new architecture for power management, called Cisco EnergyWise. Cisco EnergyWise technology allows ICT devices – such as IP telephones, wireless access points, cameras, thin client devices and laptop / desktop PC platforms – to be monitored and power-managed under policy control using the reach and range of the modern network infrastructure.

EnergyWise also allows detailed energy utilisation data to be gathered, analysed and reported. It may also be fully integrated with building management systems to allow direct policy-based control of all building services including heating, ventilation and air conditioning. More recently, with the advent of EnergyWise-capable power distribution units (PDUs), it is possible to monitor and control any device which uses mains power.

Case Study: The Use of Cisco EnergyWise by the London Borough of Hillingdon

Hillingdon has positioned itself to implement new and innovative solutions through its investment in Cisco infrastructure based on our Borderless Network Architecture.

In 2002, Hillingdon introduced Cisco IP Telephony to cut operational costs and increase productivity. This also brought sustainability benefits by enabling home working – an option since taken up by around 900 employees. It was followed in 2006 by the launch of a data centre

virtualisation project, using VMWare, which has now reached more than 50% of the server estate.

Hillingdon are now deploying Cisco EnergyWise as the foundation for an evolving set of integrated energy-saving solutions, using the network as an enabler for cost and carbon reduction. It provides centralised network control of IP phones, wireless access points and other Power over Ethernet (PoE) devices. At Hillingdon, this part of the solution

now extends to 3,000 IP phones, 50 Wireless Access Points, seven Cisco IP surveillance cameras, and 11 CCTV cameras.

Hillingdon calculates that Cisco EnergyWise has to date generated savings of £20,000 on its annual utilities bill with a carbon emissions reduction of 44 tonnes and a return on investment (ROI) achieved in six months.

Key Cisco Recommendations

- Adopt the Cisco four-phase approach for the use of ICT to create a modern, flexible workforce. This reduces energy use within buildings and lowers the overall carbon footprint through travel reduction
- Employ smart connected building technology to monitor and control all building systems and so reduce energy use. Use intelligence to tailor building systems to building occupancy
- Exploit the power, reach and range of Borderless Network infrastructure by implementing Cisco EnergyWise power management to power cycle network-attached devices (i.e. only supply power when a device needs to be used) in line with business policies





Greener Public Services

This section deals with the third area covered in the Greening Government: ICT Strategy – how ICT can deliver energy efficient public services.

Delivering public services is, of course, the prime role of Public Sector organisations. The role of business operations is to create financially and organisationally strong structures to allow those services to be delivered in an effective manner.

An organisation must start with business operations and ensure they are cost-effective and energy efficient. Once this has been done internally, it should examine its range of services, how they are delivered and look to make them as energy efficient as possible.

Again, Cisco believes that ICT has a critical role to play in reducing the energy used in delivering those services and the following sections provide our guidance and recommendations.

ICT has a critical role to play in reducing the energy used in delivering services

Public Services Channel Shift

The Government has engaged in a 'channel shift' programme for several years seeking to target two key elements to drive down costs:

- Transaction Volumes: initiatives, such as 'Tell Us Once' and National Indicator 14 – Avoidable Contact (now withdrawn), that seek to eradicate duplicated and unnecessary interactions between citizens and the Public Sector
- Transaction Channel: initiatives within overall channel strategy, such as 'Digital by Default', that seek to reduce the number of face-to-face and telephone service transactions and replace them by web transactions

Both these elements are hugely significant from an energy use point of view, as well as a cost. If transaction volumes are reduced, the Public Sector will require a smaller workforce, fewer buildings and less supporting ICT infrastructure. If there is transaction channel shift, the Public Sector will require a smaller face-to-face and contact centre workforce, fewer buildings and, most likely, less supporting ICT infrastructure.

Channel shift, therefore, is of great importance to energy use in the Public Sector and exploitation of ICT can assist this process. All Public Sector organisations should have a Services Delivery Strategy to explain how channel shift should be

implemented. The following sections provide Cisco recommendations on the role of ICT in enabling that shift and realising the consequent energy efficiencies.



Reducing Face-to-Face Contact – The Role of Video

Channel shift seeks to reduce face-to-face contact through transitioning services and service transactions to contact centre and web channels.

However, despite this process, there will still be a substantial need for face-to-face capability for certain services and for certain stakeholder groups. Public Sector organisations must look at how they can reduce the cost and energy use associated with this provision while, at the same time, maintaining their quality and availability.

Video-based solutions have a genuine role in transforming face-to-face services. This has already been proven by the Courts Service in a number of virtual courts pilots. Cisco believes that more extensive use of remote video pods will provide ease of access for citizens in dispersed communities while allowing skilled resources to be centralised.

This will provide real benefits to the citizen – ease of access to services, less travel, ability to access multiple services via a single video pod and potential access from home in the future.

It will also provide benefits to the Public Sector – reduction in the number of face-to-face centres and face-to-face staff, reduced staff travel, better use of distributed Public Sector building assets and improved access to skilled resources.

All these have a significant impact on Public Sector costs but also on the use of energy because of the need for fewer buildings, fewer staff and for less staff travel. In addition, there will be a significant reduction in citizen travel, thus reducing the overall carbon footprint associated with the provision of services.

Implementing Multi-Channel, Virtual Contact Centres

Channel shift will increase the strategic importance of Public Sector contact centres which must be provided in a cost and energy efficient way.

Modern IP based, multi-channel contact centres provide solutions that scale and offer comprehensive facilities for a good citizen experience. Scalability affords the opportunity for Public Sector contact centres to be consolidated to reduce ICT device counts and reduce energy use – an approach first advocated by the Varney Service Transformation Report as long ago as 2007. The availability of comprehensive facilities allows contact centres to be operated as shared services to deliver queuing and skills-based routing, and provide the capacity to handle peak loads.

The benefit of using an IP-based, multi-channel contact centre lies in the ability to distribute contact centre infrastructure and staff to best suit business operations. It permits staff to work from any location, including their home. This reduces energy use within an organisation as there will be fewer on-site staff and the need for less building space. But staff will also benefit through improved work-life balance and through improved inclusion. For example, a disabled person may not be physically capable of travelling to an on-site contact centre but still able to operate very successfully from a home location.

Key Cisco Recommendations

- Develop a clear channel shift strategy for public services delivery. This reduces the dependence on staff, buildings and infrastructure
- Exploit video technology to supplement conventional face-to-face services
- Adopt modern IP-based, multi-channel contact centres for consolidation and to develop new distributed operating models

The Cisco Approach to Becoming a Greener Organisation



The impact of energy used by ICT devices is an extremely important, yet complex, issue for Cisco. As a technology vendor, it impacts how we develop and manufacture products and how we recommend that our customers use them.

Like all businesses we are continually assessing how we can drive down energy use so that we can meet our corporate obligations, such as the UK CRC Energy Efficiency Scheme.

Cisco includes its policies on the environment within its overall corporate social responsibility (CSR) policies.

Our 2011 CSR Report focuses on four key areas for our business: product energy efficiency, low carbon solutions, operational energy efficiency reporting and product end-of-life. Cisco believes that these areas will make the greatest difference to energy efficiency for our business and for our customers, so we concentrate much of our environmental sustainability effort on them.

Our 2011 CSR Report focuses on four key areas:

- Product energy efficiency
- Low carbon solutions
- Operational energy efficiency reporting
- Product end-of-life

Product Energy Efficiency

Life-cycle analyses of electronic products indicate that the use phase can contribute up to 90% of total life-cycle carbon impact. This makes product energy efficiency a key consideration for all product design and generation improvements.

Reducing the power used by complex application-specific integrated circuits (ASICs), which are used in most Cisco products, is a focus of our efforts to cut product energy use. Our new ASIC energy management mechanisms have been shown to reduce energy demand between 10% - 30% in ongoing laboratory tests.

Improving the energy efficiency of power supplies is also a priority, and Cisco product specifications mandate that all new power supplies must be at least 85% efficient.

However, we believe that the most effective way to address product energy efficiency across the industry is to promote global requirements and global standards for energy measurement and efficiency features. Cisco was co-editor of the Alliance for Telecommunications Industry Standards (ATIS) TEER (Telecommunications Energy Efficiency

Ratio) standard for the measurement of product energy efficiency, and we are implementing the accompanying methodology for all applicable products.

Low-Carbon Solutions

Although the use of ICT products consumes energy, there is also substantial opportunity for them to reduce energy-related GHG emissions as described earlier in this paper. Cisco is, and will continue, to deliver network technologies that can help reduce GHG emissions by:

- Offering low-carbon ways to avoid business travel and employee commuting. Our customers are rethinking their behaviours and finding innovative, network-enabled alternatives, such as web-based collaboration rather than travel, as well as telework rather than daily commuting
- Providing connected energy management, so customers can use the network as the platform to measure, monitor, report, and plan for greater energy efficiencies

Cisco is also developing integrated solutions to bring people and services together, and promote low-carbon urban living and working. Our Smart+Connected Communities initiative will give the network a central role in the delivery of integrated offerings across real estate, transportation, safety and security, utilities, health, education, and government to improve community management, economic growth, citizen quality of life, and sustainable development.

We recognise that the application of technology alone will not result in reduced emissions. It has to be coupled with changes in culture, management practices and business processes in order to achieve its full potential. This evolution to collaborative technologies, smart buildings

and work spaces, and connected energy management creates additional benefits. These include faster decision-making, improved cross-cultural communications, broader dissemination of information around the world, and more efficient deployment of scarce internal resources.

Operational Energy Efficiency Reporting

Cisco believes that reporting GHG emissions publicly through the Carbon Disclosure Project (CDP) is a key first step to the reduction of emissions.

Cisco was rated the first IT company, and the fifth company overall, based on our responses to CDP's 2011 Investor survey¹.

Cisco is on track to meet our commitment to reduce all Scope 1, 2, and business-air-travel Scope 3 GHG emissions worldwide by 25% by 2012 (from a 2007 baseline).

In our financial year 2010 – 2011 (FY11), we estimate that Cisco has conserved approximately 16.9 million kWh of energy and avoided 7,400 tonnes of CO2 emissions by investing US\$1.9 million in energy conservation projects. Our approach to reduce energy consumption and GHG emissions from our operations is to:

- Increase the use of Cisco technology to collaborate remotely, avoiding emissions from business travel. In FY11, employees engaged in 23 million people hours of web conferencing, up from 19.3 million in 2010
- Expand the use of Cisco Connected Workplace to reduce office space needs through our new building space policy
- Improve the efficiency of our buildings, focusing on engineering labs that represent over 60% of Cisco's electricity use. Our new lab energy programme is expected to save 30,000 tonnes of CO2 emissions by improving building energy efficiency, installing power monitoring and control technologies, and engaging lab employees in energy-saving initiatives
- By the end of FY11, 23 Cisco facilities had achieved certification to the U.S. Green Building Council's Leadership in Energy



Green Data Centre

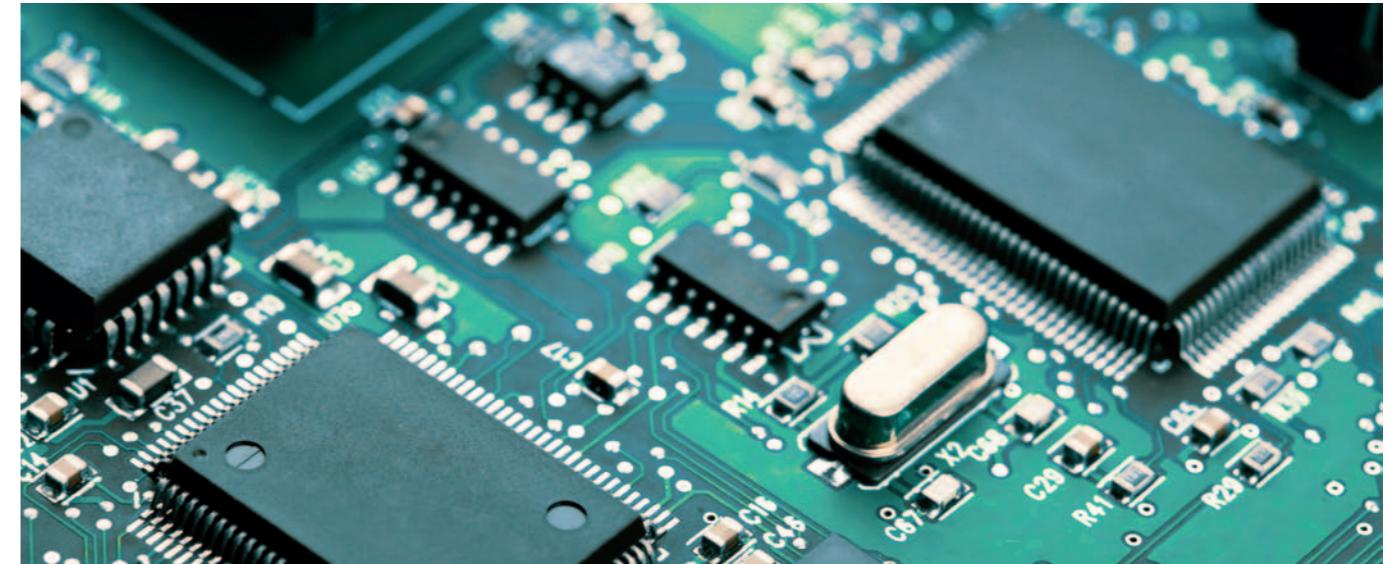
Our new green data centre in Texas, which opened in April 2011, uses Cisco's full data centre technology portfolio to maximise energy efficiency.

The data centre is cooled by an energy-efficient air-side economiser system. This reduces the need for mechanical chilling by using ambient fresh air when the outside temperature is low (expected to be around 65% of the time), saving approximately US\$600,000 per year in energy costs.

Instead of hundreds of batteries, the data centre has an uninterruptible power supply using rotary flywheels. Should there be any mains power loss, these require very little energy to continue in motion to start up diesel generators. At the same time, solar cells on the roof generate 100 kW of power for the office spaces in the building.

and Environmental Design (LEED) new construction rating system, and we are integrating environmental requirements into our leasing terms

- Purchase electricity from certified low-carbon and renewable sources where available. Cisco participates in the U.S. Environmental Protection Agency (EPA) Green Power Partnership. In July 2011, Cisco was listed ninth among the National Top 50 and seventh among Fortune 500 companies in the EPA's green power rankings
- Produce electricity from low-carbon, onsite technologies. In FY11, we installed solar photovoltaic systems at two of our data centres. We will use the experience of these pilot systems to assess the potential for wider implementation



Product End-of-Life



Our trade-in and take-back programmes are designed to recover any items sold by Cisco so that products, components and raw materials can be reused and recycled.

During FY11, these programmes refurbished, resold or reused over 2,000 tonnes of equipment.

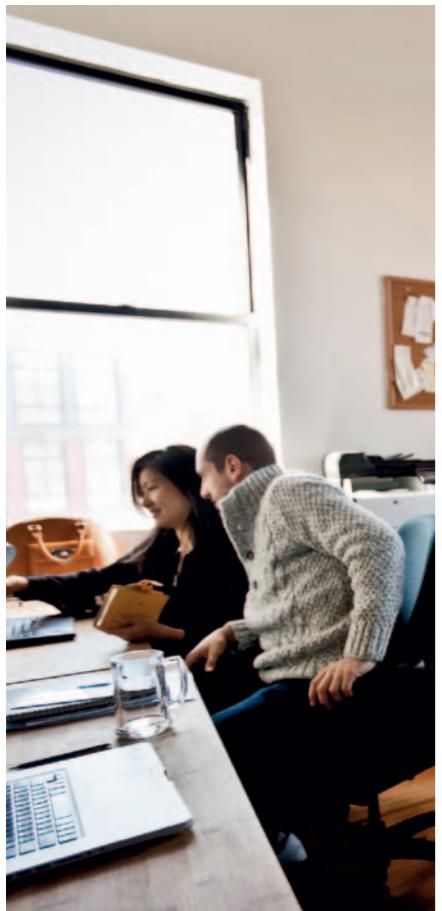
Our main challenge today is to promote awareness of our take-back and recycling programmes among our channel partners and customers, so that more material is returned directly to Cisco for processing.

Reuse is always the first priority. Cisco has reused over US\$200 million of Cisco equipment, calculated at standard cost, in each of the last three fiscal years.

If an item does not qualify to be reused, it goes to one of our authorised recyclers. Cisco contracts require each recycler to follow our strict requirements and provide us with monthly reports showing the weight of each lot as weighed in, and the weights of all fraction commodities yielded from the lot. We hold quarterly business reviews with each recycler to review the past quarter's results, and conduct random site audits of their facilities.

We also promote recycling of IT equipment within Cisco, encouraging employees in participating offices to bring in any unwanted electronics equipment from home for recycling. In April 2011, we held our sixteenth recycle IT event, with 78 Cisco offices around the world participating and over 142 tonnes of e-scrap collected.

Summary and Recommendations



Cisco has produced this paper in response to the publication of a new version of the Greening Government: ICT Strategy in October 2011.

The current version of the strategy expands on its predecessor to explain how ICT can be delivered in a more energy efficient way and exploited to make Government operations and public service delivery more energy efficient.

This paper has been produced by Cisco and draws upon our experience as a product manufacturer, as an ICT solutions provider and as a business seeking to meet its energy efficiency obligations.

Cisco incorporates energy efficiency and sustainability into the heart of its business and publicly reports the actions it takes, and the results, as part of its Corporate and Social Responsibility (CSR) programme.

The paper provides recommendations aligned to the three main sections within the Government Strategy. The recommendations are based on the experiences of our Public Sector customers and partners and on internal Cisco programmes that have reduced energy use. Selected case studies provide guidance on the reductions in energy that might be expected.

The paper makes a total of 10 recommendations as follows:



Greening the Provision of ICT

1. Consolidate and virtualise data centre assets. This reduces energy use through smaller numbers of physical devices and through increased asset utilisation
2. Converge all data, voice and video networks onto a single wired and wireless Borderless Network to reduce the number of network devices. Embrace the PSN programme as a route to achieve consolidation and convergence and as a platform for greater shared services energy savings
3. Deploy VDI infrastructure using thin clients as end-user devices for appropriate stakeholders. This reduces the energy use of end-user devices and increases device life-cycles
4. Life-cycle manage all ICT assets. This lets you balance longer device lifetimes with new product provision and benefit from the latest devices with the lowest energy footprints
5. Adopt the Cisco four-phase approach for the use of ICT to create a modern, flexible workforce. This reduces energy use within buildings and lowers the overall carbon footprint through travel reduction
6. Employ smart connected building technology to monitor and control all building systems and so reduce energy use. Use intelligence to tailor building systems to building occupancy
7. Exploit the power, reach and range of Borderless Network infrastructure by implementing Cisco EnergyWise power management to power cycle network-attached devices (i.e. only supply power when a device needs to be used) in line with business policies

Greening Government Operations

8. Develop a clear channel shift strategy for public services delivery. This reduces the dependence on staff, buildings and infrastructure
9. Exploit video technology to supplement conventional face-to-face services
10. Adopt modern IP-based, multi-channel contact centres for consolidation and to develop new distributed operating models

Greener Public Services

- Cisco is a major ICT supplier and can provide you with the solutions outlined in this paper; helping you consolidate and virtualise ICT infrastructure, energy manage devices using the reach and range of the network, and provide the toolsets to increase the energy efficiency of your workforce and your offices.

We look forward to the opportunity to discuss this paper with you and to a partnership that will deliver green outcomes for your business.

How Cisco Can Help

Cisco has contributed actively to the development of energy efficient ICT products and solutions and has pioneered the use of ICT to create greener organisations. We offer the technology and the deployment expertise to drive energy efficiency.

Cisco Products and Solutions

Cisco provides infrastructure and solutions to transform the energy efficiency of your business

Cisco is able to provide energy efficient ICT infrastructure and a range of solutions that can be used to transform the energy efficiency of your business.

These are offered as three architectures: borderless network, data centre virtualisation and collaboration. The use of an architectural approach by Cisco allows our customers to develop solutions incrementally, as budgets permit and requirements demand, to create finalised ICT blueprints.

The products and solutions of particular relevance to this paper are as follows:

- Borderless Network Architecture: virtualised LANs and WANs, EnergyWise energy management

- Data Centre Virtualisation: virtualised data centre fabrics, virtualised compute and storage
- Collaboration: unified communications, collaboration, messaging and business video
- Smart Connected Buildings
- Smart+Connected Communities

The final section of this paper provides references to further information on the above.



Cisco Services

Cisco Services has global consulting practices which can provide the link between you and Cisco's expertise in deploying energy efficient ICT and exploiting it for business advantage.

Our practices can provide advice and guidance on how to incorporate the recommendations of this paper into your business, services and technical strategies. That advice and guidance can support the efforts of your organisations to meet your obligations under the CRC Energy Efficiency Scheme.

We believe Cisco and our Cisco Services teams will help you by:

- Assisting in the development of your ICT strategy to ensure green technologies are embraced to the full
- Carrying out infrastructure assessments to pinpoint opportunities for consolidation, virtualisation and convergence
- Advising on life-cycle management of ICT to maximise the green benefits associated with newer Cisco product lines and

technologies (and reduce costs at the same time)

- Developing transition plans to ensure new technologies meet business requirements

We would welcome the opportunity to discuss the contents of this paper and share our knowledge and experience directly with you. Please contact your Cisco Account Manager if you would like to discuss your requirements in more detail.

Further Information

Further reference information on climate science, Government green policy and strategy, and Cisco's approach is available as follows:

Climate Change Science

The Royal Society - Climate Change: A Summary of the Science

http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/2010/4294972962.pdf

Parliamentary Office of Science and Technology - Climate Change Science

<http://www.parliament.uk/documents/post/postpn295.pdf>

UN and EU Papers

United Nations Framework Convention on Climate Change - Kyoto Protocol

http://unfccc.int/kyoto_protocol/items/2830.php

United Nations REDD Programme

<http://www.un-redd.org/>

EU Emissions Trading System

http://ec.europa.eu/clima/policies/ets/index_en.htm

Government Green Papers

The Stern Review on the Economics of Climate Change

http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/sternreview_index.htm

2008 Climate Change Act

http://www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx

CRC Energy Efficiency Scheme

http://www.decc.gov.uk/en/content/cms/emissions/crc_efficiency/crc_efficiency.aspx

Government ICT Strategy (including Green ICT)

<http://www.cabinetoffice.gov.uk/content/government-ict-strategy>

Government ICT Strategy Implementation Plan

<http://www.cabinetoffice.gov.uk/content/government-ict-strategy-strategic-implementation-plan>

Greening Government: ICT Strategy (2011)

<https://update.cabinetoffice.gov.uk/sites/default/files/resources/greening-government-ict-strategy.pdf>

Greening Government - Resources - Case Studies, Workbook and Maturity Model

<http://www.cabinetoffice.gov.uk/resource-library/uk-government-ict-strategy-resources>

Cisco Green Papers and Case Studies

Cisco Connected Workplace: Green Office Design

http://www.cisco.com/web/about/ciscoitatwork/business_of_it/green_office_design_web.html

Cisco's New Green Allen, Texas Data Centre

<http://newsroom.cisco.com/press-release-content?type=webcontent&articleId=775140>

London Borough of Hillingdon Green ICT Strategy

http://www.cisco.com/en/US/prod/collateral/switches/ps5718/ps10195/Hillingdon_EnergyWise.pdf

Manchester Metropolitan University Case Study

http://www.cisco.com/en/US/solutions/collateral/ns340/ns517/ns224/MMU_V2CS_-_Cisco_approved.pdf

Cisco Technology Papers

Energy Efficient Data Centres

http://www.cisco.com/web/about/citizenship/environment/data_centers.html

Cisco EnergyWise Technology White Papers

http://www.cisco.com/en/US/products/ps10195/prod_white_papers_list.html

Cisco EnergyWise

<http://www.cisco.com/en/US/products/ps10195/index.html>



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