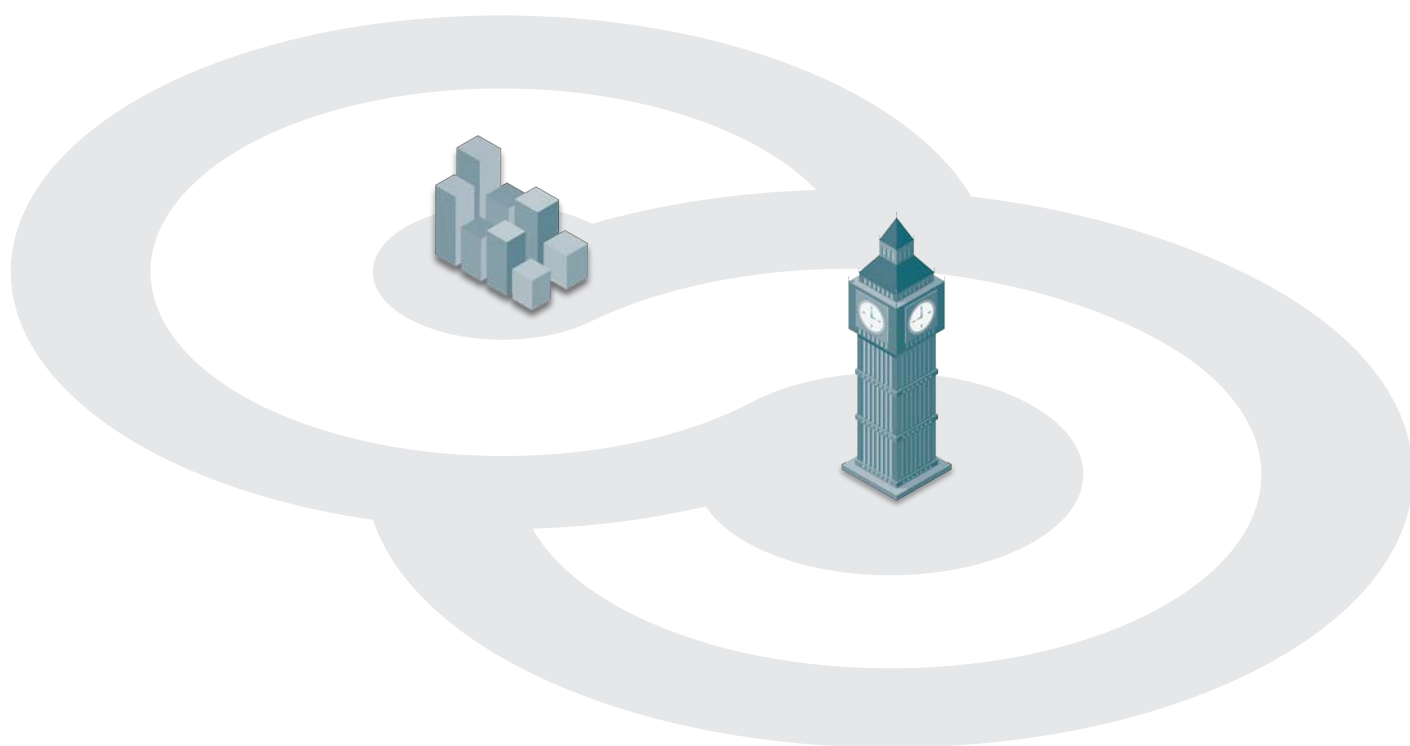


Greening Government ICT

How cloud can help



Executive summary

The UK public sector is under pressure to deliver better services for less cost, and to work more efficiently and productively. And it must do all that while reducing its impact on the environment, too.

Sounds like a tall order, but cloud computing can provide the foundation for realising all those objectives — and more.

This white paper explains why cloud computing is a credible green technology, and discusses how it can help government departments and other public sector bodies meet the aims of the Government Digital Strategy, the Greening Government: ICT Strategy, and the Digital by Default Service Standard. It also showcases some of the brilliant results already being achieved within the public sector around carbon reductions, cost savings and green IT maturity.

Finally, this white paper provides a guide for public sector buyers about key environmental considerations to examine during the procurement cycle.

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Cloud computing and UK government strategy

The Government ICT Strategy sets out to deliver better public services for less cost, and to release savings by implementing technology that increases public sector productivity and efficiency. A key aspect of the strategy is cloud computing. That's because cloud helps to deliver more dynamic and agile ICT solutions, and moves government towards common infrastructure and shared services.

Cloud computing also delivers other business benefits. It enables resources to be used on a subscription or utility basis, so organisations pay only for what they consume — an approach that provides substantial long-term cost savings. Cloud computing also offers access to extensive resources that improve availability, reduce risk and provide greater security.

The government followed the ICT Strategy with a number of key programmes and policies to help realise key objectives and encourage cloud adoption. These include:

- The G-Cloud programme — an Official Journal of the European Union (OJEU)-compliant framework that buying organisations can use to procure cloud services quickly and simply.
- The Cloud First policy — central government organisations with a new ICT requirement must evaluate cloud solutions before they consider any other option. They're free to choose an alternative to the cloud — but only if they can demonstrate that it offers better value for money.

In parallel with the drive to adopt cloud computing for its business benefits, the government wants to reduce its impact on the environment in terms of greenhouse gas emissions by reducing energy and resource consumption. In March 2011, therefore, the Cabinet Office released a supplement to the ICT strategy — the **Greening Government: ICT Strategy**¹.

This strategy challenges public sector organisations to consider the environmental impact of new ICT, as well as its potential to reduce costs, improve service and increase agility. Buying organisations are encouraged not only to select technology that is energy efficient, but also to adapt their activities in order to reduce carbon emissions and consumables, use ICT more efficiently, and work smarter. The Greening Government: ICT Strategy outlines how government will meet these challenges.

In addition to these programmes, all new significant technology proposals now have to be assessed against the Government Digital Service (GDS) Technology Code of Practice². One criteria used in that assessment is to "ensure best sustainability practices, whether in-house or via external suppliers, including compliance with Greening Technology" (Technology Code of Practice item 13).

1 <https://www.gov.uk/government/collections/ict-strategy-resources#greening-government-ict>

2 <https://www.gov.uk/service-manual/technology/code-of-practice.html>

Why cloud computing is green

Both commercial and public sector organisations have increased their reliance on IT services over recent years. This has led to the construction of sprawling data centre estates to accommodate their infrastructure requirements — whether on an in-house or outsourced model.

But this traditional model of large premises filled with rack after rack of increasingly powerful dedicated servers and associated network infrastructure is now being challenged, for both the amount of power it consumes (to drive the infrastructure and the associated data centre services), and the waste by-products, which include:

- Greenhouse gas emissions associated with producing the power consumed
- The inevitable loss of a percentage of refrigerant/coolant used to cool the data centre estate
- The heat discharge from the associated cooling activities, which warms the atmosphere

The use of large data centres is therefore being questioned for two reasons:

- The efficiency and footprint of the infrastructure which supports each customer
- The environmental performance of the data centre environment itself

Virtualisation and energy reduction

Virtualisation uses software to create a virtual (rather than a physical) version of something, such as an operating system, a server, a storage device or network resources. Virtualisation allows the physical infrastructure components to be separated from the operating systems and application layer by software abstraction (for example, using VMware's vSphere hypervisor). This means a large number of inefficient conventional servers can be consolidated into separate virtual environments on a single physical server which:

- Allows increased use of the physical infrastructure
- Considerably reduces waste by-products (because fewer servers are needed)
- Gives organisations the flexibility to scale virtual resources up and down in line with operational demands

Another key — but often underrated — benefit of virtualised environments is their improved environmental performance, which significantly reduces carbon emissions.

In 2012, Pike Research (now Navigant Research) published a 'Green Data Centers' report³, which noted that the conventional model of dedicated server hosting (with no virtualisation) has associated emissions of approximately 46kg of CO₂ per year. This is dramatically reduced to 2kg of CO₂ for a virtual server operating within a cloud environment that follows current best practice.

3 <http://www.navigantresearch.com/research/green-data-centers>

Virtualisation has been widely accepted as a key contributor to improved ICT efficiencies, as it allows for increased resource utilisation (the comparison of useful work undertaken, compared to the amount of resources consumed (and emitted) in operating the environment). It also contributes to related environmental impact reduction initiatives, including:

- Consequential reduction in manufacturing (and disposal) related emissions, as virtual estates require less overall resources and processing compared to standalone environments
- Consequential reduction in packaging resources and shipping related emissions
- Related reductions in the operating overheads within the data centre environment

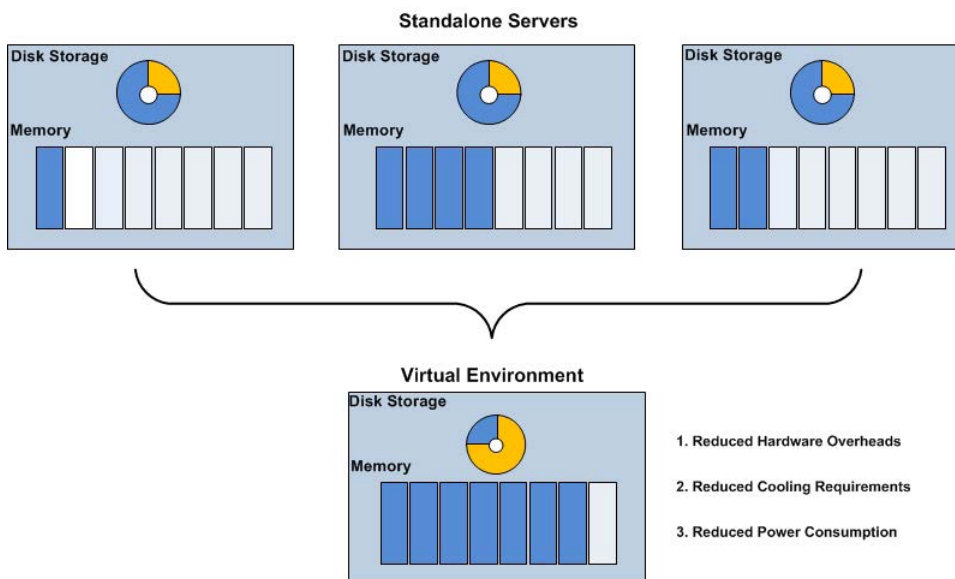
Virtualisation can be achieved in-house but this would demand investment in new hardware and software and would still require an in-house or hosted infrastructure, not to mention specialised skills and resources.

A virtual environment hosted in the cloud removes the need for that capital investment, hosting infrastructure and in-house resources.

Finally, the selection and utilisation of cloud environments allows for the prompt and effective redeployment of resources to another customer when its current use is no longer required. Conventional hosting would normally see the physical infrastructure being removed and passed for recycling or disposal.

It remains an important consideration, therefore, for public sector organisations to carefully assess their server requirements and choose an environment that satisfies those requirements but at the same time maximises their emission reductions and contributes fully to the wider UK Government ICT strategy.

Figure 1. Server virtualisation



Worked examples

Example 1

A 2010 study by the Southwestern Illinois College compared the total cost of ownership of a physical 35-server upgrade with 35 virtual servers located on just four physical host servers running VMware virtualisation technology.

The indirect costs associated with the two projects included a breakdown of the data centre costs (including power and cooling). This was reduced from just under \$137,000 for the physical estate to \$17,000 for the combined virtualised environment — just 12.4% of the traditional data centre operating costs.

Example 2

A traditional rack-mounted infrastructure comprising 30 separate HP DL380 servers:

Total power consumption = 308W x 30 servers = 9.24KW

9.24KW x 24 x 365 = 80,942 KWh (for one year)

80,942 x 0.44548 (Defra/DECC conversion factor) = 36,058kg CO₂ (annual greenhouse gas emissions)

One physical server, hosting 30 virtual servers consumes 400W power

Total power consumption = 0.4KW

0.4KW x 24 x 365 = 3,504 KWh (for one year)

3,504 x 0.44548 (Defra/DECC conversion factor) = 1,560kg CO₂ (annual emissions)

This represents only 4.3% of the power required and the greenhouse gas emissions produced compared to allocating each virtual server its own dedicated physical server.

Example 3

One business function (e.g. a database) resides on its own physical HP DL380 server:

Operating continuously throughout the year, its annual power consumption = 308W x 24 x 365 = 2,698 KWh

From Example 2 above, we know that one virtual server = 3,504 / 30 = 117 KWh per virtual machine (VM) a year

This scenario demonstrates that a virtualised instance requires only 4.3% of the power needed for a dedicated physical server. However, if the VM is further configured to auto start at 09:00 and stop at 18:00 on working days only, it would run for just 45 hours — 27% of the full week. This would further reduce power consumption to 31 KWh per year — just over 1% of the power of the full-time dedicated server.

The Greening Government: ICT Strategy

The Greening Government: ICT Strategy outlines a clear objective:

A cost effective and energy efficient ICT estate, which is fully exploited, with reduced environmental impacts to enable new and sustainable ways of working for the public sector.

Actions the government will take to realise the strategy's vision include:

- Striving to purchase sustainable, efficient products and services
- Proactively managing and reducing greenhouse gas emissions across government estates by 25% by 2015 (from a 2009/2010 baseline)

A two-pronged approach

The Greening Government: ICT Strategy recognises that although ICT generates significant greenhouse gas emissions through its consumption of resources and energy, it's also an enabler to change the way government operates and provides services. This in turn can help government realise efficiency and environmental improvements on a much wider and larger scale. To this end, the strategy outlines what government will do when:

- **Greening ICT:** ensuring technology used and procured is energy efficient
- **Adopting a greener way of working:** using ICT to change how it works in order to reduce carbon emissions and consumables

1 Greening ICT

Government organisations have been tasked with buying sustainable, efficient products and services.

The strategy specifies cloud computing as an example of a technology that is sustainable and efficient, and is an effective way to share and reuse infrastructure and services. Cloud services are delivered via a multi-tenanted platform which enables resources to be deployed quickly and simply and shared easily; and capacity to be made available on demand as required.

To further increase sustainability and efficiency, the strategy also aims to reduce the number of government data centres through a programme of virtualisation, consolidation and rationalisation. This will help government maximise server and storage utilisation as well as reduce the number of devices used, saving energy and costs.

71% fewer servers
2013 project by the
Department for
International Development
cut the number of servers in
its UK estate from 304 to 95,
and in its overseas estate
from 298 to just 78.

Cloud computing offers government organisations an alternative to traditional data centre environments that can help them reduce the number of data centres they use. Delivering ICT services via a virtual cloud environment means that a traditional data centre is no longer required. This also offers another way to lower the energy required to deliver services. Cloud allows consolidation of infrastructure through tiering, based on common access, security and availability requirements.

Data centres are a key focus of the Greening ICT Strategy. Public sector organisations have been asked that, when they migrate to the cloud, they choose data centre facilities that are energy efficient in accordance with best practices set out in the EU Code of Conduct for Data Centres.

4 government departments had endorsed the EU's Code of Conduct for Data Centres by the end of 2013.

2 A greener way of working

The government has outlined a number of best practices for exploiting technology to green government operations by enabling new and more efficient ways of working, and transforming how public services are delivered:

Using ICT more efficiently

This initiative challenges government users to identify and make efficiency savings through behavioural changes (for example, turning equipment off when it's not in use) and dematerialisation of activities (for example, swapping high- for low-carbon options).

How cloud can help. With the right virtualised cloud environment systems can be powered down when they're not being used, to cut the amount of power used. Resources can be provisioned on demand to match requirements, and scaled up or down when those requirements change. This means there's no need to manage or pay for extensive hosted resources implemented to cope with peaks in demand, which often sit idle (but continue consuming resources) when demand is low.

Using ICT to reduce travel

Cross-departmental working has led to an increase in journey-based emissions as well as unproductive travelling time. The Greening Strategy says that travel should be reduced — and many departments have already made significant progress in this respect.

teleconferencing

The Home Office has extended its previously restricted departmental teleconferencing facilities contract to all staff.

The MOD has increased its use of video- and teleconferencing as part of its travel budget cuts and efficiencies initiative.

How cloud can help. Cloud services enable the introduction of document management, collaboration and conferencing applications. These reduce the need for physical cross-departmental meetings and so lower the emissions associated with travelling between departmental locations. Many providers offer these services on a SaaS basis, running on a cloud infrastructure. Users can access the applications from various devices using a thin client interface such as a web browser.

Public sector organisations who opt for these services don't need to manage or control the underlying infrastructure (network, servers, operating systems, storage) or individual application capabilities. Many service providers offer assured cloud services with reassuringly high levels of data security.

Using ICT to work smarter

Flexible and remote working can cut travel costs and downtime, and enable office space rationalisation. Public sector organisations can make efficiency savings by reducing estate running costs and the associated environmental impact of estate management and commuting.

How cloud can help. Smarter working and agile office spaces can be enabled by appropriate ICT. SaaS options ranging from remote desktops and collaboration tools to online file sharing can be provided via the cloud alongside unified communications and remote access technologies.

Using ICT to reduce consumables

Electronic documents are cheaper and less environmentally damaging than printed copies, thanks to reduced use of paper and printer consumables; and stored hard copies can be replaced by electronic archiving systems. Many departments are striving to achieve a 'paperless' or 'paper-light' working environment.

2018 The Department of Health has committed to delivering a paperless NHS service by 2018.

How cloud can help. Cloud services enable implementation of low-carbon ICT solutions such as online storage and e-publishing, to replace printed document production and publishing. Most cloud service providers offer IaaS options for archiving, storage and backup services, in place of traditional hosted storage solutions, offsite tape backups, additional hardware purchase, and management and maintenance of equipment.

Using ICT to green public services

The Government Digital Strategy⁴ recognises that moving to digital channels could save up to £1.8bn a year. As part of the strategy, government departments are redesigning all services which handle over 100,000 transactions each year.

Moving public services online increases accessibility and reduces cost at the point of delivery. All redesigned transactional services will go live by March 2015; any new transactional services that went live after April 2014 had to meet the Digital by Default Service Standard⁵.

Delivering public services online is fundamental to shifting the government's approach to interacting with citizens and businesses. It's a shift that has to be supported by the right technologies and systems to make the most efficient use of hardware and power. Digital by Default is crucial to greening ICT: it reduces the environmental impact of physical and paper-based processes by using technology to create more cost-effective, efficient and user-centred online services.

80% Since HMRC made the shift to online services, more than 80% of tax returns have been submitted via the internet. This has saved lots of paper and cut carbon emissions by 760 tonnes. Using channels like SMS for alerts helped cut paper use even further.

How cloud can help. Rapid time to deployment of online services is critical, given the deadlines and standards set by the Digital by Default agenda. Cloud computing offers short procurement cycles and short deployment times, which help reduce application development lead times. In addition, cloud's inherent elasticity helps organisations respond to fluctuating demand.

Results to date

Since the Greening Government: ICT Strategy was published, each department has been assessed annually on:

- The level of maturity it's reached in embedding green technology principles and best practices
- Key target outcomes achieved through the adoption of these best practices
- Estimating a footprint for the energy consumed in providing ICT services
- Achieving EU Code of Conduct for Data Centres 'Endorser' status
- Statistics and case studies to provide evidence for progress

⁴ <https://www.gov.uk/government/collections/government-digital-strategy-reports-and-research>

⁵ <https://www.gov.uk/service-manual/digital-by-default>

The government targeted for all departments to meet a green IT maturity score of level 3 by 2015. The maturity levels were defined as follows:

1. Foundation — evidence and intelligence gathering to inform actions, agreed plans
2. Embedded — show commitment and basic initial development, basic processes in place
3. Practised — moving forward taking actions to improve, repeatable actions
4. Enhanced — pushing for new opportunities, adoption of best practice, improving capability
5. Leadership — taking control, having own vision, optimising performance

**£1.9m saved,
10,500t less CO₂**
HMRC developed a unique green ICT model⁶ based on the principles of carbon and cost accounting. In one year it led to a reduction of over **10,500 tonnes of CO₂** and an energy cost saving worth **£1.9m.**

The Cabinet Office produced an updated report⁷ on the Greening ICT Strategy in April 2016.

10 government departments reported a major reduction in energy consumption by ICT.

Major contributors to this reduction were noted as:

6. Procurement of commodity ICT services through the G-Cloud Framework
7. The establishment of Crown Hosting Services
8. Moving to Digital Services for customers
9. The use of open source software and Agile techniques

14 major Government departments reached the Maturity Level 3 (Practised) by 2015.

The report highlights the contributions made by shared print services, multi-function devices, virtualisation technologies and e-conferencing services in achieving these maturity levels.

⁶ <https://www.gov.uk/government/publications/one-year-on-implementing-the-government-ict-strategy>

⁷ <https://www.gov.uk/government/publications/greening-government-ict-2015-annual-report>

Buyer considerations

Buying organisations have always evaluated potential ICT solutions to check they meet technical needs, address any legacy constraints and fulfil data confidentiality requirements. They're now also actively evaluating the energy efficiency of technology solutions — and not just because of the environmental impact of traditional hosted environments.

Government policies and programmes such as the G-Cloud programme, Cloud First policy and Digital by Default standard encourage adoption of cloud computing because it is both cost efficient and energy efficient. The combination of flexibility, security, ease of deployment and geographical independence offered by virtualised cloud environments provides a compelling proposition that can help all public sector buyers support the government's ICT strategy.

But how does a buying organisation work out which cloud service providers will deliver maximum energy efficiencies? Buyers will need to examine service providers' green credentials — including energy consumption, equipment disposal and service delivery. Buyers should also consider whether service is provided from a platform hosted in a data centre that conforms to the EU Data Centre Code of Conduct.

Buyers should assess the capabilities each provider offers within its cloud environments, and in particular, the ability to automate the environment. The best way to reduce power consumption and the associated greenhouse gas emissions is simply to switch off an environment when it's not required (for example, overnight, at weekends). This delivers clear benefits compared with infrastructure that remains powered up and operational 24 hours a day. Cloud providers should enable their customers to implement automated solutions which can dynamically respond to changing requirements by programmatically controlling their solution.

True cloud providers will also offer granular billing: billing by the hour (reflecting when the infrastructure is powered on and working) which offers considerable cost savings compared to standard monthly invoices.

The data centre environment

Whether ICT services are provided in-house or by a service provider, they'll rely on data centre resources at some point. Even cloud computing will be delivered from a platform housed in a data centre. That's why looking for a data centre that operates as efficiently as possible matters.

The PUE metric

The efficiency of data centre operations is assessed using the power usage effectiveness (PUE) metric, which was developed by the Green Grid, an organisation focused on maximising data centre efficiency.

The PUE of a data centre environment is worked out by dividing the amount of power entering the data centre at its perimeter by the amount of power consumed by the computer infrastructure located within it.

For example, if 1kW of every 2kW of power that enters a data centre is used by the heating, cooling, lighting and security systems, then only 1kW remains for the computer infrastructure, giving a PUE ($2 \div 1$) of 2. The greater the energy efficiency of a data centre, the nearer the PUE gets to 1.

With energy prices always rising, public sector organisations should assess carefully the PUE of any environments in which they host ICT systems. This isn't just for the sake of energy efficiency (and therefore reductions in energy waste) but also as a direct input to the bottom line of the invoices they receive from the hosting provider.

The aim is to identify an acceptable position on the following:

- In what ways has the data centre environment been designed to maximise energy efficiency?
- How is infrastructure cooling done and how are airflows managed?
- Has the PUE been assessed and verified? How does it compare to other providers?
- Are any other assessments or approvals available (eg EU Data Centre Code of Conduct)?

What is the European Union Data Centre Code of Conduct?

The EU Data Centre Code of Conduct⁸ was created in response to increasing energy consumption in data centres and the need to reduce the related environmental, economic and energy supply impacts. It aims to stimulate data centre operators and owners to reduce energy consumption in a cost-effective way without hampering the mission-critical function of data centres. Energy savings focus on two main areas:

- IT load — the consumption of the IT equipment in the data centre
- Facilities load — the mechanical and electrical systems that support the IT electrical load

Organisations signing up to the Code are expected to follow its intent and abide by a set of agreed commitments:

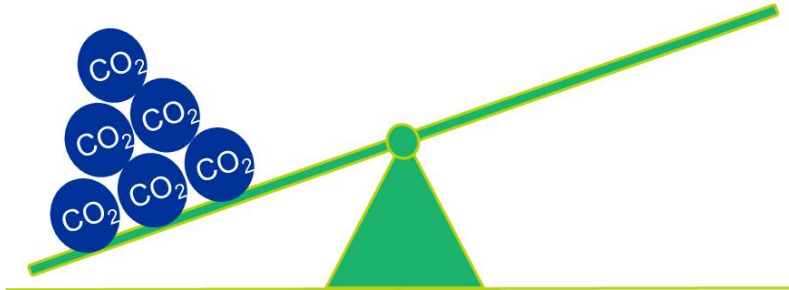
- An initial energy measurement and energy audit to identify the major energy saving opportunities
- Preparation and submission of an Action Plan, whose acceptance grants 'Participant' status
- Implementation of the Action Plan according to the agreed timetable — energy consumption must be regularly monitored to see progress in the energy efficiency indicator related to the data centre.

The UK government has specified that public sector organisations should choose data centre sites who have signed up to the EU Data Centre Code of Conduct.

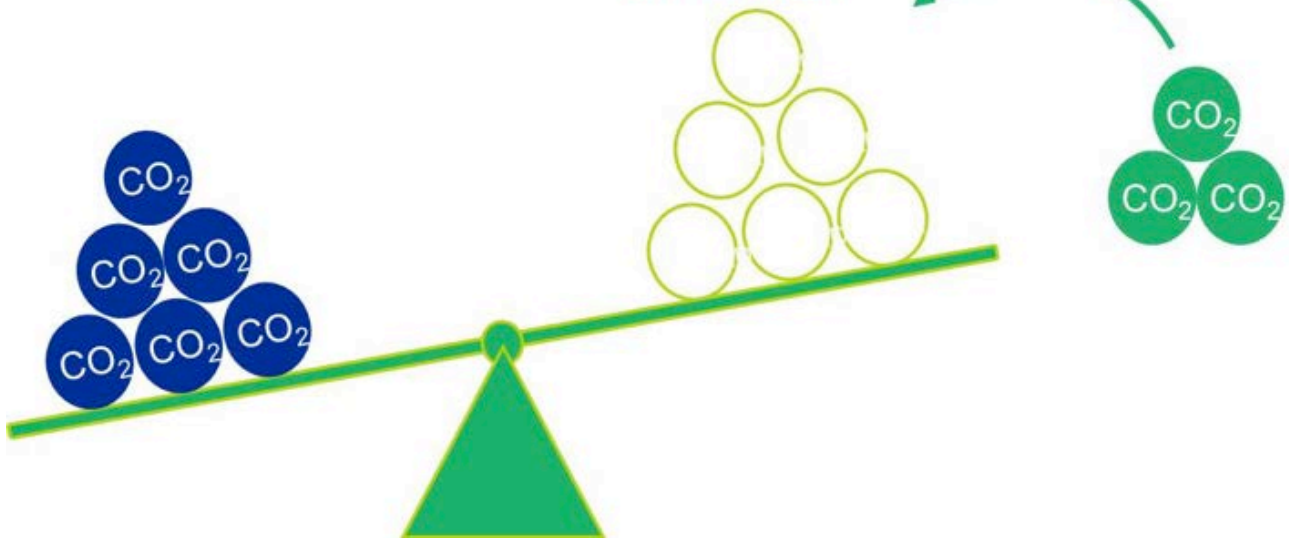
⁸ <http://iet.jrc.ec.europa.eu/energyefficiency/ict-codes-conduct/data-centres-energy-efficiency>

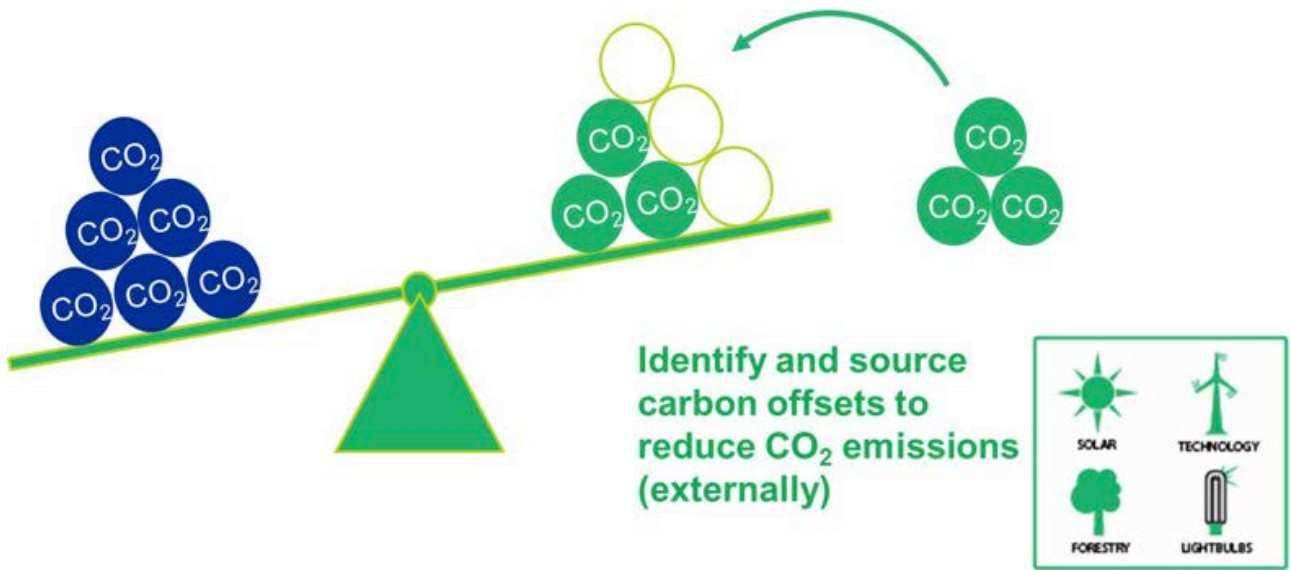
How does carbon offsetting work?

Carry out an external greenhouse gas assessment to establish current CO₂ emissions

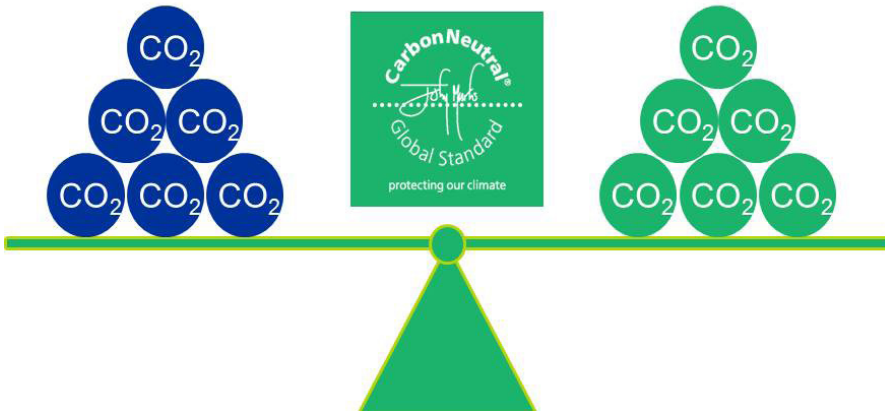


Internally, execute cost-effective ways to reduce CO₂ emissions





CO₂ outputs matched by CO₂ savings for a CarbonNeutral® position



UKCloud: a CarbonNeutral provider

Sustainability and environmental responsibility are embedded in all of UKCloud's activities. Many of our daily activities have been assessed as having a minimal impact upon the environment. We've identified and measured those that do have an impact, and are committed to addressing it through effective and verifiable carbon offsetting activities.

A CarbonNeutral® Company



Since our formation, we've worked with The CarbonNeutral Company to measure and reduce our corporate carbon footprint to net zero. This makes us a CarbonNeutral® Company. We've worked to identify and measure the carbon footprint associated with all forms of CO₂ emissions across our business. This greenhouse gas assessment includes our energy usage, commuting and business travel emissions, and waste production. It's independently validated to ensure accuracy.

Having understood our footprint, we've implemented a variety of initiatives to reduce energy use and emissions as far as possible.

These include:

- Use of low-energy-consumption office equipment and IT
- Installation of low-energy, motion-activated lighting systems
- Use of car-sharing and promoting public transport for business travel
- Secure remote working capabilities to reduce commuting-related emissions
- Materials recycling capabilities, material recovery and reuse, and print reduction initiatives
- Making environmental performance a key consideration in our supplier selection process

The reduction effects have been validated and deducted from our overall carbon footprint, and the residual balance has been offset to zero by the purchase of carbon credits. These credits are invested in offset projects around the world which either absorb CO₂ or produce an equivalent amount of clean energy, enabling us to neutralise our unavoidable effect on the environment. We invest in 100% renewable energy projects — a mixed portfolio of solar, wind, hydro, geothermal, ocean and biomass projects, each of which is verified to the Voluntary Carbon Standard.

CarbonNeutral® Cloud Services



Public sector organisations that use our secure, accredited infrastructure can take immediate advantage of:

- Environmentally responsible, secure data centre environments with best-in-class PUE
- High-availability, scalable virtualisation infrastructure which allows on-demand use of cloud resources
- Granular billing, reflecting only the compute and storage resources that are consumed
- Working with a CarbonNeutral® Company with a responsible and meaningful environmental strategy

However we don't think that's enough. There is a perception that cloud services delivered via a multi-tenancy platform make the energy efficiency and location of the underlying hosting infrastructure not readily visible. Customers are wary that the source of any emissions are less obvious and difficult to measure so meeting obligations to report on supply chain emissions becomes complex and challenging. So we've removed that challenge.

Our cloud services are CarbonNeutral® Cloud Services. We achieved this status by working with The CarbonNeutral® Company to measure and reduce our CO₂ emissions across all sources used to deliver our cloud services to our customers. These include direct emissions from all owned or leased stationary sources that use fossil fuels and/or emit fugitive emissions, and emissions from the generation of purchased electricity and steam (including transmission and distribution losses) to power our servers.

For our cloud services to achieve CarbonNeutral® status, an independent assessment of the CO₂ emissions produced from direct and indirect sources required to deliver them was carried out, followed by an offset-inclusive emissions reduction programme.

This means that for every tonne of greenhouse gas emissions we produce in delivering cloud services, we buy a verified carbon offset which guarantees that an equivalent amount of greenhouse gas emissions is reduced from the atmosphere through a renewable energy or clean technology project.

Monthly carbon offset certificates

Our customers receive a monthly carbon offset certificate. This confirms that an independent greenhouse gas assessment has been conducted, and that the carbon emissions which have resulted from their consumption of cloud services have been reduced to net zero by us through verified, high-quality carbon credits, at no extra cost to the customer.

Customers can use these certificates to provide evidence of adoption of best practices. In addition the carbon offset itself can support customers as they strive to achieve their greening ICT commitment to reduce greenhouse gas emissions by 25%.

About UKCloud

UKCloud provides a true public cloud for the exclusive use of UK Public Sector organisations. We are dedicated to helping our customers gain value from the agility and cost savings of using a sovereign, assured cloud platform.

Focusing solely on Public Sector customers, we are able to provide a leading cloud proposition that delivers outstanding value and capability. This ultimately benefits the UK taxpayer, citizens and businesses by enabling Public Sector organisations to deliver better services through technology.

Here's how:

- **We're focused on cloud.** Delivering a true cloud platform that is massively scalable, flexible, assured and cost-effective – and customers only pay for what they use.
- **We're open. You are never locked in.** Using industry standards and open source software our platform gives customers the flexibility and choice to transition and transform their applications and deploy across multiple cloud solutions.
- **Dedicated to the UK Public Sector.** Our business is designed specifically to serve and understand the needs of public sector organisations, and is UK sovereign, with UK cleared staff and we pay UK taxes.
- **We develop communities.** We bring together communities of users that are able to share datasets, reuse code, test ideas and solve problems that enhance services and benefit the UK citizen.
- **Customer engagement.** We will only be successful if our customers are successful. We embody this in the promise: Easy to adopt. Easy to use. Easy to leave.

Supporting both cloud native and enterprise applications – based on VMware, OpenStack and Oracle stacks – the platform is used extensively to host both citizen web applications, and internal facing applications only available through secure government networks.

Our industry-leading platform is built on the unique and cutting-edge technologies of the UKCloud Cloud Alliance – QinetiQ, VMware, Cisco, EMC and Ark Data Centres – which continually drives innovation and product development, at the lowest price to meet the needs of the UK Public Sector.

Additional information about UKCloud can be found at ukcloud.com or by following us on Twitter at [@ukcloudltd](https://twitter.com/ukcloudltd)

UKCloud. The power behind public sector technology.

More information

For more information about UKCloud and how we can help you, please send an email to info@ukcloud.com



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