

Managing carbon reduction across your data centre assets

Taking steps towards meeting the legal challenge of carbon reduction within data centres in a sensible, cost effective and sustainable manner.

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In April 2010, many organisations will find that they fall under the UK's new Carbon Reduction Commitment legislation (now known as the CRC Energy Efficiency Scheme). With IT constituting a large part of many organisations' energy usage, a well thought out, measurable and actionable approach to data centre power management can bring major benefits visible at the bottom line.

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Managing carbon reduction across your data centre assets

Taking steps towards meeting the legal challenge of carbon reduction within data centres in a sensible, cost effective and sustainable manner.

The UK's CRC Energy Efficiency Scheme (previously known as the Carbon Reduction Commitment (CRC)) is expected to impact 5,000 organisations in the first instance - but is likely to draw more into its net as time progresses. Planning now to create a better optimised data centre can help in many ways - from minimising CRC bills to moving an organisation under the limit where CRC kicks in.

- **Intensive energy users have had to deal with energy saving incentives for some time - now it's the less intensive users' turn**
The European Union's Energy Trading Scheme (EU ETS) has set targets with incentives and penalties around energy savings. From April 2010, UK organisations in less energy intensive sectors will be subject to similar targets through the CRC Energy Efficiency Scheme.
- **The data centre can constitute a large proportion of a low-energy intensive organisation's energy usage.**
The main energy usage in "high energy intensive" organisations comes through core business such as metal smelting or oil refining. For "low energy intensive" organisations, however, the data centre can easily be the highest energy user. This will bring a direct business focus on the data centre's energy usage.
- **The CRC Energy Efficiency Scheme (CRC) can provide solid pay back**
Provided that an organisation sets reasonable targets and fulfils them, the CRC can provide a good return on investment through the pay back on allowances bought but not used at the beginning of the year. As trading of allowances takes off, further benefits can be accrued.
- **The dynamics of the CRC means that long term plans are necessary**
The CRC uses a "league table" of performance, meaning that only those demonstrating the best energy savings against agreed targets will gain the largest benefits. Although very quick wins may be available in the first year, CRC planning should look to the long term, enabling the benefits to be gained year on year.
- **A solid knowledge of the assets and actual workings of the data centre are required**
Without full knowledge of what there is in the data centre and how it is using energy at the moment, creating a valid future state view becomes pure guesswork. Data centre modelling, enabling "what if?" predictions and real usage reporting, provides the platform for creating an ongoing sustainable model to maximise the possible benefits of the CRC.
- **The CRC is a starting point, and its net is likely to widen**
Although those organisations that are affected by the start of the CRC regulations will already have been informed of what is required of them, it is highly likely that the UK Government will need to extend the scheme to meet its carbon emission reduction targets. By starting to put in place the tools required to best understand the data centre environment, organisations can plan to minimise any impact from changes to the CRC in the future.

Conclusions

The CRC will have a large impact on those organisations caught in its net, and it is likely that this net will widen in the medium term. Quocirca recommends that organisations look to implement an automated means of measuring, monitoring and modelling their data centres, so that suitable plans for sustainable energy savings can be made on an on-going basis.

1. Introduction

Over one third of UK CO₂ emissions come from the business and public sectors, with the rest made up from areas such as domestic and travel. In 2005, the European Union (EU) introduced the concept of an Emission Trading System (EU ETS), creating the largest greenhouse gas emission trading system worldwide¹. The EU ETS was built on an EU Directive (2003/87/EC), enacted in October 2003. The EU ETS mandated EU countries to set up their own electronic registries in which to keep records of greenhouse gas emissions for their countries. Over the whole of this sits an EU Central Administrator, who maintains the Central Independent Transaction Log, checking for any irregularities in transactions. The EU ETS is also allied with the various Climate Change Agreements (CCAs) aimed at reducing greenhouse gases². Whereas the EU ETS and the CCAs are aimed at energy intensive organisations such as metal smelting, oil refining and other sectors where energy is a major aspect of their core operations, it has left a gap for less energy intensive organisations (those where energy usage is subsidiary to their core operations) who nevertheless have high energy usage patterns overall.

Within the UK, this has led to the creation of the Carbon Reduction Commitment (CRC), now known as the CRC Energy Efficiency Scheme (CRC EES). Throughout this report, Quocirca will refer to this as the CRC. The aim of the CRC is to reduce the levels of carbon emissions from what are termed as “low energy intensive” organisations by approximately 1.2 million tonnes of CO₂ per annum by 2050.

The CRC will become law in the UK in April 2010, and will be compulsory for organisations that have a half-hourly metered electricity usage of 6,000 MWh as measured between January 1st and December 31st 2008 - or in 2009 prices, an electricity bill of around £500k. All organisations that fall in to this group should have been notified by the Environment Agency by July 2009. As such, it is impossible for these organisations to do anything now to try and come in under the 6,000 MWh/yr lower limit - but those not yet caught in the net should plan now to try and avoid the widening of the net in the future, and those who have been notified should do everything they can to minimise its impact, or maximise the benefits that can be gained. In its current form, the CRC will impact around the 5,000 largest electricity users in the UK.

This paper looks at what can be done to effectively manage the IT component of an organisation’s energy usage, and how organisations not yet in the net of the CRC can take steps now to minimise the impact of CRC - or avoid it for a longer period.

2. What the CRC actually does.

The EU ETS and CCAs have created real incentives for energy intensive organisations (such as steel, aluminium, mining, glass, chemicals and so on) to change their energy usage patterns, many less energy intensive industries (retail, service sectors, banking, public sector) were left unaffected. However, many of these organisations are large users of energy, and it was decided that similar incentives - and penalties for non-conformance - would be required to change usage patterns in these sectors.

Within the UK, the CRC has been set up to target such sectors. It was first mooted in a Government White Paper published in May 2007. Although the lower limit measurement for the CRC is based on electricity used, the CRC itself covers all energy used, excepting transport fuels. Therefore, organisations covered will have to look not only at electricity used, but also at gas, oil and fuels outside of transport.

In essence, every organisation will need to measure its energy usage, then calculate the equivalent CO₂ emissions, and will need to purchase carbon allowances for the amount of CO₂ created. The money raised from the purchase of allowances will create a centralised pot, from which the incentives for improvement will be made to organisations which make significant reductions in their year-on-year CO₂ emissions.

All organisations will receive some level of repayment against their purchased allowances. However, the CRC will create a “league table” of performance, and the position of an organisation within this league table will define how much they get back - and this could be more or less than their initial expenditure. Therefore, the CRC is not based on hard and fast rules of

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¹ http://ec.europa.eu/environment/climat/emission/index_en.htm

² http://www.decc.gov.uk/en/content/cms/what_we_do/change_energy/tackling_clima/ccas/ccas.aspx

what CO₂ reductions will result in what payment - each organisation is in constant competition with all other organisations. The biggest risk for an organisation, therefore, is in standing still. Organisations that do not make reductions will find themselves considerably out of pocket, and even those who make small reductions are unlikely to get their allowance investments back.

Although the CRC in its first year will be based on static charging for allowances, in future years, it is envisaged that it will be based on an auction of allowances - and that these allowances will be able to be traded between organisations. Therefore, those managing to buy allowances at one price and managing their energy requirements effectively will be in a position to sell excess allowances to those who are not managing their requirements quite as well. Therefore, those at the upper end of the CRC league table will not only receive bonuses against the allowances they keep, but will also gain revenues from the allowances they do not need.

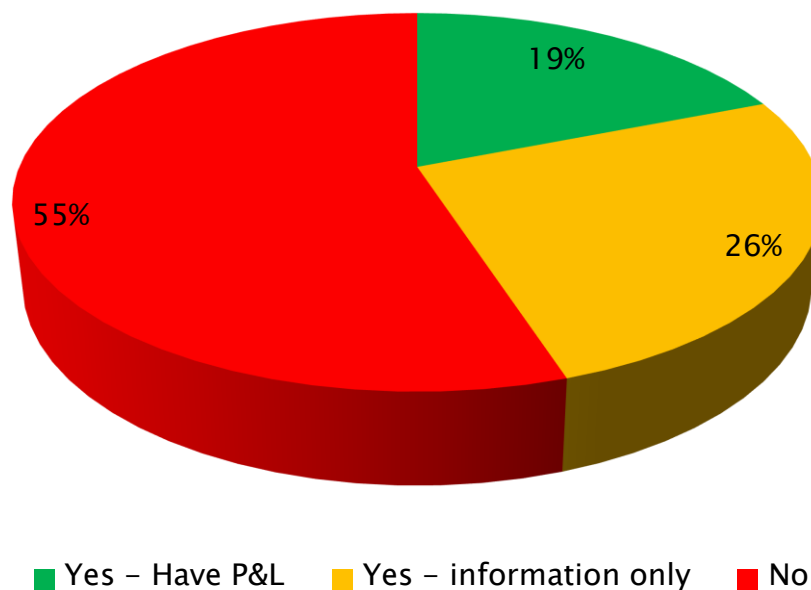
IT can be a massive user of energy within an organisation. Calculations show that a 5,000 m² data centre will need around 5,000 MWh/yr - five sixths of the CRC lower limit level. Therefore, optimising the energy efficiency of the data centre becomes not only helps the bottom line through direct energy cost savings, but also becomes a major means of gaining greater benefits from the CRC through maximising the bonuses available through cutting CO₂ emissions more radically.

3. The data centre and CRC

In research carried out for nlyte in 2008, Quocirca found that 55% of data centre managers did not see the energy bills for the data centre, and that only 19% had P&L responsibility for energy usage in the data centre. With energy prices remaining unstable, but still trending upwards, this is becoming increasingly unsustainable. Now, as CRC is ready to become law, Quocirca expects to see organisations taking main board decisions that will directly impact the data centre manager, putting pressure upon them to ensure that energy efficiency is optimised across the IT environment.

Do you receive the electricity bill for the data centre?

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However, without a granular knowledge of what energy your data centres are using - and how the usage patterns change throughout cycles such as on a daily, monthly or quarterly basis, it is difficult to draw up the right plans to optimise data centre energy utilisation. Also, not only is measuring energy utilisation an issue, but then calculating the CO₂ emissions equivalence is required.

To this end, it is important to be able to model, measure and monitor your data centres to a high degree of accuracy. Only then can you begin to play the “what if?” scenarios that are central to being able to optimise the data centre’s energy utilisation.

As technology has changed, the energy needs in different areas have also changed. Today’s cabinet-based systems have far higher energy densities than yesterday’s tower-based systems, and also need more specific and targeted cooling than used previously. However, data centre design has struggled to keep up with the change, and power distribution and cooling provision within the data centre may be poorly designed for the needs of equipment now housed within the facility. Only by modelling the facility sufficiently will you be able to see where, for example, energy used in cooling equipment is being wasted, or where the way that equipment has been put together within cabinets is causing hot spots where cooling is struggling to keep temperatures within limits.

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Once a base level of energy usage has been defined, a degree of optimisation can be considered. For example, the use of virtualisation is a hot topic at the moment, enabling utilisation of Windows/Linux servers to be moved from an average of less than 10% to 50% or greater. At the storage level, utilisation can be driven from around 30% to 80% or greater. This then means that less equipment is required, and older equipment can be retired, so lowering energy requirements further.

Once an organisation has full control over what assets it has, and how those assets can be optimally utilised, it can then look at how best to re-engineer the data centre itself. Here, using more targeted cooling, possibly through the use of hot aisle/cold aisle technologies or ducted cooling may provide further energy efficiencies, as may allowing the data centre to run at higher ambient temperatures. Structured cabling may open up the voids under raised floors, enabling better flows of cooling air.

For this, the use of techniques such as computational fluid dynamics combined with infra-red hot spot modelling provides a view of the data centre where further refinements can be made, for example to the positioning of cabinets and to the ducting of cooling systems.

Importantly, the CRC will require ongoing energy savings to be made. Therefore, massive gains in year one may lead to a good return in the first year, but it is then likely that returns in following years will be minimised, or even that penalties will have to be paid. A full, long term model will be required to ensure that all energy savings are sustainable, that incremental savings will be possible, and that CRC targets can be met over the long term, and not just in the immediate future.

4. Conclusions

The advent of the CRC will create opportunities and problems for large energy users in the low-energy intensive sectors. Those who demonstrate little control over their current and future energy usage will find themselves being heavily penalised, while those who take a proactive approach will find that the incentives will be considerable, resulting in the investment in energy savings being repaid rapidly and handsomely. With IT being such a large part of many organisations’ energy usage, it makes sense for data centres to be an early focus in maximising the possible benefits of the CRC. However, much remains to be done, at such simple levels as being aware of current energy usage, and in putting in place the tools to allow a highly granular approach to be taken in measuring, monitoring and managing energy usage in the data centre.

Even for those organisations who are below the lower limit of the CRC energy usage, it makes sense to start planning now. Through suitable planning, it may be possible to avoid the CRC system altogether, or to ensure that the benefits outweigh the costs and risks if you are caught in the widening net.

About nlyte Software

nlyte Software (formerly Global Data Centre Management) is the leading provider of data centre performance management solutions. Founded by data centre management professionals in 2003, the company created nlyte, a performance management suite for improving the efficiency and management of data centre assets and physical infrastructure. nlyte Software provides a complete solution for data centre performance management, combining next generation software, proven best practices, and unsurpassed expertise in data centre operations.

Background

Long ago, when low-cost electricity was the norm and IT budgets were robust, sophisticated managers used Microsoft Excel and Visio to manage the assets in their data centres. Over time, rising energy cost and server sprawl gave rise to a new set of software solutions designed to extend the capabilities of Visio and Excel to help data centre personnel accurately track data centre components, map their physical location, and provide data to support capacity planning initiatives. These early Data Centre Infrastructure Management (DCIM) solutions were significantly better than Excel and Visio, but didn't fully execute on the vision of management for improving data centre operations by applying advanced analytics, predictive algorithms and sophisticated automation to improve the decision making and achieve true performance management in the data centre.

Our founders evaluated many of these early DCIM solutions and found them ill equipped to manage real-world problems in the data centre. All of the solutions they reviewed provided a two dimensional view of the data centre floor, but couldn't account for assets and infrastructure above the cabinets, below the floor, or on the walls. Many of the early DCIM solutions were proprietary, didn't integrate easily with other data centre applications, and didn't provide enough information to make informed decisions on critical capacity issues. Out of the frustration of not finding a DCIM solution that fit their needs, nlyte was born.

The nlyte Software Data Centre Performance Management (DCPM) suite is the next step in the evolution of DCIM, providing an integrated set of features and functions that enables total performance management for your data centre. This DCPM solution integrates with your other legacy data centre applications (CMDB, Asset Management, Network Management) to provide a complete picture of your data centre's physical infrastructure. With nlyte, we provide the tools and the processes to revolutionize data centre management, ensure operational best practices, and resolve some of the biggest issues facing data centres today. Basically, things you can't do with Excel, Visio and DCIM solutions!

Our goal is to empower IT professionals by providing software solutions and services that enable them to make informed decisions for the planning and effective management of their data centre assets and physical infrastructure. nlyte Software is committed to the ongoing development, enhancement and support of the nlyte DCPM suite. nlyte Software will continue to expand the range of services available to provide a total solution for data centre performance management.

nlyte is offering a **free data centre carbon footprint assessment** to organizations who may be affected by the CRC. The assessment will provide a vendor independent view of a data centre's active power utilisation based on modelled power and real-time power consumption. The assessment will also provide a real-time view of current and future CRC allowance requirements, enabling organizations to set data centre targets and to manage changes to align with UK CRC allowances.

For further information visit www.nlyte.com or e-mail us at enlighten@nlyte.com or call us on +44 (0) 208 877 7200



REPORT NOTE:

This report has been written independently by Quocirca Ltd to provide an overview of the issues facing organisations seeking to maximise the effectiveness of today's dynamic workforce.

The report draws on Quocirca's extensive knowledge of the technology and business arenas, and provides advice on the approach that organisations should take to create a more effective and efficient environment for future growth.

Quocirca would like to thank nlyte Software for its sponsorship of this report.

About Quocirca

Quocirca is a primary research and analysis company specialising in the business impact of information technology and communications (ITC). With world-wide, native language reach, Quocirca provides in-depth insights into the views of buyers and influencers in large, mid-sized and small organisations. Its analyst team is made up of real-world practitioners with firsthand experience of ITC delivery who continuously research and track the industry and its real usage in the markets.

Through researching perceptions, Quocirca uncovers the real hurdles to technology adoption – the personal and political aspects of an organisation's environment and the pressures of the need for demonstrable business value in any implementation. This capability to uncover and report back on the end-user perceptions in the market enables Quocirca to advise on the realities of technology adoption, not the promises.

Quocirca research is always pragmatic, business orientated and conducted in the context of the bigger picture. ITC has the ability to transform businesses and the processes that drive them, but often fails to do so. Quocirca's mission is to help organisations improve their success rate in process enablement through better levels of understanding and the adoption of the correct technologies at the correct time.

Quocirca has a pro-active primary research programme, regularly surveying users, purchasers and resellers of ITC products and services on emerging, evolving and maturing technologies. Over time, Quocirca has built a picture of long term investment trends, providing invaluable information for the whole of the ITC community.

Quocirca works with global and local providers of ITC products and services to help them deliver on the promise that ITC holds for business. Quocirca's clients include Oracle, Microsoft, IBM, O2, T-Mobile, HP, Xerox, EMC, Symantec and Cisco, along with other large and medium sized vendors, service providers and more specialist firms.

Details of Quocirca's work and the services it offers can be found at <http://www.quocirca.com>