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PUE, CUE and DCeP. Can Metrics Rescue Green IT?

By Alistair Maughan

Businesses' technology estates consume ever-greater amounts of energy and, at the same time, the cost of that energy continues to escalate. Green IT initiatives seem to have little effect despite the fact that, on paper, the ways to measure – and thus manage – energy consumption and efficiency are more sophisticated than ever before.

As The Green Grid publishes a new data center energy productivity (DCeP) metric – to sit alongside existing benchmarks such as power usage efficiency (PUE) and carbon usage efficiency (CUE) – we look at how organisations' IT leaders are reacting to the developments in energy measurement and pricing techniques, and how these techniques sit alongside other proactive steps that can be taken by CIOs to reduce energy costs and boost Green IT initiatives.

According to recent statistics, the global ICT (information and communication technologies) system last year consumed about 10% of the world's electricity. A single iPhone uses as much energy as an average refrigerator. Data centers alone are responsible for 2.5% of European energy consumption, and that figure is rising by 10-15% a year.

Individual businesses, whether local or global, face the same issue – and it's one exacerbated by continuously rising energy prices. As businesses become increasingly reliant on the ICT environment, the energy consumption of that environment becomes a bigger factor in organizations' cost bases.

Green IT (*i.e.*, the adoption of practices designed to use ICT more efficiently) has been around for many years now. It is a key measure in reducing the collective global carbon footprint of the ICT environment and in tackling climate change.

There are, of course, many very strong arguments for Green IT. Clearly, there are significant financial incentives to reduce energy consumption and the cost of energy. Increasingly, there are also great PR reasons why companies would want to demonstrate themselves to be energy-efficient and low carbon organisations. A Greenpeace report published in April 2014 singled out Amazon Web Services for using only 15% renewable energy to power its data centers (a claim which AWS disputes). Greenpeace contrasts this with other major data center operators which are much further towards a goal of majority – or even total – renewable energy use.

But the take-up of Green IT in practice by businesses has been very slow. This could be for a range of reasons, including lack of clear "ownership" of the problem, a belief that energy is a fixed cost within the supply chain, and little external pressure to change. One significant issue may also be the lack of detailed Green IT benchmarks for organizations to adopt in order to measure and manage the energy consumption/cost metrics of any given ICT estate. This, at least, is something that the IT industry is changing as it puts in place a series of standards and accepted metrics that enable measurement and guidance as to energy consumption.

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ICT ENERGY METRICS

As far back as 2009, a study by Gartner identified that CIOs are not paying enough attention to measuring and controlling energy use in data centers specifically and across their ICT estates generally. More tools to enable such monitoring are appearing regularly. Measuring energy at the data center level is becoming increasingly important with the growth of cloud computing, for example. Traffic through data centers is predicted to grow three-fold between 2012 and 2017.

In March 2014, The Green Grid published its approach to data center energy productivity, "DCeP". The Green Grid is a global taskforce on data center efficiency comprised of representatives from the U.S. Department of Energy, the U.S. EPA, the European Commission, Japan's Ministry of Economy and Japan's Green IT Promotion Council. The initial impetus for The Green Grid was a desire of various major corporations to do more to improve the resource efficiency of data centers.

The DCeP metric allows an organization to define the "useful work" of a given business – *e.g.,* the number of sales of a retail business, or searches by an online search company – and relate that to the energy consumed. The metrics come with standards and conventions for reporting on energy productivity. As The Green Grid said in introducing its report: "*With escalating demand for data center operations and rising energy costs, it is essential for data center owners and operators to monitor, assess and improve performance using energy efficiency and greenhouse gas emission metrics.*"

In the past, The Green Grid has published guidance on measures such as power usage effectiveness (PUE), which compares a facility's total power usage to the amount of power used by the ICT equipment. PUE is a significant measure in determining the effectiveness of data centres. It has also published a green energy co-efficient (GEC), the energy reuse factor (ERF), and the carbon usage effectiveness (CUE) measure. All of these metrics come with guidelines and specific measurement protocols. Admittedly, each one of these metrics only shows part of a larger picture but, taken together, at least they provide a baseline through which energy consumption – and therefore the effectiveness of energy saving measures – can be assessed.

Importantly, The Green Grid now makes it possible to harmonize the use of these various resource efficiency metrics to get a more holistic picture of data center energy usage. Businesses ought to be able to use standardized published metrics like PUE, GEC, ERF and CUE in tandem rather than in isolation.

MAKING METRICS USEFUL

But having a tool is one thing; using it properly is quite another. IT Departments firstly need to use metrics widely, and then should implement relevant metrics as part of a suite of joined-up Green IT measures either within their own organizations or, more commonly, within their ICT supply chain, including key service providers.

For some time, it's been possible to evaluate and select data center providers based on factors including environmental measures such as PUE. Such factors can be backed-up by contractual requirements to maintain and improve the PUE ratio. An ideal PUE is 1.0 although a typical data center probably has an average PUE of 2.5 (meaning that, for every 2.5 watts of power supplied to the facility, only one watt is delivered to the ICT load). A business with a significant data center requirement may target reducing its PUE down to 2.0 or below.

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But PUE is often considered a poor measure in isolation. Imagine a data center with a power draw of 3MW of electricity for the entire facility, of which 1.5MW goes to the ICT equipment: this gives a PUE of 3/1.5 = 2.0. If the data center operator makes efficiency improvements and reduces the ICT equipment energy draw by 0.3MW, then the total draw drops to 2.7MW, that should be good, right? But the PUE actually goes up: 2.7/1.2 = 2.25! It's not quite as simple as this in practice, but it does illustrate the point that measures shouldn't be used in isolation.

Going a step further, consider which is best: a data center with a low PUE run off electricity generated by brown coal, or one with a slightly higher PUE powered by electricity from a mix of sources, including high renewable energy content?

That's why a holistic mix of measures, including PUE, CUE and the new proposed DCeP is a better idea than simply using one measure.

WIDER GREEN IT INITIATIVES

Most large ICT providers – whether of data center facilities or distributed IT – make much of their green credentials. Many buyers of ICT services fail to exploit the potential to convert the providers' sales talk into contractual measures.

There are a number of other highly effective steps that any organisation can take to reduce ICT-related energy consumption and improve its carbon footprint. Ideally, of course, organisations will make sure that Green IT is embedded as a principle across the entire business, including the supply chain. These measures include both internal steps and steps to be implemented across the web of commercial relationships supporting an organisation's ICT estate.

1. Implement a set of Green IT principles. IT departments can adopt a written set of principles, products and practices designed to mandate improvements in environmental behaviour, such as increasing the use of energy-efficient devices and renewable energy sources, promoting recycling and ensuring compliance with all applicable environmental regulations.

At one level, a set of principles is nothing unless acted upon. And, as any lawyer will tell you, asking a service provider to sign up to a set of principles may not get you much further than lip service. However, setting out as part of key ICT supply contracts a consistent basic commitment to conduct all IT operations in accordance with defined Green IT principles will help to underpin many other specific requirements.

Organisations ought, at the very least, to have an environmentally preferable purchasing policy. Service providers should be required to commit to provide services in accordance with those Green IT principles. IT departments can engage with selected suppliers, and include carbon and resource impacts within procurement criteria and processes. Where appropriate, any evaluation and selection process of competing service providers ought to take account of each service provider's compliance with appropriate standards such as ISO14000 and the strengths of each provider's own demonstrated sustainable development strategy.

2. Embed Green IT into Governance of the ICT supply chain. Make Green IT a part of the contractual governance structure. Within the ICT estate, a senior person should be made responsible for implementation of Green IT and the co-ordination of all service providers Green IT policies – *i.e.*, a Green IT champion. This

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position should be mirrored as a requirement within the organisational structure of key ICT service providers to make certain there is a joint customer/provider leadership team designed to champion the implementation of Green IT across the ICT estate.

The leadership team ought to commit service providers to provide advice back to the customer around evolving best practices and international guidelines or standards that might be implemented in relation to Green IT, particularly with regard to things like data centre operations, end user computing, packaging for hardware shipments, and recycling or disposal of decommissioned hardware.

3. **Energy Usage**. Contracts with key ICT service providers ought to include obligations to minimise energy consumption at the system, rack and data centre level. This can be backed up with regular reporting requirements and even SLAs around energy consumption and usage ratios. Contracts can require providers to make optimal use of data centre space, server and other assets put under their stewardship and to identify opportunities for re-engineering steps that could improve the utilization of computing resources, space and energy.

4. **Focus on charging**. Either directly through a service charge element or potentially indirectly through a service level monitored by service credits, some element of the charges can often be attributed to energy efficiency measures and Green IT.

In many data centre-type contracts, there is also the possibility to investigate a separate line item of charging in relation to energy consumption and to make the basis for pass-through of energy charges far more transparent than most service providers are prepared to do without being pushed.

Large organisations should already be on top of their obligations under available government schemes, such as the UK government's Carbon Reduction Commitment scheme. In on-going relationships, a service provider could be required to advise its customer pro-actively of the availability of any carbon credits, and recommend cost and gain-sharing proposals which enable the customer to take advantage of carbon credits.

5. **Tech Refresh and Recycling**. Recycling and e-waste are key action areas. There are already legal requirements for e-waste in many areas, such as the EU directives on waste electrical and electronic equipment (WEEE), and directive and reduction of hazardous substances (RoHS). Typically, many customers require service providers to commit to be responsible for safe and legally compliant disposal of all supported equipment and potentially any customer-owned equipment that gets replaced as part of the services.

It's possible to go a step further and require a provider to implement a programme of activity throughout the contract term to upgrade all IT equipment to models with a better energy rating. This can be backed up with regular reporting on progress through the governance process.

Green IT is not a new concept and, in principle, is now firmly embedded as part of many businesses' corporate social responsibility programs. But relatively few businesses take Green IT from drawing board into reality as much as they realistically could. Gartner has described most CIOs' reaction to sustainability initiatives as reactive, not proactive. There is a still lot of work for CIOs and their IT departments to do if the technology sector is to get greener and more energy efficient.

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Contact:

Alistair Maughan
(+44) 20 7920 4066
amaughan@mofo.com

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