

DATA CENTRES

green.....greener.....greenest

One of the CIO's challenges

By Bram Slaager

Green is not a colour new to this planet of ours, and though not as long in politics, for some it seems it has been there more than long enough, but unfortunately the challenges to the sustainability of the natural world are many and varied, and so we have to keep moving forward with new initiatives if we want to keep this rich and valued colour in our lives. In this article we focus on the effects of, and on, the ICT world and the emergence of the Green Data Centre.



A “green” data centre? Ironically green as a colour, is not very dominant in even the best designed data centres, but as an environmental concept, “green” is set to dominate data centre design and operation very strongly as time goes on. So how is a green data centre achieved? For some the purchase of forest preservations or CO2 credits seems to be the primary strategy, but this of course doesn't contribute to the reduction of CO2 emissions. A green data centre, in the view of this author, is one where maximum effort is made to maximize energy efficiency in relation to the established ICT systems in the data centre. In other words, to reduce the energy consumption of the ICT systems as much as possible and also put technology in place which limits the extra consumption required for cooling and other systems as much as possible. It's about the CO2 you don't generate, rather than what you do about it afterwards.

Why is demand emerging for green data centres? Ever increasing processing density has resulted in an obvious increase in power and cooling demand, but the answer is not simply to meet this demand, as the increase in power and cooling density, as well as generally new technology and its implementation requirements, brings with it new challenges in terms of effective distribution, particularly with cooling, that result in the inefficiency of the data centre increasing at a much greater rate if a new approach is not taken. That new approach is the green data centre.

Legislation. Governments are also becoming increasingly aware of the need to take steps leading to the rational use of energy by data centers. Globally data centers consume 2% of the total energy consumption worldwide, as much as the entire aviation industry. This has led to legislation being implemented for the first time in the Amsterdam area, where by the Environment Act now prescribes the maximum extra energy that can be used in addition to the energy required for the IT systems themselves. This legislation will be adopted by other regions in the Netherlands, with data centre users and administrators having to implement measures to comply with it.



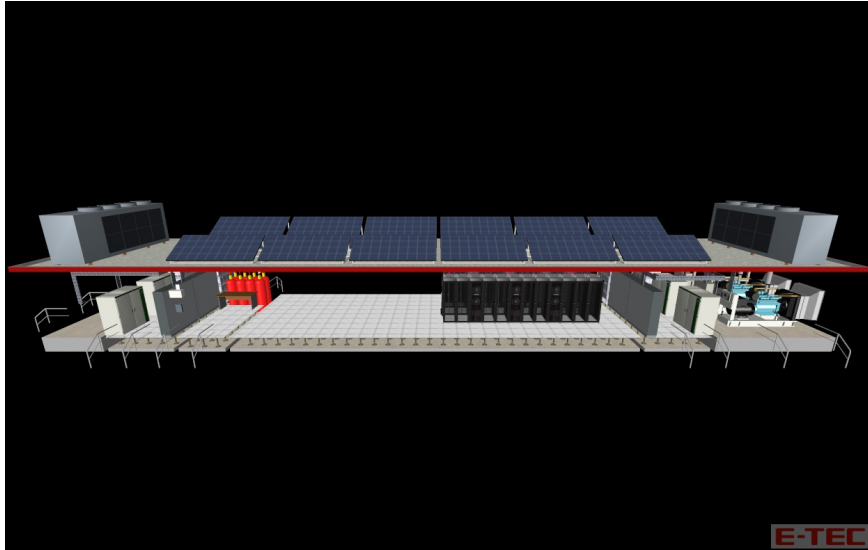
Energy efficiency (PUE / EUE) and CO2 reduction. Energy efficiency in your data center is calculated as follows: $(\text{Total energy taken from the grid}) / (\text{Total energy consumed by the ICT Equipment})$. Most datacenters have a factor which lies between 1.5 and 2. The goal from the current standards is to arrive at a factor between 1.2 and 1.4. When this is achieved based on a 200kW ICT equipment load, cost savings of €50,000 per annum can be achieved and a CO2 reduction of 350 tons.

White papers on PUE. Several white papers are published on the topic of PUE. Examples of this can be found at www.thegreengrid.org , www.google.com , www.apc.com , www.eaton.com and many others. In the opinion of this author, all those white papers can lead you to a different philosophy for approaching data centre efficiency but not specifically providing solutions as to how they can easily be implemented. But one thing is certain, PUE should be proven during the design phase and not afterwards when the datacenter is ready and in operation.

What measures can you take? To be as energy efficient as possible with the ICT systems in your data centre, many measures can be taken. Below is an explanation of some examples, but is by no means a comprehensive list and not intended to be.

1. ICT hardware. Adapt procurement policies of your organization to select energy-efficient hardware through Total Cost of Ownership (TCO) analysis. Here, along with server virtualization and clustering, the largest gain in energy savings is achieved by using a higher density.
2. ICT software. A reduction in the number of applications required to run on dedicated servers, which are typically running significantly under capacity, meaning more servers are required and therefore higher power consumption than necessary.

3. Data storage. Classifying data into categories based on whether or not there is the need for it to be instantly available. This can lead to a reduction in the need for active storage capacity and therefore less energy use. For ideas on this visit <http://www.ozzodata.com> where you can download the whitepaper version 1
4. Cloud computing and outsourcing. This is a hot issue for many companies where ICT challenges are present. The number of providers is growing significantly and the way services are offered is becoming clearer. By using cloud computing where systems and applications are remotely taken, energy consumption in your data centre will reduce.
5. Redundancy. The greater the redundancy the lower the efficiency, so explore the nature of redundancy required to attain the specified level of availability and whether the existing method exceeds this or not. For example if there is a backup data centre, provisions here might not necessarily have to mirror those of the main site, thereby achieving an energy saving.
6. Technical measures. There are many technical measures that can be taken, and the following are some we would highlight:
 - Design in relation to practice; a common situation after a data centre is constructed and in operation, is that checks are not regularly carried out to ensure the facility is being operated as per the design intent. Deviation from the intent can lead not just to a risk of downtime but also to energy inefficiency.
 - Efficiency of installations; gains can often be achieved by replacing old systems with new ones, as more up to date technology can result in systems running at higher efficiency. In the Netherlands the cost of UPS replacement can even be offset by a grant under the Energy Investment Deduction scheme.
 - Pollution; pollution of supply voltage by harmonics fed back by ICT systems, can create an unnecessary extra energy drain. This pollution can be addressed by means of filtration that is specifically designed for this purpose.
 - Air flow separation; making sure that hot and cold air flows in your data centre are separated as much as possible can raise efficiency of the cooling system which creates energy savings.



Free cooling? As most people know, Free does not exist. However, you can cool your data centre environment by means of optimum cooling techniques with maximum use of the cooling capacity of the outside air. This can be a direct or indirect way and we often speak here of free cooling. Also the storage of heat from your data centre in the ground is an increasingly applied technique. When you use the latter, also called WKO, then the heat is subsequently reused for heating your office or other premises in the area. It is not possible to describe here all the techniques that can be used, however it has been found through various techniques that the energy required for cooling can be reduced by as much as 65% or more. This gives you immediate gains in energy efficiency and lower energy costs.

Future View. The good news is that increasing attention is being given to improving energy efficiency in the data centre. New techniques will be introduced in the coming years which will reduce the energy used by ICT systems, however, the growth of ICT continues and this will lead to continued growth in demand for power and cooling. Also, new systems and solutions for power and cooling will be developed in further efforts to increase efficiency. So together we need to continually work to keep up with this, as the complexity of the data centre will only continue to grow, and more and more company CIO's will need an experienced data centre partner to talk to.

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