

GREEN IT - ADDRESSING THE ENVIRONMENT AND SUSTAINABILITY CONCERNS

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ABSTRACT

Green IT (Information Technology) it refers to the study and practices of using computer resources and IT infrastructure in efficient and in a more responsible way. Green IT's primary concern is to maximize the energy efficiency during the span of IT products and creating eco-friendly products thereby promoting the biodegradability of outdated products and minimizing the impact which happens in designing, Manufacturing, and disposing of IT products in environmentally friendly way.

Keywords-Green IT, sustainability, data centres, environment, energy efficiency, technology, IT industry

INTRODUCTION

It's been a long journey for information technology and various computing technologies at large to reach the sophistication we witness in its current state. Computers started their journey by using vacuum tubes to compute a few simple mathematical calculations, and used a great deal of space and large amount of energy to operate. Then this paradigm shifted, from vacuum tubes to transistors, bringing down the size, operational possibilities and power consumption to a great degree. The invention of integrated chips ushered in the silicon revolution. With the help of IC's (Integrated chips) the size and power consumption was scaled down exponentially, therefore allowing computers to become more affordable to large enterprises, small businesses and to the general populace across the world. This allowed enterprises and businesses and various industries to re-imagine ways of manufacturing as well as their business models with the help of information technology, as a result productivity and efficiency increased to such a level, that there had been no precedence of such a monumental impact in the history of human productivity and commerce. With this new reality coupled with software innovations it opened up new possibilities and at the same time reimagining of what computers could do in every aspect and strata of life. So, the energy demands of this new dynamic and ever progressing phenomenon of information revolution in tandem with its progress and innovations led to greater and greater energy demands. And the demand for computers grew exponentially and has continued to be so today. With the advent of internet and the whole culture of sharing information and the networking of computers and the associated networking technologies, inventions of new networking hardware to facilitate the ever growing demand of sharing information among governments, large enterprises, small businesses, educational institutions and the general populace at large brought with it higher consumption and operational cost but more importantly energy required to run the new emerging information technology industry.

Although the modern computer hardware and all the associated hardware are more efficient than their predecessors. But the sheer number of computers consumed and also the rate at which computers are connecting to the internet by end users, various industries and businesses is growing at the faster than ever before. This amounts to a lot of energy consumption globally. Therefore, we have to think critically and also to a certain degree ethically about the impact information technology has on the environment. We have to also think about the connectedness of global industries and business with the natural environment. Running and sustaining rapidly growing industries and at the same time leaving very little carbon footprint is of the outmost importance. Reducing power consumption in the IT industry directly correlates to the cost of running an industry which translates into affordable and energy efficient products to the consumers and also the cost of production to the manufacturer, at the same time protecting the environment and the natural resources of the planet. Considering the fact that the planet has limited amount of resources and coupled with the fact that there are no truly viable renewable and sustainable energy generating technologies, it becomes absolutely imperative to adopt and promote green IT.

2. Data centres running cost-The cost of data centres is going up as a result of increasing power needs. Power density will continue to increase and their infrastructure to support this increase. Although there have been massive improvements in performance of servers and end user computers but at the same time the number of servers is

growing very rapidly every year. Data centres are becoming more critical for business operations resulting in the most expensive fault tolerance design. This can also increase the cost of running data centres.

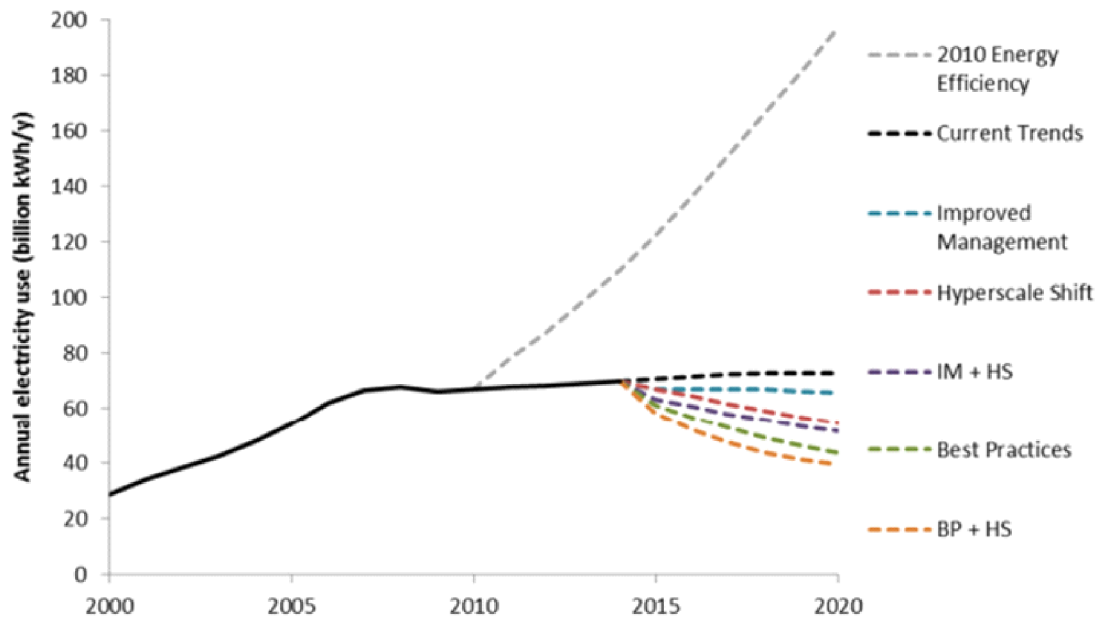


Figure 1. Projected Data Centre Total Electricity Use [1]

Estimates include energy used for servers, storage, network equipment, and infrastructure in all U.S. data centre. [1]

416.2 terawatt hours of electricity world's data centres used in 2015 was far higher than UK's total consumption. [2]

3. Cooling cost of IT equipment and data centres-Not only does it take a great deal of money and energy to run servers and computers but, about 40% of total energy consumed is for cooling IT equipment therefore cooling cost are major contributors to the total electricity consumption. [3]

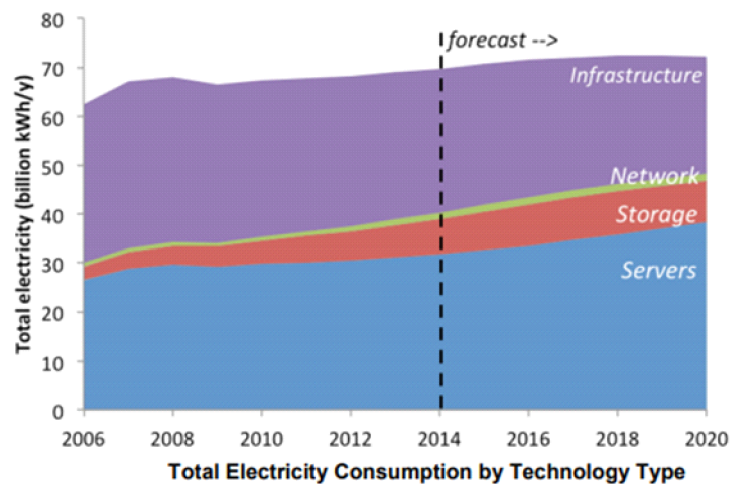


Figure 2[b]

4. Green IT consideration towards personal computing-As computers are ubiquitous in the personal domain it is absolutely critical to think of green IT, in the IT products that we consume. More and more computer hardware

technologies are used in every possible scenario. It is not only necessary but also incumbent to use green certified IT products.

5. Energy saving through virtualization– Hardware virtualization has emerged as a major energy saver in the IT industry. By virtualizing underutilized servers into a single physical server, this offers significant power savings as physical servers could be removed. For example, by virtualizing five physical servers running at 15% utilization into five virtual machines within a single physical server, this would potentially eliminate the running costs of four servers.

Comparison between the consumption of virtualized & physical servers.

	Virtualized	Physical
No of Clients	2 VMs	2 servers
Idle	104.5	207.6
Workload 1	111.4	209.1
Workload 2	117	230.2
Workload 3	121.4	234.9

Figure3 [4]

Energy Performance Assessment of Virtualization Technologies Using Small Environmental Monitoring Sensors.

6. Green coding- There have been many significant innovations towards energy efficiency in terms of IT hardware. Going forward, a greater degree of energy efficiency can be achieved through efficient coding in development of software.

“A University of Washington project sees a role for programmers to reduce the energy appetite of the ones and zeroes in the code itself. Researchers have created a system, called EnerJ, which reduces energy consumption in simulations by up to 50 percent, and has the potential to cut energy, by as much as 90 percent. [5]

7. Paper consumption in IT industry-Paper consumption is one of the least discussed aspects of IT industry, but one the less has a great significance in terms of Green IT. As the IT industry grows and proliferates, the printing needs of the industry grow as well. Compared to paper made from forest fibre, recycled paper reduces total energy consumption up to 44%, greenhouse emissions up to 38% particulate emissions by 40%, water saving by 50% and wood use by 100%. [6]

8. Green and Sustainable Power-Looking at the larger picture, a logical and environmentally friendly computing should lead towards steering away from traditional fuels used to generate electricity to a more environmentally friendly, renewable and sustainable energy sources. There is no doubt that IT industry uses energy to operate and sustain itself but on the other hand it is also helping to transform and innovate the energy industry by coming up with efficient ways of energy production, distribution and also sustainability. Data is quantitative it must undergo transformation of data by discrimination into categorical data before appropriate algorithm is applied.

9. International energy consumption report-

- In the report, it is projected the global energy consumption occurs more in non-OECD Asia region that includes (India & china), projected the demand in non-OECD to increase by 15%(or by 102 quadrillion Btu) during (2015-40)
- In the non-Asia regions also projected to contribute to substantial increases in energy demand. Rapidly growing population which have access to domestic resources are both important determinants of energy demand in Africa and the middle east where energy use is expected to increase 51% and 45% respectively, between 2014 and 2015. [7]

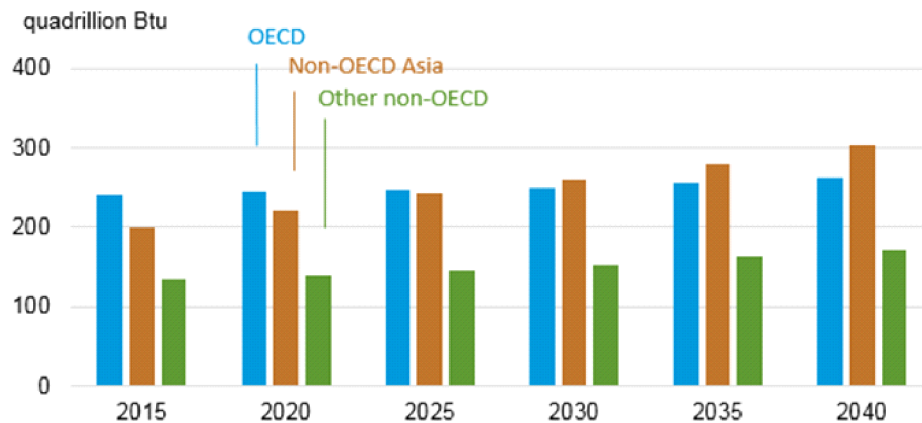


Figure 4 [d]

10. Big Blue-This initiative was taken by IBM and invested \$1billion to make world wide data centres more energy efficient, cost effective. This plan includes upgrading of hardware and software to increase the processing speed and double the computing capacity worldwide by 2010 without increasing its power consumption, originally initiative was started by name Big Blue later named as “Big Green”. [8]

11. Summation-There are many challenges ahead for green and responsible information technologies to operate and sustain. It is more so important for developing nations to incorporate green IT as they progress toward their developmental goals. New energy saving models can be adopted early, and reduce energy consumption to a great degree. Education and governmental policy making is also very critical to the green computing. The IT industry is spearheading a revolution towards energy efficiency with its innovations and energy saving models, which has a positive impact on the environment. Lastly, adopting Green IT not only impacts the IT industry in a positive way, but also to every other industry at large. For A Green World, Think Green.

12. REFERENCES

- [1] ArmanShehabi, et al., (2016). United States Data Centre Energy Usage, ES-2, 8. Retrieved from <https://eta.lbl.gov/publications/united-states-data-center-energy>
- [2] Tom Bawden, E. (2016, January 23). Global warming: Data Centers to consume three times as much energy in next decade, experts warn. INDEPENDENT. Retrieved from <http://www.independent.co.uk/environment/global-warming-data-centres-to-consume-three-times-as-much-energy-in-next-decade-experts-warn-a6830086.html>
- [3] ArmanShehabi, et al., (2016). United States Data Centre Energy Usage, 2.3.5, 26. Retrieved from <https://eta.lbl.gov/publications/united-states-data-center-energy>
- [4] Lu Liu, Osama Masfary, and Nick Antonopoulos (2012, May 18). Energy Performance Assessment of Virtualization Technologies Using Small Environmental Monitoring Sensors <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3386759/>
- [5] Hannah Hickey(2011, May 31). Code green: Energy-efficient programming to curb computers power use <http://www.washington.edu/news/2011/05/31/code-green-energy-efficient-programming-to-curb-computers-power-use/>
- [6] Susan Kinsella et al., (2007) - The State of the Paper Industry Monitoring the Indicators of Environmental Performance.
- [7] US energy information administration. (2017, September 14). 2017 International energy report. <http://www.eia.gov/ieo>
- [8] GreenBiz Retrieved May 9, 2007, GreenBiz, IBM launches Billion-Dollar ‘Project Big Green’- <https://www.greenbiz.com/news/2007/05/09/ibm-launches-billion-dollar-project-big-green>

REFERENCES (Graph’s)

- Figure 1 : ArmanShehabi, et al., (2016). United States Data Centre Energy Usage, ES-2, 8. Retrieved from <https://eta.lbl.gov/publications/united-states-data-center-energy>
- Figure 2 : ArmanShehabi, et al., (2016). United States Data Centre Energy Usage, 2.3.5, 26. Retrieved from <https://eta.lbl.gov/publications/united-states-data-center-energy>
- Figure 3 : Lu Liu, Osama Masfary, and Nick Antonopoulos (2012, May 18). Energy Performance Assessment of Virtualization Technologies Using Small Environmental Monitoring Sensors <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3386759/>
- Figure 4 : US energy information administration. (2017, September 14). 2017 International energy report. <http://www.eia.gov/ieo>