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Sustainable Business Practices

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For:
Sustainable Energy 16:332:402
Spring 2011
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Table of Contents

1. Introduction

We have seen sustainable energy practices spreading throughout industry. Increasingly, large corporations have adopted sustainable energy practices. While sustainable energy practices are a "good thing," the real question is: Why are these institutions adopting these practices?

For purposes of this paper, I am working under the basic economic premise that for-profit corporations are rational, profit-seeking, and profit-maximizing firms. Then the analysis is examining how sustainable energy practices assist these companies' bottom lines.

This paper takes the form of two case studies examining two well-known companies, Google and General Electric. Google has embraced energy efficiency in its data centers. Why and how Google does this is important to understanding how other companies can maximize energy efficiency and profit from it. General Electric provides a different, but just as useful case study. General Electric has invested billions of dollars across its enterprises in order to bolster its sustainable energy portfolio.

2. Case Study 1: Energy Efficient Data Centers (Google)

Google was not the first company to offer search services. In recent memory there have been a number of search companies that have sprung up, became recognizable names, and then land on the ash heap of Internet history. Yet Google reigns supreme.

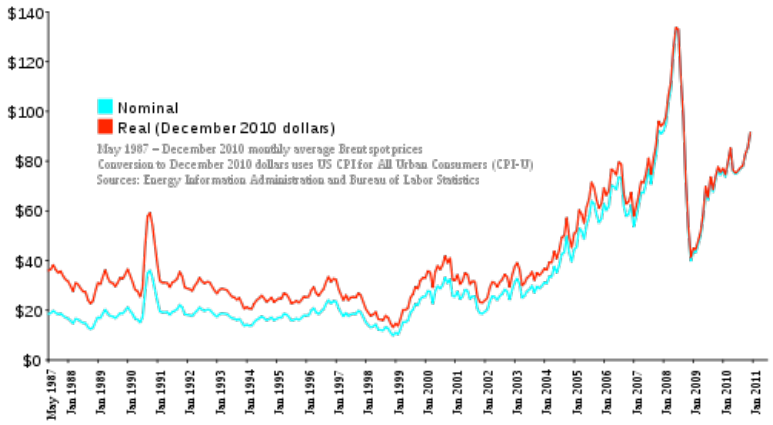
Two big advantages that Google has had over its competitors are that it does search better and t does it faster. Through better algorithms and more hardware, Google has maintained a competitive advantage in the face of more competition.

Google looks at hardware efficiency differently than we traditionally analyze hardware metrics. Google does not look strictly at gigahertz clock speeds or memory sizes. The important metric is performance ***per watt***.[1] Another view is, "When Hardware is Free, Power is Expensive."[2] Moore's Law dictates that hardware doubles in speed every two years.[3] A corollary is that every two years, the cost of hardware is halved.

A. Energy Costs in Data Centers

Energy costs do not follow a consistent pattern. Energy costs are subject to market forces, and have tended to increase over time.

Figure 1: Brent barrel petroleum spot prices, May 1987 – Jan 2011.[4]



Over time the cost of energy has remained steady or increased. Lately, energy costs have again begun to spike.[5]

To analyze the relationship between energy costs and server efficiency, we have to analyze the relationship between the power consumed and the hardware cost.

> Power per server cost (in watts per thousand dollars) can be decomposed into two component parts, as shown in equation 1:
>
> **Equation 1:** Power per server cost
>
> $$\frac{\text{Power}}{\text{Server cost}} = \frac{\text{Power}}{\text{Performance}} \times \frac{\text{Performance}}{\text{Server cost}}$$
>
> . . . .
>
> where[:]

$\frac{\text{Performance}}{\text{Power}}$ = system performance divided by the measured power use for that server system to deliver that performance (i.e., performance per watt); and

$\frac{\text{Performance}}{\text{Server cost}}$ = that same performance metric divided by the server hardware capital cost as configured to achieve that performance.

> This equation explains why measuring power use, performance, and server costs in a consistent fashion is so important—it allows us to understand the underlying drivers of power per server cost in an unambiguous way. It also shows that whenever performance per server cost is increasing faster than performance per watt, power use per thousand dollars of server costs will increase.[6]

The power usage becomes a more important metric than any other computing efficiency metric. Additionally, economies of scale are realized when purchasing large amounts of computer equipment, these same economies cannot be realized when purchasing power.

B. Google's Data Centers

Google uses these metrics when building its data centers. By their own estimates:

> Google-designed data centers use about half the energy of a typical data center. As a result, the energy used per Google search is very small; to be precise, we currently use about 1kJ (0.0003 kWh) of energy to answer the average query. This translates into roughly .2g of CO2 (for non-metric users, that's 0.007 ounces).[7]

Google does not disclose too many specifics of the Google Data Centers.[8] We do know certain facts about their hardware though. Google custom builds all its hardware in order to maximize the energy efficiency. For example, Google has invested more in its voltage conversion components, which reduces the energy loss from converting from AC to DC power and then from the voltage from the power supply to the microprocessors. By their own estimates, this reduces power loss to a "little over 15% of the electricity they pull from the wall during these power conversion steps, less than half of what is lost in a typical server. Efficient power conversion pays real dividends; we estimate an annual savings of over 500 kWh per server over a typical system."[9] They also omit parts such as graphics chips to save energy costs.[10]

C. Google's Data Center Locations

In addition to designing the most efficient servers possible, Google also locates their data centers to take advantage of lower cost energy and renewable energy resources.[11] Geographically distributed data centers have additional benefits as well. It allows for shorter distances between data and customers, it builds redundancy into the system to ensure uptime, and allows greater experimentation in hardware design, cooling systems, *etc*.

D. Data Center Policies Adopted by Other Companies

Other companies have adopted the data center policies pioneered by Google. Most recently, Facebook has released the specifications for its data centers.[12] Facebook has followed a similar pattern for its large, distributed data centers. It has published its specifications online for all to see, comment on, and reproduce at OpenCompute.org.[13] Some of Facebook's improvements on traditional server design include:

> innovations, such as newer fans that are larger (the entire server is 50 percent taller than the traditional 1 u sized box) and fewer of them (a design tweak introduced by Rackable [a data center service provider], which is now SGI). Those fans account for 2 percent to 4 percent of energy consumption per server, compared to industry average of 10 percent to 20 percent.[14]

These particular innovations are unique to Facebook, but Facebook and Google are not alone in their zeal to improve energy efficiency. Microsoft and Yahoo have released details of their new data center designs as well.[15]

Google, Facebook, and others are striving to increase efficiency in energy usage across the board. These innovations provide savings and a competitive advantage in the marketplace. Sustainable energy policies are good business for these high-tech firms.

3. Case Study 2: Sustainability for Profitability (General Electric)

> "The main social responsibility for a company is to win."
> - Jack Welch, former CEO of General Electric[16]

General Electric (GE) is a large, multi-national, corporation with a diversified interest in a wide range of technologies. The one message being pushed by GE is what they call "Ecomagination," a portmanteau of ecology and imagination.[17] In GE's own words, "Ecomagination is GE's commitment to imagine and build innovative solutions to today's environmental challenges while driving economic growth."[18]

This push towards sustainable energy research is part of its overall strategy. According to the World Business Council for Sustainable Development, GE has a strategy for reducing greenhouse gases and for increasing its product line of sustainable products.[19]

A. GE Sustainable Technology Research, a Competitive Advantage

GE's research is in a number of different technologies in the field of sustainable energy. These technologies include solar panels, wind turbines, cleaner running trains, more efficient jet turbines, new electricity transformers, better batteries, membranes, washing machines, digital medical equipment, washing machines, and—of course—compact florescent light bulbs.[20]

These technologies not only advance the GE product line, but allow it to get an advantage in the sustainable energy regulatory future. For example, GE makes compact florescent bulbs (CFLs). Because there is an incandescent light bulb ban coming into effect in the United States and other bans worldwide, there is an increased demand for CFLs. This provides a windfall for GE. Other regulations may mean more government contracts for GE.

Additionally, having a first-mover advantage in the technology space means that they have a stronger patent portfolio as sustainable energy becomes the norm. This patent portfolio will mean greater profitability in the long term.

It is with these advantages in mind that GE has committed to "invest $10 billion in environmentally friendly products by 2015, double the amount it spent in the past five years, under Chief Executive Officer Jeffrey Immelt's 'ecomagination' program."[21]

B. GE Public Relations: "Greenwashing?"

Greenwashing is when corporations tout environmentally friendly policies that are overstated or simply false—a whitewashing of a non-sustainable policy.[22] GE is aware that environmentalists are wary of a multinational corporation professing to be in favor of green technologies. In an interview, its vice president of Ecomagination, Lorraine Bolsinger, explained that GE is committed to sustainable development.

> Ecomagination is for us, above everything else, a growth strategy. It is a business strategy based on the idea that by investing in technologies to help customers solve these big megatrends that we're seeing, to help them grow sustainably in this world--where there is more regulation, more scarcity, higher energy costs--that we can grow sustainably as well. So what's good for business is good for the environment, and what's good for the environment can be good for business. [23]

Still, it is undeniable that that GE is taking advantage of their Ecomagination line to promote itself. It has run seemingly countless commercials on television and its own website links to these. Additionally, the Ecomagination website has further links to its social media promotions. These links include its Twitter feed, its Facebook page, and its YouTube channel.

GE is using their sustainable energy development to further its public image.

C. Tax Advantages to Going Green

For 2010, GE paid no corporate income taxes.[24] From the news reports and analyses of this, it appears that GE did so completely legally. GE took full advantage of all available tax deductions and credits, and did not pay US tax on income earned outside the US (which is standard practice).[25] Much of these tax credits and deductions were because of the research and development in sustainable energy technologies, which are favored by the tax code.

These tax incentives were designed to encourage the very behavior that it has seen in GE. Because of these tax advantages, GE has significantly increased its research and development in sustainable energy technologies.

4. General Observations and Conclusions

Going green can be beneficial for a company's bottom line. Sustainable energy practices can save companies money, may provide a competitive advantage, make for good public relations, and have tax advantages.

When advising clients it is important to stress these real advantages to sustainable energy practices. In conclusion, sustainable energy practices are not solely for those who want to save the earth; these practices are for those who want to make money.

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