SUSTAINABLE ENERGY : HOW THE DIGITAL WORLD CONSUMES MORE THAN YOU THINK

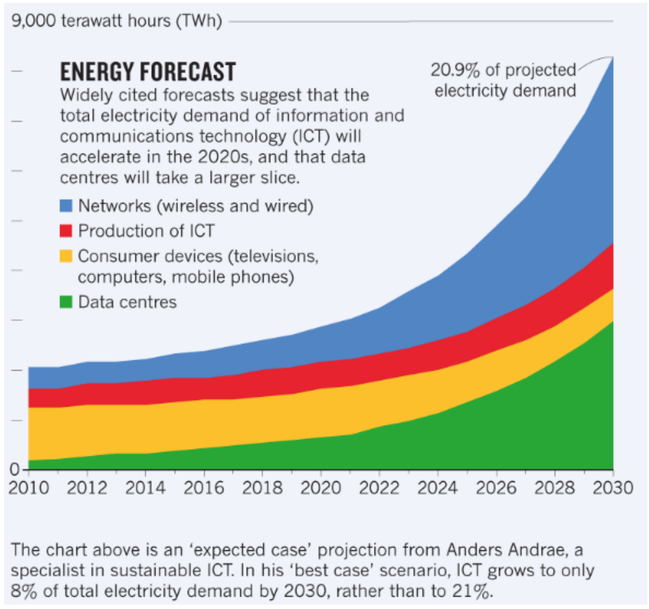
HOW COMPANIES ARE CONTRIBUTING TO ENERGY FOOTPRINT ?

Over the last decade, the demand for digital technology is continuously growing in order to keep the world more connected and technologically advanced.

The excess demand is resulting in an increased energy footprint of the digital economy. The electricity consumed by electronic devices, data centres and information technologies make up approximately 10% of the world's electricity consumption and internet traffic is only expected to grow. About 80% of the electricity consumption comes from burning coal, natural gases and petroleum which are all contributing to global warming .

The emission from burning these non renewable sources of energy has important consequences such as damaging the atmosphere, contributing to water and soil pollution as well as creating toxic waste. These resources are not unlimited and will, in the future result in scarcity resulting in price volatility and high prices. The use and production of energy has a large impact on the climate and can alter future energy needs. On the contrary, climate change can also impact energy consumption as hotter climates demand cooling systems for not only individual households but data centers driving up energy consumption.

Technology giants must adopt sustainable practices in order to think of their long term viability in the industry. As the technological demand increases, how are companies contributing to solving this issue instead of contributing to the problem? What can they do to reduce their energy footprint in the digital economy?



The chart above is an 'expected case' projection from Anders Andrae, a specialist in sustainable ICT. In his 'best case' scenario, ICT grows to only 8% of total electricity demand by 2030, rather than to 21%.

WHAT ARE TECHNOLOGY GIANTS DOING?

Facebook is committed to minimize energy usage by using "robust sustainability data" to identify and fix problems. While Facebook's electricity consumption doubled the last two years, their goal is to reduce emissions of greenhouse gases by 75% in 2020 (Statista). Furthermore, their electricity usage has been made up of over 75% of renewable energy since 2018. In addition, they have been "contracted for over 4.0 gigawatts of renewable energy" (Facebook Sustainability, 2020). Lastly, they also use power usage effectiveness which measures how efficient the operating systems of our data centers. While they have made progress on averaging a 1.11 Power usage effectiveness and below in recent years, they are working towards generating ideas on how to get closer to the ideal power usage effectiveness of 1.0 in the long-term(Facebook Sustainability, 2020).

In 2017 and 2018, Google was consecutively able to purchase "100 percent renewable energy to match their annual electricity consumption for global operations" (Google Data Centers, 2020). This was done by acquiring numerous wind and solar farms along with using various purchasing power agreements. It is also beneficial from a physical perspective due to the fact that "electricity on a grid is fungible", it does not make a difference where the energy sources bought are located – just "as long it's on the same grid as our data center" (Google Data Centers, 2020). Furthermore, when Google commits to acquiring clean power sources, they are ensuring that they will have a tremendous impact in seeing clean energy become available in the market (Google Data Centers, 2020). This enables them to reduce their carbon footprint through making renewable energy accessible for use by both their data centers and the surrounding communities (Google Data Centers, 2020).

Amazon has not made significant efforts towards using renewable sources of energy. In 2019, they were accused of not following through on their plan of "running their data centers on 100% renewable energy" rather they were putting more effort on acquiring business through the oil and gas industry (Hern, 2019). They are prioritizing projects that cause further problems instead of working towards sustainability. In addition, Amazon increased its operations by 59 percent last two years without increasing their current renewable energy usage of 12 percent. Contrarily, they have tried to put some effort in becoming more sustainable: "Our engineers have spent years perfecting Google's data centers, making them 50% more energy-efficient than the industry average" (Hern, 2019).

Apple has made the claim that all their global facilities are powered by 100 percent renewable energy (Apple, 2019). However, according to Apple's 2019 environmental responsibility report, the company's 4 largest data centers in the U.S. use on average 47 percent energy derived from coal and only 11 percent renewable energy. Apple actually pays off consumers and other companies to give themselves 'green credits' for their coal electricity usage (Epstein, 2016). Practically, Apple is not contributing positively to the problem and has not applied real solutions to solve the problem.

Microsoft is still not operating on 100 percent renewable energy; however, they have a clear plan and are executing on it. The company's goal is to cut operational carbon emissions by 75 percent by 2030 (Smith, 2019). In response to that, they achieved a target of powering their data centers by 60 percent renewable energy in 2019 and are working towards achieving 70 percent renewable energy usage by the end of 2020 (Microsoft, 2019). In addition, Microsoft is building, renovating and operating their campuses in a way that reduces their impact on the environment. Brad Smith points out: "We will remove fossil fuels from these new buildings and run this new addition, as well as the rest of our campus, on 100 percent carbon-free electricity" (Smith, 2019). Furthermore, Microsoft is empowering their consumers and partners to deliver greater efficiencies. For instance, Microsoft is partnering with Ecolab and Ørsted which are improving water conservation and efficiency of renewable energy with Microsoft Azure, IoT, and AI (Smith, 2019).

HOW CAN THESE TECH GIANTS REDUCE THEIR ENERGY FOOTPRINT ?

A zombie server is defined as a server that is still consuming energy despite it being no longer used by a company. Zombie data is defined as data that is still stored on a server in a data centre and, in turn, consuming energy in order to be maintained despite it no longer being used. Zombie systems are usually the result of faulty repurposing and decommissioning by companies, often due to fear of overall problems in the data centre occurring. In the context of this study, zombie data can refer to an old email that has not been deleted yet even though it has not been touched by a user since it was first opened.

In 2015, just over a third of all of the physical servers in the world were reported to be turned on but not actually doing any work. It was also reported that inactive servers consume approximately 5.44 gigawatts of energy worldwide, enough energy to power every home in both Chicago and New York.

Undead Machines

The estimated number of zombie servers—those powered on but doing nothing in data centers—and the electricity they are burning

U.S. ZOMBIE SERVERS: 3.6 million

ENERGY DRAW: 1.44 gigawatts

EQUIVALENT TO: Power from three large power plants; power used by 1,152,000 households, roughly the number in Chicago

GLOBAL ZOMBIE SERVERS: 10 million

ENERGY DRAW: Four gigawatts

EQUIVALENT TO: Power from eight large power plants; power used by 3.2 million households, roughly the number in New York City

Eliminating zombie servers could save companies approximately $3.8 billion annually. This can be accomplished through virtualizing servers that are utilized on a low frequency. As for the servers that are not utilized at all, companies should simply have them disabled in order to prevent them from demanding energy. As for zombie data, solutions may be more complicated due to the possibility of consumers having a hand in the data, but they are nonetheless easy to implement.

Auto-Deletion Process: Companies could implement processes that automatically delete data from the server after a specified period of time. Similarly to how Google automatically deletes data corresponding to an email if it has been in the "Bin Folder" for thirty days, companies could have data corresponding to an email deleted automatically if it has not been opened in two years, even if said email is in the Inbox or Sent folders.

Push Notifications: Companies could send push notifications after a specified period of time to remind users that they should delete something in order to clear up data on a server. For example, Google could establish a process that sends a prompt to users, reminding them to delete an email if it has not been accessed within the past year. If the user presses the "No button" and does not open the email for another year, the prompt process would be sent again, and so forth.

Combination of the Prior Two Solutions: Companies could send push notifications after a specified period of time to users to remind them that they should delete content in order to clear up data on a server. However, if they reject the prompt and still don't open it after a specified period of time, companies could implement a process that automatically deletes said data from the server. For example, Google could send a prompt process to a user to delete an email if it has not been opened in one year in order to delete its corresponding data. If the user presses the No button and does not open the email for another year, an auto-delete process would be implemented to the email regardless of its folder location.

In conclusion, companies can eliminate zombie servers by having them disabled and can eliminate zombie data by sending processes to consumers, such as auto-deletion processes and push notification processes. Doing so will lead to the deletion of the corresponding information that hasn't been utilized for a long time. By doing all of this, companies could save a lot of money on energy and less of the world's energy would be used inefficiently.