

# Barriers in Achieving Green Computing

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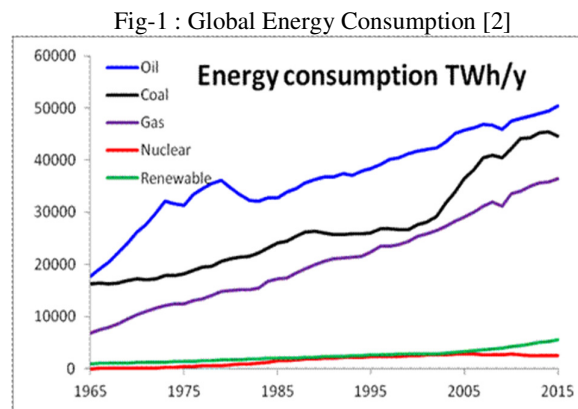
## Abstract:

Achieving Green Computing becomes a challenging task as technologies keep growing in each and every aspect of mankind which has led to half of the universe being dependent on electronic devices/gadgets. However, Green computing focuses on reducing Techno trash, also called as E-waste/e-trash. This document describes the hazardous metals those help in Computer manufacturing and creating threat to mankind as such. Managing and reducing Techno trash is where green computing is focused on. Even though fully getting rid of these materials is not feasible; they can be reduced, recycled or replaced.

**Keywords —** Techno trash, Energy Star, Toxic waste, Greenhouse gasses, Global warming, Waste to Energy(WtE).

## I. INTRODUCTION

Green Computing is an analytical study, practice of environmentally sustainable computing. Today's world is totally dependent on technologies which increased the growth of electronic gadgets enormously. As per Statista, it is estimated to grow to 4.77 billion smartphone users in 2017 [1]. As the devices increase to grow in numbers, the need for power supply keeps increasing rapidly, but the power source we have will not be adequate to meet with the requirements. We gradually swindle the Mother Nature for our electricity needs. As the chart below depicts the Energy consumption is rapidly increasing; it is necessary to consider energy consumption over Green Computing, as it plays a vital role in global energy consumption.

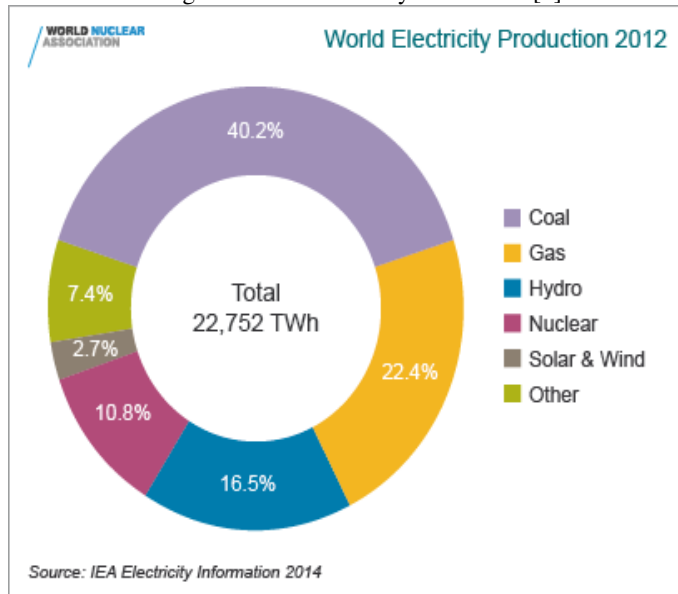


## II. SURVEY

According to the report from BP Statistical review of World Energy June 2017, primary energy consumption increased by just 1% in 2016 and emission of Carbon-dioxide (CO<sub>2</sub>) increased by 0.1% globally [3]. Computer components need 10 times of its original weight of fossil fuels to be manufactured when we compare to an automobile which requires 1 or 2 times of its weight in fossil fuels [3]. The hazardous metals and chemical elements those are used in manufacturing PC's are Antimony (Sb-51), Arsenic (As-33), Cadmium (Cd-48), Chromium (Cr-24), Cobalt (Co-27), Lead (Pb-82), Mercury (Hg-80) and Selenium (Se-34) [3]. When these elements are buried in ground in any form, they contaminate the land and ground water as well. People who drink contaminated water or contaminated food can be infected by diseases like diarrhea, nausea and even cancer. When we discuss about global energy production, Uranium plays a very important role in nuclear power generation. 80% of Uranium is mined in Kazakhstan, Canada, Australia, and Niger. Even though nuclear plants contributed smaller portion of world's total energy production, they, especially Uranium, supply electricity with low greenhouse effect which will help in achieving green computing [4]. On the other hand, the chart prepared by World Nuclear Association shows that global energy production

mostly relies on Coal and Natural gasses. A report submitted by Australian Computer Society says IT equipment and gadgets consumed 7% of total Australia's electricity and contributed 2.7% of carbon emissions in the year 2009 [5].

Fig-2 : World Electricity Production [4]



### III. EFFECTS OF GREENHOUSE GASES

Greenhouse Gases (GHS) are type of gasses those can hold and emit radiation in the atmosphere. They radiate energy in all directions and a part is directed towards the surface that keeps the global warm. By the human activities the volume of greenhouse gasses in the atmosphere is consistently being increased. The increase of such gasses at the atmosphere causes global warming. To address the effects of greenhouse gases even though global warming is the right choice, it will be effective when we recall deaths and premature deaths around us which are caused by these gasses. To realize the effect of Carbon monoxide, the incident that caused six deaths can be recalled in Delhi, India on 29<sup>th</sup> November, 2017. Six chefs traveling in a truck found unconscious and later declared dead because of inhaling carbon monoxide from a tandoor that they used to keep them warm [6]. This incident too warns the world against greenhouse gasses. Global warming is one of the main effects of greenhouse gasses. From the late 1970s, the Arctic has lost an

average of 20,800 square miles of sea ice per year, which increases the sea water level [7]. As Archimedes' principle says, as Arctic melts the equivalent volume of sea water raised to the surface which will reduce the living space for human beings.

### IV. SECURITY CHALLENGES

In achieving Green Computing the main security threat is managing Techno trash that is also known as E-waste or E-trash. Techno trashes are electronic gadgets or part of them those are not used anymore or replaced with some other devices. It is noticeably important that we, the users, help in recycling them. The peripherals are made up of few hazardous elements. And it is important that they are recycled properly in order to avoid the greenhouse effects. As mentioned earlier, when these are buried under ground they contaminate ground and ground water and moreover they are non-degradable elements which may also affect the ground water level as it becomes difficult for rain water to penetrate further.

Global warming is an important threat to the world because of greenhouse effects. Greenhouse gasses are also produced by these toxic e-wastes. Electronic gadgets, nowadays, work efficient and faster. The main issue with them is that they produce more heat with greenhouses gasses, such as Carbon monoxide, Carbon dioxide etc.

Electricity consumption in ICT (i.e. Information and Communications Technology) is another notable area to concentrate. Carbon emission also has to be considered. The heat produced by computing devices has to be reduced or controlled. Carbon emission, heat production and more electricity consumption are very most important areas that obstacles in achieving green computing.

### V. STEPS INITIATED

In 1992 the U.S. launched Energy star program which promoted energy efficiency in Monitors by implementing sleep mode among consumer electronics eventually [8]. Following that TCO, a Swedish organization, launched a certification program to promote low magnetic and electrical emissions from electronic devices [8]. Nearly most

of the organization in the industry including Intel, IBM, Dell, HP, AMD etc. encourages green computing. The Green Grid, a global consortium was founded in all the above mentioned IT giants. Government organisations and NGOs' also encourage by reducing taxations on installing solar systems and so on. Even though, this is in initial stage it is hopefully believed that it may help in reducing the power consumption globally.

Fig-3 : Enery Star [8]



## VI. CONCLUSION

As we all know that eliminating technologies from our lives is merely feasible, it is possible to support in achieving green computing.

- Usage of limited and necessary devices that may help in reducing the manufacturing rate.
- Necessary usage of technologies, to avoid unnecessary usage of the technologies those serve the same purpose.
- Usage of cloud computing.

Even though Waste-to-Energy (WtE) supports in lower power generation; it has to be encouraged for eco-friendly computing and energy production as well, which in return will lead to reduce E-waste/E-trash.

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