

# A Detailed Study on Fuel Cell Market: A Step Towards Energy Sustainability in ICT

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## Abstract

There is need for dependable and economical backup power due to increasing socio-economic benefits of mobile phone technology and rapid expansion of wireless communication systems. Telecommunications companies are installing fuel cells at cell phone, radio towers etc. So, in this paper, we have discussed about the fuel cell market which acts as a step toward energy sustainability.

## Keywords

Energy Optimization, Environmental Sustainability, Fuel Cell, Mobile Technology

## 1. Introduction

Energy is consumed in variety of ways among different sectors which can be from homes to industries. Much of that energy is consumed usefully but some get wasted, and that wasted energy should be addressed uniformly so as to achieve energy optimization [3]. The explosive development of ICT (information and communication technology) industry has emerged as one of the major sources of world energy consumption. Challenge arises to power the telecommunication networks [4, 12]. Energy needs are rising progressively very similar to curve of hockey stick which should be directed actively if sustainable development has to be made. Currently, energy consumption by ICT is highly demanding due to various Wireless Communication Devices viz. Laptops, Smart Phones, Padfones, etc. which leads to increase in energy consumption. Fast growing hunger for energy has led to a rapid rise in the need for energy [9]. Overconsumption of energy is the main trigger for the global warming that is now threatening to cause devastation in many areas of the world [11]. Consequently reducing the energy consumption of wireless networks is considered vital for the future. Fig.1 shows the increased energy consumption by world market from the year 1980-2030.

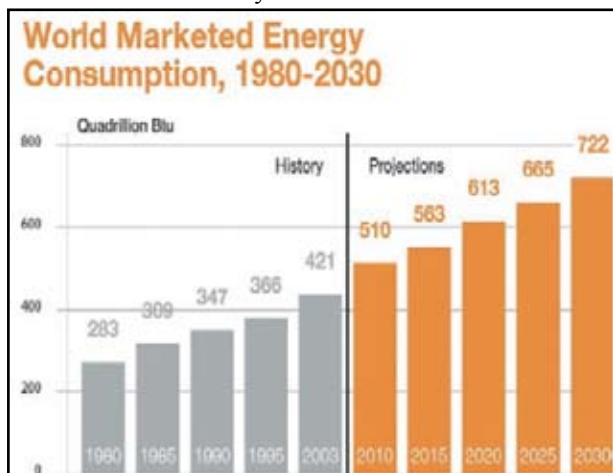


Fig. 1: World Marketed Energy Consumption, 1980-2030

Sources: EIA 2003, International Energy Outlook 2007, World Resource Institute

Fig. 2 shows the overview of broadband technologies that can deliver access to the internet, at various speeds via various devices.

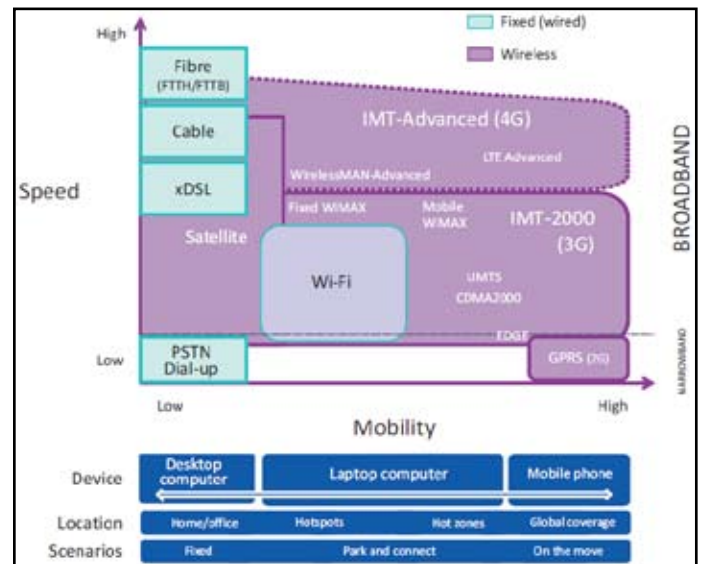


Fig. 2: Fixed (Wired) - and Wireless-Broadband Technologies – Speed Versus Mobility [10]

Within ICT, the contribution of mobile communication networks was 64 Megatons of CO<sub>2</sub> in 2002. This may seem a rather small fraction (12% of ICT emissions) but it is expected to grow by nearly a factor of three to 178 Megatons in 2020 as shown by fig.3 [5]. The largest fraction of CO<sub>2</sub> emission from mobile communications occurs in the radio access network, i.e. in the base stations. Compared to this, the energy consumption (and the according CO<sub>2</sub> emissions) of both the mobile devices and of the servers in the core network infrastructure are smaller by a factor of 4 or 5. Regarding only the power consumption during operation the contribution of the mobile devices is even as low as a few percent. Improvements in the access network infrastructure are thus key to Green ICT.

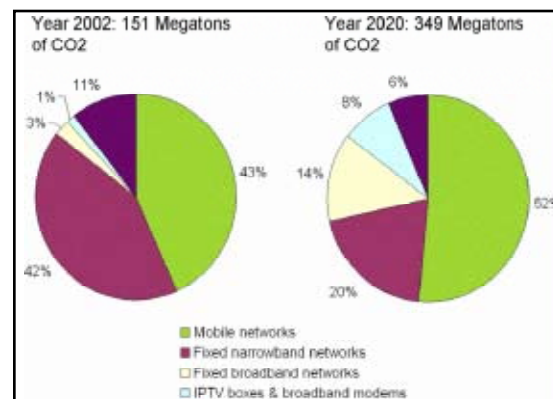


Fig. 3: Contribution of Mobile Communications to the CO<sub>2</sub> Footprint of Telecommunication Industry in 2002 and Estimated for 2020

Energy consumption has become an important issue in mobile networks mainly in 3G and beyond wireless communication technologies which are raising the problems of the energy needed to create, maintain and cooperate between systems [6]. Many milestones have marked the journey toward sustainable development after the Rachel Carson's Silent Spring which was published in 1962 [2]. With vision, effective policy choices, cross-sectoral partnerships and targeted investment, we can turn our world into one that is sustainable—in other words green, prosperous and equitable [1] According to International Energy Agency, World Energy Outlook 2008, "Current energy trends are patently unsustainable—socially, environmentally, economically". Word "Unsustainable is used because energy consumption has always a noticeable impact on the environment [15]. Increased energy consumption in wireless networks directly results in the increase of greenhouse gas or CO<sub>2</sub> emission, which has been recognized as a major threat for environmental protection and sustainable development [13]. Fig. 4 shows the global wireless data usage.

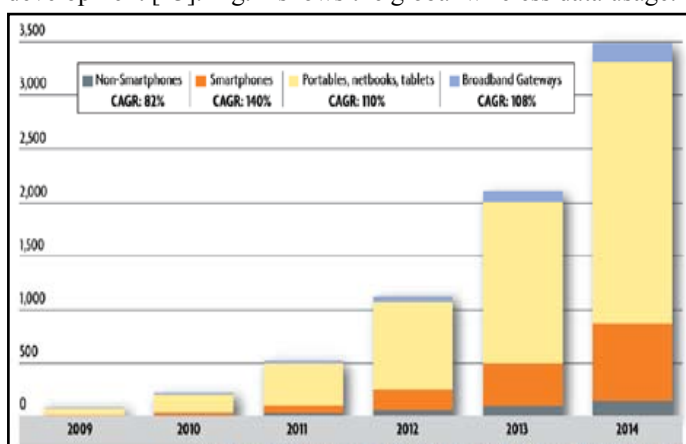


Fig. 4: Global Wireless Data Usage (Exabyte per Month) [17]

So, there is a pressing need to accelerate the development of advanced clean energy technologies in order to achieve sustainable development by using alternative energy resources which will not only reduce environmental impact, it will also cut costs and help to make technology more affordable for everyone. Fig. 5 shows the methods to achieve sustainable energy.

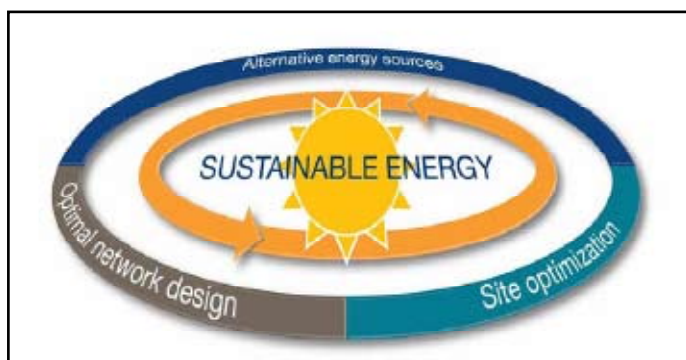


Fig. 5: Methods to Achieve Sustainable Energy [14]

The use of renewable energy is not new. More than 150 years ago, wood, which is one form of biomass, supplied up to 90% of our energy needs. Today, there is a need to look for the future in renewable sources to meet our progressively rising needs [16]. There is a need of transforming vision of energy in our world and need to turn it into action. We need to understand the worldwide energy dilemma, and to empower people with the tools to tap alternative sources for their energy needs [7]. Also, Diesel power

plants are being used in remote areas where electrical grid power is unreliable or totally unavailable and there is risk of rising costs in recent years, and will continue to expose operators to the risks of rising fuel prices and the future cost of carbon emissions. Meanwhile, alternative energy technologies are becoming more reliable [8].

## VII. Conclusion

There is a pressing need for more reliable power than is available on the current electrical grid, and fuel cells have proven to be up to 99.999% reliable. Fuel cells can replace batteries to provide power for 1kW to 5kW telecom sites without noise or emissions, and are durable, providing power in sites that are either hard to access or are subject to inclement weather. Such systems can be used to provide primary or backup power for telecom switch nodes, cell towers, and other electronic systems that would benefit from on-site, direct DC power supply. Network operators are increasingly choosing fuel cells as their backup power solution because they are lower cost, reliable, low maintenance, and because they are a clean energy contributing to global reduction in carbon footprint. Fuel Cell systems are used today to back up critical communication network infrastructures in wireless, fixed and broadband telecom applications.

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current interest includes Techno-Economic Analysis of Broadband Wireless Networks viz. WiMAX, HSPA, EV-DO and LTE. His future focus is to explore the Green Wireless Technologies and Sustainable development.



Yun-fei Liu was born in Nanjing, China, on December 20, 1962. He received the B.S. degree in physics from Zhenjiang Normal College, Zhenjiang, China, in 1984, the M.S. degree in optics from Sichuan Normal University, Chengdu, China, in 1991, and the Ph.D. degree in testing measuring technology and instrument from Nanjing University of Aeronautics and Astronautics, Nanjing, China, in 2005. He was a teaching assistant, lecturer, associate professor, with Department of Basic Courses, Nanjing Forestry University, in 1991, 1994 and 2000 respectively. He was an associate professor, professor, College of Information Science and Technology, Nanjing Forestry University, in 2000 and 2007 respectively. His research interests include digital signal processing, electronic measurement techniques, microwave and optical technique. At present, He is engaged in Gaussian optics and terahertz technique in forestry application.



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