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ADOPTION OF GREEN TECHNOLOGIES IN ELECTRONICS AND COMMUNICATION ENGINEERING

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ABSTRACT

The evolution in technology is important only when it is harmonized with our mother nature. So, while developing any technology, environment should be the utmost priority. Wireless Communication is the most emergent, prolific and accepted area of communication field. So far, research efforts focus on Spectrum efficiency, transmission reliability, data rate and services provided to users. However, most of the recent research efforts have disregarded the implication of wireless network's environmental responsibility, e.g., energy efficiency and environmental impact. Recently, it has been shown that the accumulation of greenhouse gases in the atmosphere is growing more rapidly than initially predicted. This understanding has led to a push towards "green" wireless communications that strives for improving energy efficiency as well as reducing environmental impact. Reduction of the green house gases produced or caused by the telecommunication sector is referred to as greening of telecommunication. Green telecommunication has many facets. It can be classified broadly in terms of greening of telecommunication networks, green telecommunication equipment manufacture, atmosphere friendly design of telecommunication buildings and safe telecommunication waste disposal. As network equipments have become more IP-based, the energy consumption required has progressively increased. Green wireless communication can be achieved with the use of Green handover, Green codes, Green electronics, Green power amplification systems, Green antennas and Green base transceiver stations using renewable energy sources. This paper includes the various aspects for the development of green wireless communication to preserve the nature.

Key Words: Green telecommunication; Green handover; Green codes; Green electronics; Green BTS; Green antenna

I. INTRODUCTION

The most boisterous revolution in technology has been the phenomenal evolution in wireless and mobile communication. Climate change is one of the most undeniable universal challenges in present scenario. The reason for increased GHG, mainly Carbon Dioxide (CO_2), is because of the increased energy consumption which results in formation of pollutants. Natural calamities like typhoons, floods and changes in the sea levels

are attributed to the CO_2 fuelled greenhouse effect. It is predictable that during the last 30 years the CO_2 emissions have gone up by 73%. India is ranked 5th amongst the countries in the list of worldwide GHG emission, with USA and China contributing about 4 times emission than that of India. The Kyoto Protocol of 1997, which was signed by over 160 countries, including India, calls on all countries to reduce their emissions of greenhouse gasses by 5%, from the 1990 level, by the year 2012. Many governments around the world, including India have taken steps to reduce energy consumption and emissions. India is committed to reduce carbon intensity by 20-25% between 2005 and 2020. The information and communications technology electronics and communication industry alone accounts for about 2% or 860 million tones of the world's greenhouse gas emissions. The main causative sectors within the electronics and communication industry include the energy requirements of PCs and monitors about 40%, data centers about 23% and fixed and mobile telecommunication contributes about 24% of the total emissions. Compared to the other sectors such as transport, construction and energy production, the ICT sector is comparatively energy-lean with telecommunication contributing just 0.7 percent or about 230 million tones of green house gas emissions. The challenge for the government, telecommunication service providers and telecommunication equipment manufacturers is to pursue expansion in telecommunication sector, while ensuring that the 2percent of global emissions does not radically increase over the coming years. A typical communications company spends nearly 1% of its revenues on energy which for large operators may amount to hundreds of crores of rupees. Global warming is a serious problem and Intergovernmental panel on climate change (IPCC) has reported that the emissions of green house gases (GHG) must be halved by the middle of this century. However, most of the research efforts emphasizes on advancement in technology and ignore the adverse effect of technology on environment. So, more importance should be given to develop the economical as well energy efficient technologies. Telecommunication industries are growing at a

very fast rate. Nowadays, there are more than 4 billion cellular phone subscribers in the world. The rapid growth of subscribers encourages fast up gradation in technologies. While following the development in new technologies, the number of base stations will also increase. More number of base stations led to more consumption of energy. The data shows that the deployment of mobile broadband network such as Long Term Evolution (LTE) is expected to take place on the top of existing 2G and 3G networks with increase in approximately 25% in the number of base stations. This will lead to more emission of Carbon Dioxide in the atmosphere. Service providers are also facing the problem of energy expense. The analysis of energy expense of Indian and European operators. The interdependent and mutually reinforcing pillars of sustainable development are economic development, social development, and environmental protection.

II. DEVOLOPMENT OF COMMUNICATION GROWTH & POTENTIAL

*In the past two decades, the development of communication has grown rapidly, today providing network coverage to more than 90% of the world's population and connecting more than 4 billion people, the majority for the first time.

*The development of communication is forecast to invest $800 billion during the next five years; $550 billion of this is earmarked for mobile broadband, potentially connecting 2.4 billion people to the Internet.

*If mobile broadband were to fuel a similar productivity revolution to that generated by mobile voice services, it could boost global GDP by 3-4%.

*Globally, the electronic communication sector contributed 16% of GDP growth from 2002 to 2007 and the sector itself has increased its share of GDP worldwide from 5.8 to 7.3%. *The electronic communication sector's share of the economy is predicted to jump further to 8.7% of GDP growth worldwide from 2007 to 2020.

III. ELECTRONICS AND COMMUNICATION SECTOR Vs CLIMATE CHANGE

*Climate change is fundamentally altering the planet: the earth has warmed by 0.7 degrees *C since around 1900 and will warm more in coming decades due to past emissions.

*Climate change will likely have a devastating impact on ecosystems and economies, especially in the poorest parts of the world.

*Impact of more extreme weather events on the reliability of telecommunications networks

*Increasing cost and scarcity of energy to power electronics and communication equipment

*Increasing the energy efficiency of telecommunications networks

*Manufacturing more energy-efficient electronics and communication products

*"Dematerialization"and the provision of electronics and communication services that have the potential to reduce the climate change impact of customers

* Increasing efficiencies regarding data and energy passing over networks through digitization

IV. ELECTRONICS AND COMMUNICATION & CARBON EMISSION:

*Telecommunication networks are incresingly expanding into rural and suburban areas where there

*There is no poor availability of grid power.

*Globally 1.6 billion people lack access to grid electricity (they are "off grid") and an additional 1 billion have unreliable access("bad grid").

*The global electronic s and communication industry producing an estimated 2% of world 's co2 emissions.

*Elecronics and communication in India accounts for 1.5% of India's total energy bill. This is expected to go up to 2.7% by 2020.

V. ELECTRONICS AND COMMUNICATION:SOURCES OF GHG EMISSON

*Energy consumed by the network in operation

*Embedded emissions of the network equipment, for example, emissions associated with the manufacturing and deployment of network equipment

*Energy consumed by mobile handsets and other devices, when they are manufactured, distributed and used, as well as their embedded emissions

*Emissions associated with buildings run by mobile operators, and emissions from transport of mobile industry employees

VI. ALTERNATE ENERGY SOURCES:

*Solar Power

*Wind Power

*Bio Gas

*Less Polluting fuel like CNG etc.

VII. TELECOM INDUSTRY INITIATIVES

*Mobile operators and vendors are working on a number of initiatives to develop energy efficient networks and ensure that their customers use energy-efficient handsets.

*Designing low energy base station sites

*Deploying base-stations powered by renewable energy

*Implementing infrastructure optimisation and sharing

*Reducing mobile device life cycle emissions through design and recycling

*Considerable improvements in energy efficiency of base stations have been realised in recent years.

*For example, Ericsson has reduced the annual direct CO_2 e-emissions per subscriber in the mobile broadband base stations it supplies from 31 kg in 2001 to 17 kg in 2005 and to 8 kg in 2007. Nokia Siemens Networks announced in 2009 a new SM/WCDMA cabinet-based BTS with a power consumption of 790 W, versus 4,100 W for the equivalent model from 2005.Alcatel-Lucent also developed innovative techniques such as the Dynamic Power Save feature on their GSM/EDGE mobile networking portfolio, which reduces power consumption when the traffic drops with no impact on service quality.

*This enhancement reduces average power consumption by 25-to-30%, and can be installed on all Alcatel-Lucent base stations deployed since 1999.

*In India, there are more than 3,00,000 telecom towers. Monitoring the EMF radiation level of these telecom towers is a challenge.

*Presently, operator has to submit the self certification declaring the EMF radiation exposure by BTS within prescribed limit.

*Department of Telecommunications (DoT) has instructed service providers for confirming to limits for Base station emissions for general public exposure as prescribed by International Commission on Non-ionizing Radiation Protection(ICNIRP).

VIII. EMF RADIATION:INDIA:

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IX. E-WASTE: HANDSET

*A 2008 survey of 6,500 people in 13 countries reported that 44% kept their old phone, 25% gave it to friends or family, 16% sold their used phone (especially in emerging markets), 3% are recycled and 4% are thrown into landfill. About 16%(by weight) of a typical mobile phone is considered 'high value' materials. For example, 1 tonne of electronic circuit boards yields about the same amount of gold as 110 tonnes of gold ore.

*A pilot recycling project was run by Vodafone in Kenya in 2007/08 and collected, on average, half a kilogram of waste per week from each repairer. Nearly a quarter of the waste collected was phone casings, 22% batteries and 20% chargers.

*Handset vendors are also working on a variety of "green" handsets, with features ranging from simple reminders to unplug the phone when it is fully charged to using solar energy for charging. Some new models are made from recycled materials or from biodegradable plastics.

X. GREEN TELECOM: FOREST&FUTURE

*Mobile technologies are already being used to reduce greenhouse gas emissions and costs across a wide range of sectors of the economy, using SIM cards and radio modules embedded in machines and devices to deliver smart, intelligent solutions. By 2020 we estimate that mobile technologies could lower emissions in other sectors by the equivalent of taking one of every three cars off the road3.

*Mobile communications can also make it straight forward for individuals to monitor their own carbon footprint, while being an effective channel for advice and suggestions to consumers on how to change their behaviour to cut their emissions.

*The mobile industry could enable greenhouse gas emissions reductions of 1,150 Mt CO_2e - twice the emissions of the United Kingdom in 2020. These emission reductions would originate in sectors such as power (350 MtCO_2e), buildings (350 Mt CO_2e), transportation and logistics (270 Mt CO_2e), and dematerialisation (160 Mt CO_2e).

*The mobile industry forecasts that it will reduce its total global greenhouse gas emissions per Connection1 by 40% by 2020 compared to 2009.

*The number of mobile connections is set to rise by 70% to 8 billion by 2020. Despite this growth, the mobile

industry forecasts that its total emissions will remain constant at 245 mega-tonnes of carbon dioxide equivalent (Mt CO_2e) - equivalent to 0.5% of total global emissions in 2020, or the greenhouse gas emissions of the Netherlands.

*Mobile operators plan to work with handset vendors to ensure that the energy consumed by a typical handset is reduced by 40% in standby and in use by 2020.

*Mobile operators will also work with equipment vendors to ensure that the life cycle emissions of network equipment components are reduced by 40% in the same timeframe.

XI. REGULATORY INITIATIVE:TELECOM

*Assessment of the problem

*Encouragement for use of Non conventional energy sources.

*Future roadmap for implementing green energy sources in telecom industry.

*Incentive in lieu of carbon credit.

*Monitoring ground situation.

XII. REGULATORY INITIATIVE: EMF RADIATION

*Define the standards for EMF Radiation.

*Evolve the monitoring mechanism for EMF radiation.

*Define the reporting mechanism i.e. Self certifying / automatic measuring and reporting.

*Provision of penalty for violation.

*Consumer awareness program.

XIII. GREEN TELECOM: CONCLUSION:

*Electronics and communications are part of the solution, not part of the problem, and there are enormous gains to be made through the smart use of electronics and communication in virtually every single sector.

*The importance of electronics and communication now needs to be recognized globally and the vital role of electronics and communication as we move forward in dealing with climate change issues are further promoted.

XIV. CONCLUSION

The need to develop green wireless communication systems turns out to be more and more vital as wireless networks are becoming ubiquitous. Green Wireless Communication will provide energy efficient communication. It will result into less radiation from devices

as well as more economic solutions for service providers and subscriber.

Green wireless communication is the part of Corporate Social Responsibility which strives to reduce carbon footprint and Green house gases to provide Green ICT services to customers. Government should also form rules and regulations to certify a service provider as Green service provider. The integration of different energy

efficient technologies like Green BTS, Green manufacturing, Green Handover, Green antennas, Green electronics and Smart Grid solution will create accord between human being and nature.

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