SWC_RENEWABLE ENERGY (GREEN ICT) FOR MOBILE COMMUNICATIONS: POLICY ISSUES FOR AFRICA

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Abstract

Since mobile telephony is becoming ubiquitous, many African countries wish to use mobile telephony and ICT for their economic development. According to International Telecommunication Union (ITU) global mobile statistical report, it is estimated that there are about 5.3 billion mobile subscribers and about 940 million mobile broadband subscribers worldwide (Teltscher, 2010). Out of this figure, 3.8 billion are mobile subscribers coming from the developing countries. The mobile phone penetration in Africa stands at 400 million subscribers as at the end of 2008. From 2009, more and more people who never had access to landline continue to be connected and Africa has now been identified as the fastest growing mobile industry in the world (International Telecommunication Union, 2008), (ITU, 2010). The Africans feel that the mobile phone is good and have positive attributes to their lives. The mobile companies initially were targeting urban and semi urban dwellers for their market; however, the rural communities that are marginalized are overwhelmingly taking advantage of the opportunities to maximize the benefits of the technology. Despite this improvement, Africa still remains the least in terms of mobile telephony use in the world. This is due primarily to the poor telecommunication infrastructures, inadequate planning policies, lack of coordination and linkage with reliable energy supply. Since renewable sources are abundant in Africa, they could offer reliable source of energy supply for the mobile telecommunication operators. Therefore Policy and Regulatory reforms are very necessary in order to open up mobile communication and ICT industry in African countries. By this, much savings can be derived on cost of operation and maintenance. Good policy on the use of renewable energy in the mobile sector will yield environmental gains where the mobile network's carbon foot print could be kept at base while the network expands. This paper therefore examines renewable energy as an alternative source of energy for the mobile industry. The study is based on ITU recommendation.TDAG-4/7-E (International Telecommunication Union, 2000), International research and studies on policy options which will guide the industry.

1. Introduction

The importance of energy in telecommunication will continue to increase as long as there is a demand for expansion in the industry. As the cost of energy is estimated to go higher in future due to the increase in price of crude oil in the world market, it is therefore the concern of many to save in energy consumption. Another great concern of the world today is the climate change due to the increased carbon dioxide (CO_2) and other gases emission levels in the atmosphere. The CO_2 emissions are mostly due to the burning of fossil fuel for energy generation. Thus the future use of the fossil ought to be reduced and one of the ways is the large scale adoption of renewable energy sources.

1.1 Growth in Telecommunication

Modern telecommunication and ICT technological innovations have been adopted very quickly by many at a tremendous speed. The number of internet servers have multiplied with their accompanying influx of variety of mobile telephony facilities, devices and gadgets such as I- phone, mobile TV, I-pad etc, which function without any break, delay or interferences thus making the telecommunication and ICT industry to grow very fast. ITU estimated that the global mobile subscribers was about 3 billion at the end of 2010 (International Telecommunication Union, 2010) (Global mobile statistics, 2011), an increment from 4.6 billion mobile subscribers with China and India leading the growth. The driving force behind these developments has been

the ability of telecommunication and ICT to perform complex real time services. In 2009, about half a billion people in the world were having access to mobile internet, while over 6.1 trillion messages were sent via short message service (SMS) in 2010 and this global growth is expected to double in the next five years. Over the period, the mobile competition in the developed countries is getting to saturation point and the known operators are turning their attention to the developing economies for their activities and this requires increase in the number of subscribers and expansion of base transceiver stations with its core network equipment, power and cooling systems.

1.2 Telecommunication growth in Africa

Poor infrastructural development has been one of Africa' difficulty in telecommunication development, therefore the wireless technology is seen as a blessing and hailed as king. Many people never had access to land lines or any form of modern telecommunication until recently. As at 2001, only small proportion of the African population had access to telephone, but currently there are over 50 million mobile subscribers. The fixed line operators are now providing wireless and satellite subscription, thus creating more competition in the industry. As the Mobile market drifts towards the developing economies, mobile operators are taking advantage of the experience of the developed markets in many areas including the third generation (3G), 3.5 generation (3.5 G) and LTE fourth generation (4 G). About 333 million African now have access to mobile telecommunications including those in the remote area that never had landlines (Global mobile statistics, 2011). According to ITU, the mobile growth is being driven by the developing world and it is estimated that 80% of new growth of telecommunication and ICT is expected to come from the lower-income emerging markets. Currently, Africa is seen as the fastest growing mobile market in the world at about 41.4 percent, and the number of internet users have also grown faster than expected (Global mobile statistics, 2011) (www.itu.int/ITU-D/connect/africa/2007/media/kit/africa_ict.html, 2009). Mobile telephony is increasingly playing economic and social roles in development through the promotion of investment, reducing risk from disasters while the mobile operators make profit, pay taxes, open more opportunities for new services. A research confirmed that currently, 80% of a typical rural district in Africa uses mobile phone for social activities such as "chatting" among other things. In spite of this encouraging statistical rapid growth, the ICT penetration in Africa is still way behind the rest of the world, with only very few African countries having ICT systems that are comparable to the developed countries. The internet usage in Africa is negligible for both the fixed and mobile broadband.

2. Mobile Network architecture

Typical mobile network consists of the mobile radio core network with its mobile switching centre and radio access network (RAN) particularly including base transceiver station equipment (being BTS, MSC). It also houses data centre thus, IT equipment which are basically servers, storage devices etc, and power and air conditioning infrastructure that supports IT and core network equipment. The power system provide backup power, regulate voltage and converts alternating current and direct current (AC/DC), and the cooling equipment such as room air-conditioning units and computer room air conditioning units. By principle, electricity is supplied to an uninterrupted power supply (UPS) unit which serves as a backup battery bank for the system to ensure that no equipment experiences any power fluctuation and disruptions which could cause disruption to business or loss of important or valuable data of which are costly to business. Electricity is converted from AC to DC to charge the internal batteries within the UPS. The output of the batteries is then refined and converted back to AC to serve the various equipment and gadgets. Within this equipment, there are power units that regulate/convert the electricity to low voltage DC power which is then used by the internal components such as central processing units, memories, fans. The core network equipment and storage devices facilitating the transmission of signal as well as data also rely on the electricity for their operations. Mobile operators in Africa current are using Global System for Mobile communication (GSM), Code - Division Multiple Access (CDMA) systems at the Base Transceiver Station (BTSs), Base Station Controller (BSCs) and Mobile Switching Centre (MSCs) for their operation. These BTSs, BSCs and MSCs are always in operation and they consume a lot of power. Also, modern IT equipment generates high amount

of heat and therefore the necessary cooling to enhance effective operation ought to be provided. As the demand for mobile communication increases, the base stations of the mobile RAN are widely distributed throughout the network and there is an increase in the BTSs, BSCs and MSCs. This naturally leads to increase in power consumption in different parts of the mobile telecom industry.

2. 1. Energy consumption in mobile network

Typical base station power consumption is between 0.5kW to 2kW. This consumption depends on the numbers of core network element, thus as the core network element increases, the power consumption also rises. The base transceiver stations are always in operation for twenty hours a day, seven days a week, the power consumption also goes up accordingly (Koutitas, 2010). A study shows that a huge amount of electricity is consumed due to cooling infrastructure that supports the base transceiver stations therefore there is the need to develop the necessary power sources to meet this growth. Additionally, the rising oil price in the world market makes electricity cost keep going up and therefore increases the operation and maintenance cost of the system. Telecommunication network and broad band access have been proved to consume much energy for data delivery. Figure 1 below shows the various volume of energy consumption within ICT sector (Koutitas, 2010) (ITU, 2007). From figure 1, mobile networks, WLANs, LANs fixed line networks and servers take about 50 percent of the energy consumption in the telecommunication sector. A research has also show that the energy consumed within the telecommunication and broadband access networks accounts for 2 - 4% of global electricity consumption (A Gladisch, 2008) which is also estimated to be about 2- 3% of carbon dioxide emission (Telecommunication Regulation Authority of India, 2011).

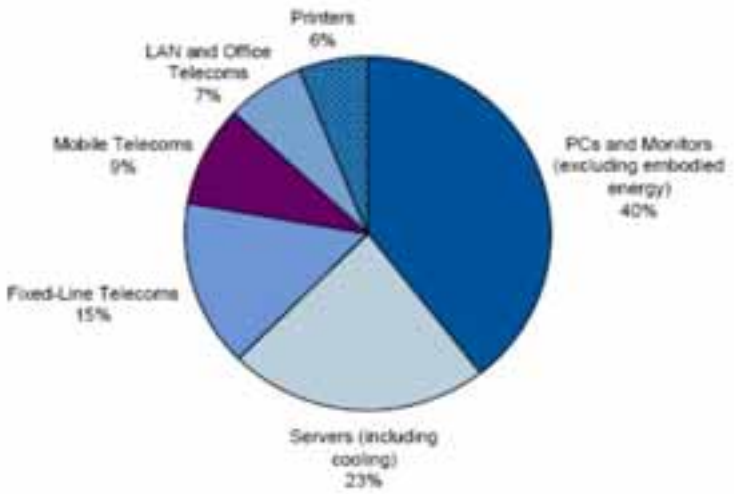

Fig.1 Energy consumption in ICT sector – Source: Gartner, Sept. 2007

3. Ways to reduce Energy Consumption in Mobile Network

There are several ways of reducing the energy consumption in a mobile network in order to decrease the network operational costs as well as minimize the carbon dioxide (CO_2) emission and other negative vices. This study examines only how the use of Renewable Energy and policy to could decrease the cost and CO_2 emission within the cell sites in a mobile network.

3.1 Renewable Energy Potential

Renewable Energy is derived from resources that are regenerative. Energy generated from renewable sources do not produce green house gases such as CO_2 and is considered to be potential for electricity generation for telecommunication and ICT industry because it has been accepted technically as a technology that is capable of producing reliable power and is competitive to other forms of energy generation. The use of renewable energy for electricity generation has seen great improvement over the years and is now considered globally

as energy source worth using. This shows that there is a need to embrace the development of renewable energy (solar and wind). (Janet Sawin, 2010)(U.S Energy Information Administration, 2010).

3.2 Energy Resource in Africa

Most African countries have difficulties with electricity generation because they depends very much on import of oil and gas for their operation and this import places big burden on their economies. The situation is likely to get worsened in the future as there is increase in fossil fuel prices. However the geographical location of African countries gives them several advantages for extensive use of most renewable energy resources which appear to be one of the most efficient and effective solutions for clean and sustainable energy development especially for developing "poor" Africa . They have fairly good sunshine durations, good wind speeds and other natural resources abundantly which are perceived to play important roles in the future energy generation for the telecommunication and ICT industry.

4. Mobile Communication Policy challenges in Africa

Although mobile communication has seen some improvement in Africa, low capacity of infrastructural installations has been hampering the telecommunication development. A good number of potential customers reside in semi-urban and rural areas, where telecommunication infrastructures are not available. The increased uses of ICT in these areas are extremely poor and bound to have negative financial implications for both the customers and the operators. The operators will require extra funds to be able to undertake any extensions and installations in these areas while the customers will be very sensitive to pricing due to their income levels. Therefore there are some policy challenges such as empowering the telecom operators to deploy renewable energy at cell sites are starring at the mobile communication in Africa.

4.1 Energy Policy Gap related to Mobile Communication

Most previous studies regarding energy policy and regulation in African countries were focused on energy supply and price regulation while others were only political statements. There is no specific uniform policy for mobile operators regarding the use of energy. There are no legalization, no flexible tax regulations and no incentives for companies to invest in renewable energy. However, some of the big weights in the mobile industry such as Vodafone are having pilot on-site renewable energy project by replacing diesel engine generators with either solar panels or wind turbines. Since sustainable energy can be the bedrock for the development of mobile telecommunication especially in Africa, there must be specific policy on renewable energy to support the general mobile communication policy framework because infrastructure for energy generation is very poor and unreliable (GSMA, 2011) in Africa.

4.2 Policy guideline

Energy policy for Telecom in Africa require an imaginative and innovation to re-orient the current focus of energy supply to the telecom industry. These could take a direct regulation from the regulatory authority or could be co-regulated by all actors or could be self regulation by the telecom operators. In view of this, all the actors will (Regulation Authority, Ministry of Energy, and Telecom Operators etc) jointly need to:

(i) Appreciate the essence and relevance of renewable energy in Telecom in Africa,
(ii) Structure policies to attract private investors
(iii) Establish an enabling environment that take into account the needs and innovative approaches that are viable through incentives
(iv) Institute capacity building based on institutional strategy that could mobilize support and broaden decision making processes, develop managerial, technical and financial capacities.
(v) Agitate for removal of subsides on convention power provider and the true cost including environmental cost
(vi) Foster the development of business models and take advantage of the unique features of African markets

(vii) Undertake research to support the development of low cost of entry models for providing mobile coverage.

(viii) Ensure that the commercial of objectives of renewable energy is taken into account when planning national infrastructure development including budget allocation

(ix) Promote a long term view of investment in the renewable energy sector through the use of tax incentives and shared risk and investment by operators and government

In order to formulate an acceptable policy, governments, planners and policy makers and other stakeholders need informed analysis based on adequate data that will show the significance and benefits of renewable energy must be assessed and the physical impact will have to be converted into economic cost. The policy guideline should create an enabling environment to attract investment into renewable energy technology to support the mobile telecommunication in enhancing speedy development within Africa. It should also encourage telecom operators to set targets for adopting renewable at all base transceiver stations while preserving the environment within which the mobile transceiver stations will be located as a way of sustaining the ecosystem. It should address barriers in the legal and regulatory framework that will ensure the independence of the regulatory authority through the inclusion of all actors on the regulatory board in order to create a "leveled playing field", development of indigenous resources and promotion of commercially proven renewable energy technology especially solar photovoltaic, and wind energy. Appropriate policy and financial incentives laws should be enacted to realize the benefits of renewable energy and encourage mobilization of capital investment through well targeted subsidies, tax holidays, fiscal and other forms of incentives.

5. Conclusion

Even though the electricity consumption in the telecommunication and ICT sector may generally be small as compared with other industries, the issue of policy and regulation is paramount as the growing trend of mobile communication and deployment of ICT gadgets represents significant addition to power consumption. Since the African countries are part the new emerging market for mobile telecommunication, we can conveniently say that mobile phones are now part of African culture and not necessarily just for the elite class. Therefore governments should aim at effective renewable energy policy and adhered strictly to regulations that will entice investors to establish businesses that will provide and sale renewable energy to the telecommunication operators and major ICT users especially in un-electrified regions. Inadequate access to modern energy services in the rural areas has been one of the factors that promote migration to cities; therefore policy makers should ensure that the benefit of renewable energy technology is equitably shared distributed in both the rural and urban areas. It should also identify the resource that is available in any particular location, considering the technical and financial feasibility. The policy should link other governmental institutions such as education and health to ensure a coherent policy that will be beneficial to majority of the people. The policy should equally identify if subsides, tax exceptions or tax holidays will be involved. In all these, the policies should take into account the Ecosystem to improve and reduce emission of any green house gases.

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