

NATIONAL COMMUNICATIONS AUTHORITY



PUBLIC CONSULTATION ON THE LICENSING OF FREQUENCY IN THE 800MHz BAND (i.e. DIGITAL DIVIDEND) FOR MOBILE SERVICES

May 2015

NATIONAL COMMUNICATIONS AUTHORITY

INVITATION FOR COMMENT

1. The NATIONAL COMMUNICATIONS AUTHORITY (NCA) intends to licence frequency in the 800MHz band to entities that shall establish, maintain and operate mobile services in the 800MHz band.
2. Accordingly, in pursuance of its mandate under section 27 of the Electronic Communications Act, 2008, Act 775 and section 4.1 of the National Telecommunications Policy 2005 (NTP'05), the Authority hereby invites views and comments from Licensed Service Providers, Consumers of Information and Communication Technology services and the General Public on the Selection and Award process for spectrum licenses in the 800MHz band which can be accessed on the Authority's website, www.nca.org.gh.
3. The public consultation begins with immediate effect and shall expire on 11th June, 2015.
4. All responses/comments should be electronically transmitted as e-mail attachments, in Microsoft Word format to secretariat.dbmc@nca.org.gh.
5. All respondents are requested to complete a response cover sheet (see Page iii).
6. It would be helpful if your response could include comments on the sections of the document you agree/disagree with.

Confidentiality

7. In furtherance of transparency and openness, the Authority shall consider all responses as non-confidential; accordingly all submissions shall be published on our website, www.nca.org.gh, on receipt.
8. Please note that copyright and all other intellectual property in responses shall be assumed to be licensed to NCA to use, to meet its legal requirements.

Next Step

9. Subsequent to the completion of the Public Consultation, the Authority shall proceed to publish the final Selection and Award Procedure Document, and thereafter invite applications.

Issued by the Director General
14th May, 2015

COVER SHEET FOR RESPONSE TO NCA PUBLIC CONSULTATION ON THE LICENSING OF FREQUENCY IN THE 800MHz BAND

BASIC DETAILS

Name of respondent:

Representing (self or organisation/s):

Address:

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response. It can be published in full on NCA's website, and I authorise NCA to make use of the information in this response to meet its legal requirements. If I have sent my response by email, NCA can disregard any standard e-mail text about not disclosing email contents and attachments.

Name :

Signed (if hard copy)

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
3G	Third Generation of mobile telecommunications technology
4G	Fourth Generation of mobile telecommunications technology
ACE	African Coast to Europe submarine communications cable
ADSL	Asynchronous Digital Subscriber Line
ASO	Analogue Switch-Off
BWA	Broadband Wireless Access
CD	Compact Disc
CDMA	Code division multiple access
CEPT	The European Conference of Postal and Telecommunications Administrations
CPE	Customer-premises equipment or customer-provided equipment
DBMC	Digital Broadcasting Migration Committee
DTT	digital terrestrial television
DVB	Digital Video Broadcasting
DVB-S	Digital Video Broadcasting – Satellite
DVB-T2	Second generation digital terrestrial television broadcasting system
DVB-T	DVB-Terrestrial
EDGE	Enhanced Data rates for GSM Evolution
EPG	electronic program guide
EU	European Union
EVDO	Evolution-Data Optimized
FDD	Frequency Division Duplex
FTA	free to air
GE06	Geneva 2006 Agreement for analogue and digital broadcasting in parts of ITU Region 1 & 3
GE84	Geneva 1984 Agreement on sound broadcasting in the band 87.5-108MHz
GE89	Geneva 1989 Agreement on VHF/UHF television broadcasting in the Africa Broadcasting Area
GHz	Gigahertz
GPRS	General packet radio service
GSM	Global System for Mobile Communications
HD	High Definition
HDTV	High Definition Television
HSPA	High Speed Packet Access
HTTP	Hypertext Transfer Protocol
IDTV	integrated Digital TV
IEEE	Institute for Electrical and Electronic Engineers
IMT	International Mobile Telecommunications
IP	Internet Protocol
ISP	Internet Service Provider
ITU	International Telecommunications Union
ITU-R	ITU Radiocommunications Sector
LTE	Long-Term Evolution
mbps	Megabits per second
MFN	multi-frequency network

Abbreviation	Meaning
MHz	Megahertz
MNO	Mobile Network Operator
MPEG	moving picture experts group
MVNO	Mobile Virtual Network Operators
NCA	National Communications Authority
NTP	National Telecommunications Policy
REV	Revision
RF	Radio Frequency
RRC	Regional Radiocommunication Conference
SAT-3	South Atlantic 3
SDTV	Standard Definition Television
SFN	single frequency network
SSA	Sub Saharan Africa
STB	set-top box
Tbps	Terabits per second
TDD	Time Division Duplex
TV	television
UHF	ultra-high frequency
USB	Universal Serial Bus
UTC	Coordinated Universal Time
VHF	very high frequency
WACS	West Africa Cable System
WiFi	a local area wireless computer networking technology that allows electronic devices to network
WIMAX	wireless industry coalition whose members organized to advance IEEE 802.16 standards for broadband wireless access
WRC	World Radiocommunications Conference

CHAPTER 1

INTRODUCTION

1.1 Overview of Frequency Management

The National Communications Authority is mandated by Section 2(1) of the Electronic Communications Act, 2008, Act 775 to “regulate the radio spectrum designated or allocated for use by broadcasting organisations and providers of broadcasting services in accordance with the standards and requirements of the International Telecommunications Union (ITU) and its Radio Regulations as agreed to or adopted by the Republic”. The ITU Radio Regulations define [1] [2]:

- the allocation of different frequency bands to different radio services;
- the mandatory technical parameters to be observed by radio stations, especially transmitters;
- procedures for the coordination (ensuring technical compatibility) and notification (formal recording and protection in the Master International Frequency Register) of frequency assignments made to radio stations by national governments;
- other procedures and operational provisions.

The ITU holds World Radiocommunications Conferences (WRCs) every three to four years to review, and, if necessary, revise the Radio Regulations.

For the allocation of frequencies the ITU has divided the world into three Regions as follows [1] [3]:

- **Region 1** comprises Europe, Africa, the Middle East west of the Persian Gulf including Iraq, the former Soviet Union and Mongolia.
- **Region 2** covers the Americas, Greenland and some of the eastern Pacific Islands.
- **Region 3** contains most of non-former-Soviet-Union Asia, east of and including Iran, and most of Oceania.

Ghana is therefore in ITU Region 1.

An ITU Region or a group of countries may hold a conference, called Regional Radiocommunication Conference (RRC) with a mandate to develop an agreement concerning a particular radiocommunication service or frequency band. Such conferences cannot modify the Radio Regulations, unless approved by a World Radiocommunications Conference (WRC),

and the Final Acts of the conference are only binding on those countries that are party to the agreement [4]. The Broadcasting Service has been the subject of several Regional Agreements.

The regional agreements that affect Ghana include the following:

- Geneva 1984 (GE84) - Plan for use of the band 87.5-108 MHz for FM sound broadcasting in Region 1 and part of Region 3.
- Geneva 1989 (GE89) - Plan for VHF/UHF television broadcasting in the African Broadcasting Area and neighbouring countries. This Agreement was revised in 1989 (Geneva, 1989 Rev. 2006).
- Geneva 2006 (GE06) - Plans for VHF/UHF analogue and digital broadcasting in parts of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz. This agreement provided a transition period from analogue to digital broadcasting, which begins at 0001 UTC 17 June 2006, and ends on 17 June 2015, but some countries including Ghana preferred an additional five-year extension for the VHF band (174-230 MHz).

The Republic of Ghana is a signatory to the GE06 Agreement and is required to change its analogue terrestrial TV stations in the Ultra High Frequency (UHF) band to digital by June 2015 to ensure that they are protected from interference internationally.

1.2 Digital Television and the Digital Dividend

“Digital broadcasting is the application of digital techniques and encoding of audio and video signals to transmit digital data rather than analogue waveforms on networks to end users / consumers. This results in clearer pictures, better sound, enhanced interactivity and higher spectrum efficiency” [5].

Digital TV can be offered on various platforms including satellite, cable, terrestrial and handhelds (or mobile TV). Satellite TV requires the transmission of TV service through satellites in space and signal is received on earth with parabolic (dish) antenna. Cable TV requires the transmission of the TV service over cable (fibre, coaxial or telephone cable) to the viewer. Terrestrial TV involves wireless transmissions on land, received using a common TV antenna / aerial.

Currently, satellite and cable TV broadcasting in Ghana are already digitized. The terrestrial platform is the only platform that is yet to be fully digitized even though it remains the dominant platform for TV reception in Ghana. It is therefore the focus of the transition from analogue to digital TV in Ghana.

Digital Terrestrial Television (DTT) has a number of benefits notable among which are:

- ❖ Higher Spectrum Efficiency as shown in Figure 1.
 - a single frequency channel can be used to transmit multiple programme channels
 - Adjacent channels can be used on the same site which is challenging to achieve in analogue broadcasting
- ❖ Better Picture quality as shown in Figure 2 (no ghosting, blurred images, etc)
- ❖ Clearer Sound (CD quality audio)
- ❖ More Stations and therefore more choices
- ❖ More Interactivity (including electronic programme guides (EPG), games, etc)

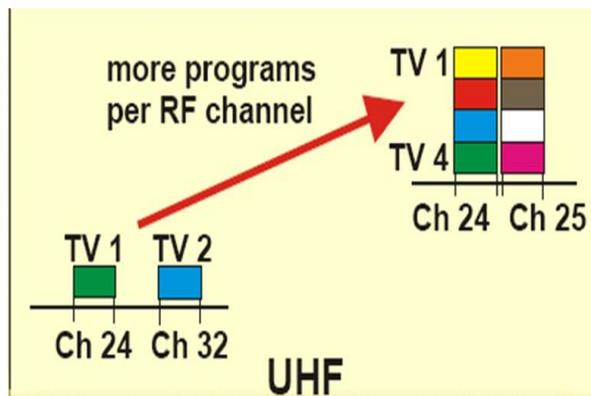


Figure 1: Spectrum Efficiency of Digital Broadcasting

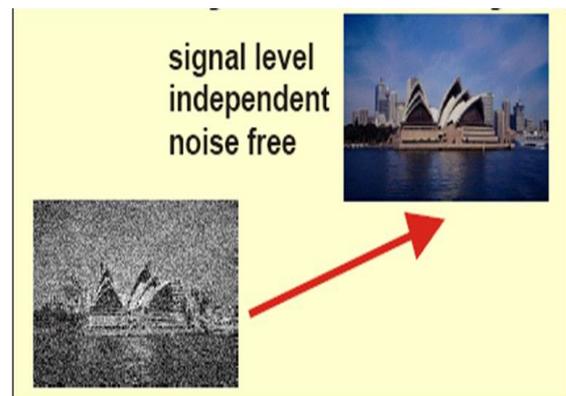


Figure 2: Enhanced picture quality of Digital Broadcasting

The spectrum efficiency of Digital Terrestrial Television (DTT) has been the key driver for the push to migrate analogue TV to digital. The ability to combine not less than twenty (20) standard definition television channels on one frequency in the digital domain reduces the total amount of frequency required for terrestrial television services. Consequently, a part of the radio frequency spectrum allocated for television services can be released for other services in what is often called the digital dividend, i.e. “the radio frequencies that are freed up as a result of more efficient spectrum use through the switchover from analogue to digital terrestrial TV”.

The digital dividend was formally adopted by the ITU at the World Radiocommunications Conference of 2007 (WRC-07) which passed Resolution 749 (REV.WRC-12) regarding the use of the band 790-862 MHz in countries of Region 1 by mobile applications and by other services. This band is referred to as the ‘first digital dividend’ from the DTT transition. Article **5.316B** of the Radio Regulations set 17 June 2015 as the effective date for the primary allocation to the mobile service in the frequency band 790-862. This means that this band can be used for mobile services from 17 June 2015.

In 2012, the World Radiocommunications Conference (WRC-12) passed Resolution 232 (WRC-12) regarding the use of the frequency band 694-790 MHz by the mobile service in Region 1 and related studies. The band 694-790MHz is thus referred to as the ‘second digital dividend’ from the DTT transition. The World Radiocommunications Conference of 2015 (WRC-15) is expected to decide on the lower edge of this assignment and to adopt recommendations on harmonisation of the frequency arrangements for this band. WRC-15 would be held from 2nd to 27th November, 2015 in Geneva, Switzerland.

The transition from analogue to digital broadcasting is the process that would free up the digital dividend for use by the mobile service.

1.3 The Transition from Analogue to Digital Television in Ghana

The transition from analogue to digital broadcasting generally involves three main steps:

- **Digital Switch-on:** The rollout of digital terrestrial television (DTT) services. The Government has committed to roll out a DTT network to carry all authorized analogue terrestrial television services in the digital domain. The Government’s network is currently available in Accra and Kumasi. It engaged an entity in 2012 to rollout a nationwide DTT network to cover more than 95% of the population. However, the entity failed to raise the necessary funding to execute the project. Hence, the Government cancelled the contract in the first quarter of 2015 and commenced a procurement process to contract another entity to supply the DTT network nationwide. It is expected that the network rollout would be completed by February 2016. Private Digital Terrestrial Pay TV services have been rolled out in all the major cities in Ghana. However, these services are encrypted and require subscription to be viewed.

- **Double illumination / Simulcast:** The period when television services are available in both analogue and digital terrestrial formats. This is required to allow consumers of terrestrial television services to acquire the right receiving apparatus for digital TV i.e. set-top boxes to convert existing analogue TV sets or integrated digital TV sets.
- Analogue Switch-Off (ASO):** The switching off of analogue transmitters to complete the transition. After ASO, terrestrial television services shall be available only in digital form. In Ghana, ASO would be done in phases/regions. The dates for each phase shall be announced by the Minister of Communications.

1.4 An overview of the Mobile Communications Sector in Ghana

1.4.1 Telecom Voice

Ghana's Telecom sector has gone through many phases of growth and diversification over the last decade. It is presently characterized by vibrant competition and innovative products and services.

The telephony licenses are classified into two (2): fixed and mobile. The fixed telephony market is composed of two (2) operators: Ghana Telecommunications Company Limited (Vodafone Ghana) and Airtel Ghana. Subscription to fixed voice services have been declining in recent years with a subscriber base of 267,430 representing a penetration of less than 1.00% at the end of January 2015 [6].

The mobile telephony market on the other hand is composed of six (6) licensees which are all operational. Subscriptions to mobile voice has been growing significantly from 4,969,000 subscriber lines in 2006 to **31,135,666** subscriber lines at the end of March 2015 [6]. This represents a penetration of 116%. The players in the mobile voice market and their respective market shares are shown in Table 1 and Figure 3.

Table 1: Market Distribution of Mobile Voice Service Providers as at end March 2015 [6]

No.	Mobile Operator	Technology	No. of Subscriber lines	Market Share
1.	Expresso	CDMA	107,448	0.35%
2.	Millicom (Tigo)	GSM	4,315,719	13.86%
3.	Scancom (MTN)	GSM	14,207,778	45.63%
4.	Vodafone Mobile	GSM	7,159,566	22.99%
5.	Airtel	GSM	3,863,252	12.41%
6.	Glo Mobile	GSM	1,481,903	4.76%
Total			31,135,666	100%

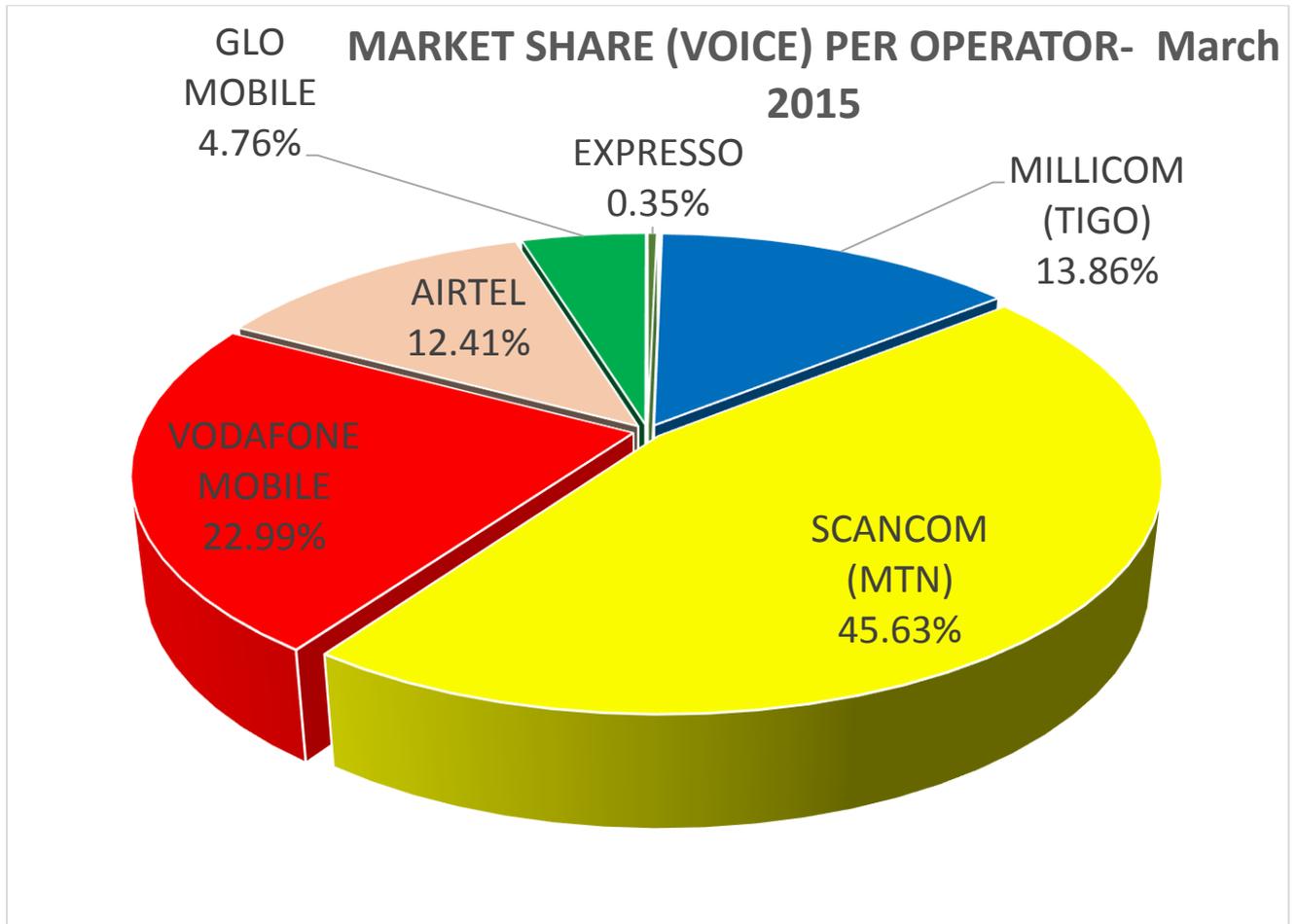


Figure 1: Market Distribution of Mobile Voice Service Providers as at end March 2015 [6]

1.4.2 Internet Data

Ghana was among the first countries in Africa connected to the Internet and to introduce broadband services using Asynchronous Digital Subscriber Line (ADSL). The internet and data communications sector is fully liberalised with about fifty two (52) authorised Public Data/Internet Service Providers (ISPs) licensed, four (4) Broadband Wireless Access (BWA) licensees and the six (6) mobile operators.

The ISPs mainly serve corporate entities providing data communication services to support their business activities. Service to homes and individuals by ISPs is very limited. Most Ghanaians use the Internet service from ISPs at work or through public internet cafes. Internet penetration accounted for by ISPs is less than 1%.

The Broadband Wireless Access (BWA) licensees were authorised to provide broadband wireless services in the 2500 – 2690 MHz band about two (2) years ago. Three (3) of the licensees are offering commercial services with the fourth at the installation stage.

The six (6) mobile telecom companies leveraging on their growing voice subscriptions have significantly grown mobile data subscriptions to 15,928,879 representing 59.13% penetration.

The market share distribution of

Table 2: Market Distribution of Internet Data Service Providers as at end March 2015 [6]

No.	Mobile Operator	Technology	No. of Subscriber lines	Market Share
1.	Expresso	CDMA 2000 EVDO	32,671	0.21%
2.	Millicom (Tigo)	GPRS/EDGE/3G/ HSPA	2,251,011	14.16%
3.	Scancom (MTN)	GPRS/EDGE/3G/ HSPA	7,778,925	48.92%
4.	Vodafone Mobile	GPRS/EDGE/3G/ HSPA	2,947,136	18.53%
5.	Airtel	GPRS/EDGE/3G/ HSPA	2,259,268	14.21%
6.	Glo Mobile	GPRS/EDGE/3G/ HSPA	629,968	3.96%
7.	Surflin*	LTE	27,530	0.17%
8.	GoldKey Telecom	LTE	=	-
9.	Broadband Home	WiMAX	=	-
10	BLU	LTE	2,370	0.01%
11	Others	-	-	-
Total			15,901,349	100.00%

*Surflin data is for end of January 2015.

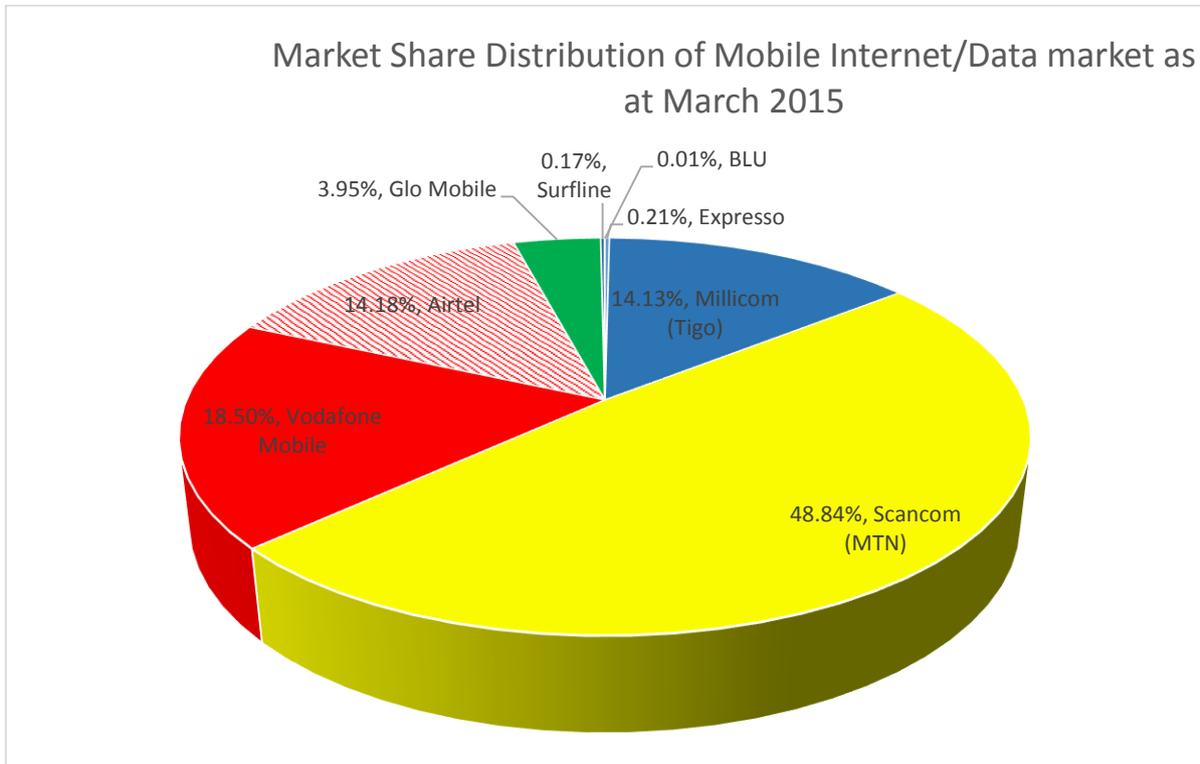


Figure 2: Market Distribution of Internet Data Service Providers as at end March 2015 [6]

1.5 Challenges with the Internet Data sub-sector

Currently, in Ghana, there is abundant supply of Internet bandwidth capacity from undersea fibre optic cables. However, the usage of this bandwidth capacity is very low. There is fifteen Terabits per second fibre optic bandwidth capacity landing in Ghana, however, the usage is under 5% of the available capacity.

The significant variance between the excess supply and demand can be attributed to many factors including:

1. Limited coverage/capacity of high speed internet services (broadband) at the last mile to the consumer
2. High costs of bandwidth to the consumer
3. Relatively high costs of consumer terminals

1.5.1 The Last mile coverage/capacity challenge

At the onset of the millennium, limited international bandwidth capacity was a key constraint in the access to Internet services. Limited capacity over satellite was the primary means of connecting to the Internet by most ISPs. The situation improved with the completion of the SAT-3 undersea fibre optic cable which linked the West Coast of Africa to Europe from Portugal to South Africa with landing stations in a number of countries including Ghana. However, the cost of international capacity was high until competition set in with the introduction of the Main One Cable, Glo-1, WACS and ACE all of which land in Ghana. Currently there is a total of fifteen Terabits per second (15Tbps) of capacity landing into Ghana with SAT3 offering a total capacity of 0.34Tbps; Glo-1 cable 2.5Tbps; Main One Cable – 1.92Tbps; WACS – 5.12Tbps and ACE -5.12 Tbps. The competition has also led to a reduction in prices, thereby removing the bottlenecks on international bandwidth capacity.

At the national level, a fibre optic network connecting major cities is in place. It was initially funded by Government and subsequently divested to private enterprise. The mobile telephony companies have also invested in intra city fibre links and parallel inter-city fibre networks. Fibre has also been extended to the northern border to link Burkina Faso, a landlocked neighbouring country to the undersea fibre optic cables. These deployments provide relatively

good capacity to support broadband services, albeit the industry continues to battle indiscriminate cable cuts.

Last mile connectivity appears to be the remaining bottleneck in expanding access to broadband services. GSM services supporting GPRS/EDGE covered 54% percent of the country's surface in 2009. This has grown marginally to about 56% at the end of 2013 [7]. The percentage of the total population covered by GPRS/EDGE was estimated at 79% in 2009 and this has also grown marginally to a little over 82% at the end of 2013 [7]. It must be noted that Electricity coverage also presents a challenge to broadband connectivity. Currently, the percentage of the population with access to electricity stands at about 80 per cent. As much as GPRS/EDGE provides Internet data connectivity, the speeds that they offer cannot be considered as broadband based on the consumer experience. Broadband is generally considered high-speed Internet access which allows users to access the Internet and Internet-related services at significantly higher download speeds (say 256kbps and higher) than those available through "dial-up" Internet access services. However, the third generation (3G) mobile services offer an appreciable customer experience. However, coverage of 3G services is limited only to portions of major cities in Ghana. 3G services covered barely 10% percent of the country's surface in 2009 and this grew to about 24% at the end of 2013 [7]. The percentage of the total population covered by 3G was estimated at 14% in 2009 and this has also grown to a little over 34% at the end of 2013 [7]. The relatively slow growth in 3G services presents a challenge in the march towards expanding access to high speed internet services.

1.5.2 The Bandwidth Cost Barrier

Bandwidth costs in Ghana have been declining since 2009 but it is yet to reach a level that can trigger a rapid surge in service uptake and growth in traffic. In 2007, consumers paid an average of \$5,825.00 per month for 2 megabits per second (mbps) bandwidth. This grew to an average of \$6,166.40 per month in 2008 but began to decline from 2009. By 2013, the consumer retail price for a 2mbps subscription per month had reduced to an average of \$1,174.00 (See Table 3). This may imply that the reduction in wholesale prices occasioned by the growth in fibre landing in Ghana may not have been transferred to the retail side.

Table 3: Average wholesale purchase price of Bandwidth and Average retail sale price of Bandwidth [8]

Year	Average Bandwidth purchase price (2-mbps) from IP transit to MNO	Average Bandwidth price, retail (2-mbps) from MNOs and ISPs to Consumers	% of the Average Margin
	US\$	US\$	
2007	4,975.67	5,825.00	17%
2008	4,653.29	6,166.40	33%
2009	4,538.64	5,158.33	14%
2010	2,479.04	4,450.00	80%
2011	1,334.05	2,258.56	69%
2012	531.17	1,920.09	261%
2013	495.50	1,174.00	137%

Mobile internet subscription in Ghana is charged per Megabyte of consumption and this does not encourage the use of bandwidth intensive multimedia applications. In jurisdictions where there is unlimited bandwidth for fixed monthly charges, consumption tends to be higher. However, the trends show a continuous decline in pricing and it is expected that this will continue in Ghana.

1.5.3 The Challenge of Costs of Consumer Terminals

Another challenge to the increase in service uptake is the cost of consumer terminals. Most laptops have integrated WiFi systems but majority of them do not have mobile wireless modems built into them. In Ghana, public WiFi hotspots are not common. Corporate WiFi installations are however pervasive in the formal sector. Most Small Office and domestic users have to either deploy USB modems or tether their smart phone connections to their laptops using Bluetooth or portable WiFi hotspot.

According to a 2013 study by Analysys Mason, “most mobile handsets in Sub-Saharan Africa (SSA) are basic phones, because although prices for feature phones and smartphones have declined in recent years, they remain too high for most people”. They project that Ghana’s handset revenue growth rate will be relatively low because the market was at or near saturation at the end of 2012 [9]. Analysys Mason projects the number of smart phones in Ghana to be under 5million by 2017 representing less than 8% of total handsets in the market [9].

The NCA's tracking of prices for smart phones and USB dongle CPEs is shown in Table 4. The prices of USB dongles have been declining from an average of US\$35 in 2010 to an average of US\$22.73 in 2013. The average prices of least priced smart phones sold by Mobile operators have also been declining from US\$262.40 in 2010 to US\$89.05 in 2013 [8]. Thus, the trends are positive in both affordability and accessibility.

Table 4: Average wholesale purchase price of Bandwidth and Average retail sale price of Bandwidth [8]

Year	Average Cost of CPE (Lowest priced USB dongles) in US\$	Average Cost of CPE (Lowest priced Smartphones sold by operators) in US\$
2010	35.00	262.40
2011	30.97	240.08
2012	26.67	79.06
2013	22.73	89.05

CHAPTER 2

THE LICENSES IN THE 800MHz BAND

2.1 Objectives of Licensing Spectrum in the 800MHz Band

The key objectives in licensing mobile broadband services in the 800MHz Band include:

- 2.1.1 To make valuable spectrum available for the provision of mobile data services to improve access and service quality whilst facilitating the diffusion of information and communication technologies in enhancing the socio-economic development of the country.
- 2.1.2 To generate revenue for the State to cover some of the costs of the transition from analogue to digital broadcasting including the cost of rolling out a nationwide DTT network to carry programme channels of the state broadcaster and other private Free-to-Air (FTA) terrestrial TV stations.
- 2.1.3 To provide a means of growth for existing internet data service providers and to facilitate the attainment of universal access to internet data services.
- 2.1.4 To provide opportunities for participation by indigenous Ghanaians in the telecom industry.

2.2 Frequency Arrangements or Band Plan

ITU Recommendation ITU-R M.1036-4 “provides guidance on the selection of transmitting and receiving frequency arrangements for the terrestrial component of International Mobile Telecommunications (IMT) systems as well as the arrangements themselves, with a view to assisting administrations on spectrum-related technical issues relevant to the implementation and use of the terrestrial component of IMT in the bands identified in the Radio Regulations”.

The frequency arrangements that affect the digital dividend are contained in Table 5.

Table 5: Paired frequency arrangements in the band 698-960 MHz [10]

Frequency arrangements	Paired arrangements				Un-paired arrangements (e.g. for TDD) (MHz)
	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	
A1	824-849	20	869-894	45	None
A2	880-915	10	925-960	45	None
A3	832-862	11	791-821	41	None

Frequency arrangements	Paired arrangements				Un-paired arrangements (e.g. for TDD) (MHz)
	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	
A4	698-716 776-793	12 13	728-746 746-763	30 30	716-728
A5	703-748	10	758-803	55	None
A6	None	None	None		698-806

Frequency Arrangement A1 applies to CDMA850 applications. In Ghana, Kasapa Telecom Limited is assigned 825-835 MHz paired with 870-880MHz. The lower half of this assignment (10MHz) is within the digital dividend. Kasapa's assignment is valid until 2019.

Frequency Arrangement A2 applies to GSM900 applications. In Ghana, this band is currently assigned to Millicom Ghana Limited (Tigo), Scancom Ghana Limited (MTN), Ghana Telecommunications Company Limited (Vodafone), Airtel Ghana Limited and Glo Mobile Ghana Limited. These assignments are outside the digital dividend.

Frequency Arrangement A3 applies to the first digital dividend in the 800MHz band and has thus far been used for 4G applications. It is the harmonized frequency arrangement adopted by the European Union per European Commission Decision (2010/267/EU) of 6 May 2010 based on CEPT reports 29, 30, 31 and 32. This frequency arrangement is what has been adopted for use in Ghana on the basis of harmonisation and economies of scale.

Frequency Arrangements A4 to A6 apply to the second digital dividend in the 700MHz band. There is currently no agreement on which of the plans would be harmonized for either global or regional use. **Ghana shall wait for the decisions of WRC-15 before adopting a harmonised frequency arrangement for the second digital dividend in the 700MHz band to avoid isolation and to provide for economies of scale. Therefore, this band shall not be part of the current licensing process.**

Based on the foregoing, the frequency that shall be licensed in this process shall be the the first digital dividend i.e. 790-862MHz.

2.3 Channelling Arrangement for the 800 MHz band

Ghana has adopted the preferred harmonized channelling arrangement adopted by the EU in CEPT Report 30 which is 2x30MHz with a duplex gap of 11MHz, based on a block size in multiples of 5MHz and with reverse duplex direction. The FDD downlink starts at 791MHz and FDD uplink starts at 832MHz.

790-791	791-796	796-801	801-806	806-811	811-816	816-821	821 – 832	832-837	837-842	842-847	847-852	852-857	857-862
Guard band	Downlink						Duplex gap	Uplink					
1MHz	30 MHz (6 blocks of 5 MHz)						11 MHz	30 MHz (6 blocks of 5 MHz)					

Figure 3: Recommended Channelling arrangement for the 800MHz band in the EU

The frequency arrangement is affected by existing assignments to Kasapa (825-835MHz) and Top TV (790-798MHz). Top TV currently operates its analogue television service only in Accra. Therefore, upon analogue switch-off (ASO) in Accra, this assignment would be freed up. However, Kasapa's assignment is valid until 2019. Consequently, a total amount of **2x25MHz** shall be made available for sale. with 2x20MHz immediately available and additional 2x5MHz available at ASO in Accra.

2.4 The Spectrum Licenses

The Authority is considering two (2) configurations in packaging the spectrum for Auction as follows:

1. Two (2) lots of 2x10MHz and one (1) lot of 2x5MHz OR
2. One (1) lot of 2x15MHz and one (1) lot of 2x10MHz.

Stakeholder comments on a preferred packaging shall be considered by the Authority.

2.5 Valuation of the Spectrum Licenses

Generally, there are three main methods for determining regulatory and spectrum fees in the telecommunications sector. These are:

- a) Cost Recovery: This ensures that the regulatory agency's costs for managing the spectrum are offset, which in turn guarantees that those who benefit from the use of spectrum should pay for its administration, rather than the State.

- b) **Market based pricing:** This method is used when the spectrum is effectively offered to the market and the price is set depending on supply and demand
- c) **Administered Incentive Pricing:** This combines features of the cost recovery and market-based principles.

The Government and the National Communications Authority have incurred significant costs in carrying out the transition from analogue to digital terrestrial television in a bid to clear the 700 MHz and 800MHz band for mobile services. Government is directly committing to spend over US\$100million to roll out the DTT network, the NCA is spending a substantial amount on public education and project management for the transition from analogue to digital television. Cost recovery is therefore a consideration in the valuation of the 800MHz band. The Authority anticipates that the demand for the 800MHz band may exceed what is currently available.

The existing BWA licensees in the 2.6GHz band enquired about this band soon after obtaining their licenses. The propagation characteristics of the 2.6GHz band is appropriate for urban deployments (i.e. deployments in highly populated areas). Theoretically, the higher the frequency, the shorter the wavelength (i.e. the distance the signal can travel in a cycle). Hence, lower frequencies offer wider coverages compared to higher frequencies. The higher frequencies tend to offer more capacity and thus are suitable for city deployments where there is high population density. On the other hand, high frequencies are uneconomical to use in suburban and rural deployments. Therefore, it is anticipated that most 2.6GHz band operators would express interest in acquiring spectrum in the 700/800MHz band to enable them expand their deployments beyond the major cities in a sustainable way.

Another group which have enquired about the digital dividend are the existing six (6) mobile telecom companies. All the telecom operators have deployed third generation (3G) data services and are likely to continue the evolution to fourth generation (4G) technology. The GSM companies deployed their 3G services in the 2100MHz (2.1GHz) band which is a relatively high frequency band compared to the 900MHz and 1800MHz bands. The existing frequency allocations to the mobile companies are already heavily used. Most of them would therefore require new spectrum for their 4G deployments and the propagation characteristics of the 700/800MHz band would make it all the more attractive.

There may also be completely new entrants who may want to enter the telecom space through the availability of new spectrum. Therefore, beyond recovering costs, it is necessary to employ market mechanisms to ensure that those who value the spectrum the most are the ones who get it.

Zimbabwe licensed their 700MHz digital dividend for US\$200million to a single operator in quarter one of 2015 [11]. South Africa estimates the 700MHz digital dividend to be worth R3.5billion (approximately US\$290million) [12]. In Europe most of the auctions were multi band covering 800/1800/2600MHz and in some cases 900MHz. For some of the countries, the value of the 800MHz spectrum was distinct whereas in others the value was part of the total auction value. For example, Germany auctioned the 800MHz along with 1800MHz and 2600MHz bands. “The multiband auction raised a total of €4.384 billion in auction revenue. Revenue from licensing the 800MHz band was €3.576 billion, over 80% of the multiband auction’s total revenue” [7].

In Ghana, the most recent pricing of spectrum under 1GHz was the sixth mobile licence eventually awarded to Glo Mobile Ghana Ltd at US\$50.1million in 2008. The award comprised 2x5MHz of 900MHz and 2x15MHz of 1800MHz making a total of 2x20MHz. Assuming that 80% of the value represented that of the 900MHz band, a block of 2x5MHz could be valued at US\$40,080,000.00. Considering that the 800MHz band is lower than the 900MHz and also that the GDP per capita of the country has grown by 50% from 2008 to 2013, we could apply a markup to the base price for a 2x5MHz block to reflect the changes in the market environment as well as the relative value from the propagation characteristics of the 800MHz band. In determining the mark up, we also need to consider other mitigating factors such as the impact of the current energy crisis on network operations, coverage obligations and anticipated support for Mobile Virtual Network Operators (MVNOs). We may therefore apply a markup of 15% to the minimum reserve price of 2x5MHz block which brings the value to US\$46.1million.

The anticipated minimum reserve price of the 800MHz blocks of frequency to be offered in this process are set out in Table 6.

Table 6: Revenue projection scenarios based on success or otherwise of negotiating with Kasapa to cede a part of their present allocation

No.	Scenario 1 (2 lots) –		Scenario 1 (3 lots) –	
	Spectrum Blocks	Minimum Reserve Price (US\$)	Spectrum Blocks	Minimum Reserve Price (US\$)
1.	2x10MHz	92.2 million	2x10MHz	92.2 million
2.	2x15MHz	140 million	2x10MHz	92.2 million
3.	-	-	2x5MHz	46.1 million
	Total	232.2 million	Total	230.5 million

CHAPTER 3

SELECTION AND AWARD PROCESS

3.1 Eligibility Criteria

1. All applicants shall possess a valid licence to provide broadband, mobile data or other telecommunications services in Ghana.
2. Where an entity is a joint venture, partnership, or consortium; all participating persons/firms shall possess a valid licence to provide broadband/other telecommunications services in Ghana.
3. Entities with foreign ownership shall have a minimum of 40% private indigenous Ghanaian ownership in the applying Entity; be it a company, a joint venture or consortium. The said minimum Ghanaian ownership shall be maintained throughout the duration of the Licence.
4. Notwithstanding the above, entities that are wholly owned privately by Ghanaians but without a licence to operate telecommunication services in Ghana shall be eligible to apply.
5. The applying Entity must be registered under the laws of Ghana, and duly certified to operate in Ghana.
6. An Entity shall be eligible for only one digital dividend spectrum block; that is, no Entity alone or along with its partner, affiliate, subsidiary or shareholder in total, can apply for more than one license.

3.2 Award Process

The National Communications Authority (NCA) is required by Section 58(3) & (8) of the Electronic Communications Act, 2008, Act 775, to “allocate the uses of the spectrum of the electronic communications sector in a manner that promotes the economic and orderly utilisation of frequencies by electronic communications networks and services”... by “granting the authorisation for the use of the frequency band (a) through auction, (b) through tender, (c) at a fixed price, or (d) based on stated criteria”.

Regulation 95 of the Electronic Communications Regulations, 2011, LI1991 requires the Authority to grant Class I Licences by public tender where:

- (a) the unassigned frequencies or frequency bands available in a given locality or service area for the provision of the public communications service required are limited,

- (b) required to grant a Class I Licence by public tender as a result of a frequency allocation made under these Regulations, or
- (c) the number of Class I licences that may be granted for the public communications service is restricted under any enactment or under the direction of the Authority.

The current frequency band under consideration (i.e. 790 – 862 MHz) satisfies the condition of limited frequency availability and the Authority intends to conduct this process through an auction.

The Auction shall be in two (2) stages as follows:

- (a) **Pre-qualification stage** – an evaluation panel assesses the eligibility of tendering entity, the technical and business plans of the tenderer. The evaluation of the technical and business plans shall be scored.
- (b) **Auction** – to determine the winners of the available frequency blocks and the final price of the spectrum. Only applicants who pass stage one of the process shall be invited to submit their financial bids in the Auction..

3.3 Auction Rules

- 3.3.1 The auction will be an open ascending price auction.
- 3.3.2 Only applicants who are deemed eligible per Section 3.1 shall qualify to participate in the Auction
- 3.3.3 Applicants shall state the spectrum lot for which they are bidding.
- 3.3.4 The time, place and duration for the Auction shall be communicated to eligible bidders at least one week to the auction.
- 3.3.5 The bidder with the highest bid for each lot when the auction is closing wins the auction for that lot. If only one bidder is eligible for a lot, that bidder will be awarded the licence at the minimum reserve price without any auction. If there is no eligible bidder for a lot, the frequency licence will remain available.

3.4 Timetable

The Authority intends to conduct the spectrum licensing process according to the timetable shown in Table 7.

Table 7: Proposed Timetable for Spectrum Licensing of the 800MHz band

No.	Activity	Duration
1.	Public Consultation	20 business days
2.	Review of Public Consultation feedback	10 business days
3.	Approvals by the Board and MoC	5 business days
4.	Request for Applications & Submission of applications	30 business days
5.	Evaluation of submissions	20 business days
6.	Notification of Eligible bidders & publication of final auction rules	1 business day
7.	Auction	1 business day (at least one week after notification to bidders)
8.	Announcement of Winners	1 business day
9.	Payment of Licence Fees	60 calendar days

CHAPTER 4

CONTENTS OF APPLICATIONS/BIDS

4.1 Contents of the Proposal

The Proposal shall contain the following:

- 4.1.1 **Receipt.** Evidence of payment of the non-refundable Application Fee which shall be the cedi equivalent of Two Hundred Thousand (GHS200,000.00) Ghana Cedis.
- 4.1.2 **Letter of Presentation.** A letter of presentation, substantially in the form of Annex 1, signed by a duly authorized (in accordance with Section 4.1.5) representative of the Applicant, which sets forth the Applicant's intention to participate in the Pre-Qualification Process and its acceptance of all the terms and conditions of this Selection Procedure.
- 4.1.3 **Certificates.** Certificates issued by the relevant governmental authorities, and other competent authorities of the jurisdiction where the Applicant is incorporated, evidencing that the Applicant is a corporation duly organized, validly existing and in good standing in such jurisdiction. All certificates must be in English. Certificates translated into English must be certified and notarized.
- 4.1.4 The above notwithstanding, all applicants shall submit certified true copies of their Certificate of Incorporation, Certificate to Commence Business and Company Regulations obtained from the Registrar General of the Republic of Ghana.
- 4.1.5 **Power of Attorney.** Each Applicant shall designate a representative for purposes of Sections 4.1.2 and 4.1.6 pursuant to a Power of Attorney issued in accordance with the laws of its jurisdiction of incorporation.
- 4.1.6 **Sworn Declaration.** A Sworn Declaration of the Applicant signed by its duly authorized representative, (in accordance with Section 4.1.5 hereof), with the following information:
- (i) Identification of all the shareholders of the Applicants that control more than 5% of its capital and of the entities that directly or indirectly are the beneficial shareholders thereof. The beneficial shareholders of the Applicant shall mean those who directly or indirectly own the majority of the shares or the voting rights or who otherwise control such Applicant;
 - (ii) Identification of a minimum of 40% Ghanaian ownership in the applying entity.
 - (iii) Identification of all the stock exchanges where the shares of the Applicant are traded;

- (iv) Statement that all the information and documentation submitted in connection with the Application are true, accurate and complete;
- (v) Statement that the Applicant has not been the subject of any bankruptcy proceedings, reorganizations, or similar proceedings in the last 5 years;
- (vi) Statement that, since the date of the Applicant's last audited reports and financial statements submitted pursuant to Section 4.1.7, there has not been any material adverse changes thereto.

4.1.7 Audited Reports and Financial Statements

- (i) The audited reports and financial statements corresponding to the last three fiscal years of the Applicant and (if applicable) the consolidated group to which the Applicant belongs.
- (ii) Projected financial statements (Income Statement, Balance Sheet, Cash flow) for the first five (5) years.

4.1.8 Additional Qualification Criteria:

- a. Information regarding the technical qualifications of the Applicant, which demonstrate its ability to undertake a significant expansion programme and to improve the quality and enhance the efficiency of communication services in Ghana. Applicants should refer to networks and businesses where such experiences have been gained, and should indicate the number of subscribers in services operated by such networks and businesses.
- b. Information regarding the operational credentials of the Applicant, indicating the services that it is currently operating and demonstrating its ability to manage the business in an increasingly competitive telecommunications market.
- c. Detailed résumé of the proposed management of the Entity.

4.2 Submission of Proposals

4.2.1 Location and Deadline for Submissions.

Proposals may be submitted during business days to the Director General, National Communications Authority (NCA), 1st Rangoon Close, Cantonments, Accra and be marked "Application for Licence in the 800MHz band", between the hours of 9.00 am to 5.00 pm. The deadline for submission shall be 5.00pm on

- i. Originals and Copies.
- b. All documents submitted by the Applicant shall be either originals or certified copies. The copies may be certified by the authorized officer of the Applicant unless otherwise specified herein or by the Authority.
- c. The documentation of the Proposal shall be submitted in eight (8) original hard copies and ten (10) electronic copies, clearly marking each as such. In the event of any discrepancies, the original shall prevail.
- d. Every page of the Proposal shall be numbered (as a fraction of total number of pages e.g. 1 of 30, etc.)
- e. Proposals shall include a table of contents and a page setting forth the Applicant's name and legal domicile as well as the postal and e-mail address, telephone and facsimile numbers of a person designated to receive notices in accordance with Section 3.6.5.
- f. Proposals shall be submitted in a sealed envelope/box.

4.3 Updating

Each Applicant shall maintain current, the facts and information supplied in the Proposal, and shall promptly communicate to the Evaluation Committee, through NCA Director General, all material changes that arise with regards thereto.

4.4 Modification

This Selection Procedure does not constitute an offer to contract on the part of the NCA and the NCA has the right to modify or amend any provision or condition hereof; provided however, that any such modification or amendment shall be valid only if it is in writing.

4.5 Disclaimer

The NCA shall not incur any liability whatsoever in exercising its rights in 4.4 above or any other rights granted in this Process.

4.6 Additional Information

The NCA reserves the right to request, at any time, additional information or documentation from Applicants.

ANNEX 1 – SAMPLE LETTER OF PRESENTATION

Date:

The Director General
National Communications Authority
1st Rangoon Close
P. O. Box C1568
Cantonments
Accra

Dear Sir,

Re: Selection Procedure for Licence in the 800MHz Band

Enclosed herewith are the documents required by the Selection Procedure for Pre-qualification with respect to the above-captioned Process.

We hereby declare our full knowledge and acceptance of and submission to, all the terms and conditions set forth in the above-mentioned Selection Procedure and the applicable Laws of the Republic of Ghana.

Yours faithfully,

(SIGNATURE OF REPRESENTATIVE)

(NAME OF REPRESENTATIVE)

ANNEX 2 – GUIDELINES FOR TECHNICAL & BUSINESS SUBMISSION

A. Legal Documentation

1. Applicant must register a company with an object to provide broadcasting service and provide the following as evidence of registration and incorporation:
 - a. Certificate of Incorporation (in Ghana).
 - b. Certificate to Commence Business (in Ghana).
 - c. Company's Regulations inclusive of the shareholding structure (NB: The Company should have a minimum of 40% indigenous Ghanaian ownership as required by Section 3.1 of this document).
 - d. Relevant Experience/Evidence of Ability to perform including agreements drawn up with any principals.
 - e. Evidence of Tax payment/Tax Clearance Certificate (Not applicable to start-ups).
 - f. SSNIT Contribution of Workers (Not applicable to start-ups).
2. Power of Attorney as required in Section 4.1.5 of this document
3. Sworn Declaration as required in Section 4.1.6 of this document

B. Management Information

1. Organisational Structure (including educational and technical background as well as experience of key personnel)
2. Ghanaian Participation in Senior Management

C. Marketing and Customer Service Plan

1. Plan to promote brand and service
2. Plan to support provide information to customers about the service, support, fault reporting and resolution, etc

D. Technical Capability & Plan

1. Choice of Technology – the technology chosen by the applicant. The reasons for the choice (including technical & commercial reasons)
2. Familiarity/Experience of Applicant or its partners - the applicant or its partner's telecom operational experience

3. Network Design - Design of the proposed network solution including the network topology and the resulting key Bill of Quantities, the assumptions used in dimensioning the network, etc. Backbone and backhaul requirements should be discussed and any additional regulatory resource requirements such as spectrum (e.g. microwave should be mentioned) and numbers should be clearly stated.
4. Rollout Plan – Practical and realistic intended rollout of the network by the applicant in months.
5. Network Management, Maintenance, and Administration Strategy – This examined the applicant’s strategy, expertise, structure, and tools proposed to be used for monitoring and managing the deployed systems.

E. Financial Capability & Plan

1. Historical and Projected Financial statements as required in Section 4.1.7 of this document
2. Support documents (e.g. letter of intent, etc) for any intended use of debt financing, supplier’s credit, etc
3. The following metrics shall be assessed:
 - a. Liquidity - to ascertain applicant’s capacity to remain a viable business by having enough cash and liquid resources on hand to meet its maturing financial obligations.
 - b. Gearing/coverage - historical and projected gearing and coverage ratios in order to ascertain the degree of risk faced by each applicant in meeting its short term and long term obligations.
 - c. Access to Financing - the extent to which an applicant would be able to raise equity and/or debt to pay for the cost of deploying and maintaining the infrastructure required for the project.

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