



Liberia Telecommunications Authority

Building #D-168, Congotown Back Road
Monrovia, Liberia



LTA-ORDER-0015-12-16-16

Establishment of New Mobile Termination Rate for Interconnection

PURSUANT TO PARTS VII AND VIII OF THE TELECOMMUNICATIONS ACT 2007 (THE ACT) AND LTA-ORDER-0014-12-14-16, THE LIBERIA TELECOMMUNICATIONS AUTHORITY (LTA) HEREBY ISSUES AND PUBLISHES THIS ORDER ESTABLISHING A NEW MOBILE TERMINATION RATE FOR WHOLESALE VOICE CALL TERMINATION ON THE NETWORKS OF INDIVIDUAL LICENSEES.

WHEREAS:

- Part VIII of the Act sets out the functions and duties of the LTA in relation to interconnection of telecommunications networks in Liberia;
- Specifically, Section 33(a) requires that the LTA promote adequate, efficient and cost-oriented interconnection of telecommunications networks and access by service providers to telecommunications facilities of other service providers in order to permit interoperability of telecommunications services that originate or terminate in Liberia and to promote the development of competitive telecommunications service markets;
- Additionally, Section 33(e) requires that the LTA determine which service providers are dominant service providers in a telecommunications market for interconnection; Section 35(2) allows the LTA to issue a regulation, rule or order clarifying the interconnection related obligations of any dominant service provider; and Section 37(1) requires that the interconnection charges of dominant service providers shall be cost-based and shall comply with any regulations, rules or orders issued by the LTA, including any pricing, costing and cost separation requirements so prescribed;

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- More broadly, under Section 11 the LTA may make orders respecting any matter or thing within the jurisdiction of the LTA under the Act, a regulation or a rule, including orders to compel a person to comply with or implement the purposes of the Act, a regulation, rule or licence, and, upon publication by the LTA such orders shall have the same legal force as a rule. In addition, the LTA may take such other actions as are reasonably required to carry out the Act, and all related regulations, rules and orders, and to perform such other responsibilities, functions and powers conferred on the LTA under any other law;
- Furthermore, LTA shall ensure that, prior to issuing any order or any other exercise of its authority that is likely to have any substantial impact on network operators, service providers, any other market participant or the general public, it conducts a process of public consultation appropriate to the circumstances and shall take account of the results of the public consultation in the final exercise of its authority;
- The purpose of this Order is to set the charges for wholesale voice call termination on the networks of individual licensees;
- This Order applies to all licensees that provide wholesale voice call termination services.

NOW THEREFORE, IT IS ORDERED:

1. Based on the LTA's updated Interconnection Cost Model of 2016, which was circulated to all service providers and relevant stakeholders, and in consideration of the outcomes and recommendations from the public consultation held on said cost model, the LTA hereby establishes and sets the new Mobile Termination Rate (MTR) for voice call termination at 2.3 United States cents per minute; which shall be for wholesale call termination on the network of any company licensed by the LTA to provide this service.
2. For the purpose of this Order, and pursuant to Part VII of the Act, the LTA has determined that:
 - a. the facilities used to terminate voice calls to a specific subscriber on a specific network constitute essential facilities in

that they cannot feasibly be economically or technically substituted;

- b. all service providers need access to the wholesale call termination service on all telecommunications networks in order to provide retail calls from any subscriber in Liberia to any other subscriber in Liberia; and
- c. pursuant to LTA-ORDER-0013-12-14-16 and LTA-ORDER-0014-12-14-16, a market exists for wholesale call termination on individual networks ("the relevant market") and in this market, the LTA has determined that each individual network operator has a 100% market share, has control of an essential facility, possesses Significant Market Power (SMP) and is thus subject to ex-ante regulation and appropriate remedies.

3. For the purpose of information, transparency and fairness, the Annexes attached to this Order summarize the methodology followed in preparing and updating the LTA Cost Model and provide the LTA's responses to concerns expressed by service providers during public consultation process.

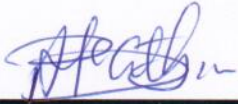
4. The rates established by this Order shall remain in force until a new determination is made and a revised Order is issued to that effect. The LTA expects to update its cost model and revise this Order on interconnection rates prior to 30 June 2020.

THIS ORDER SUPERSEDES ANY PREVIOUS ORDER ISSUED ESTABLISHING MOBILE TERMINATION RATES. IT SHALL TAKE IMMEDIATE EFFECT UPON PUBLICATION AND SHALL HAVE THE SAME LEGAL FORCE AS A RULE OF THE LTA, AND SHALL REMAIN IN FULL FORCE AND EFFECT UNTIL OTHERWISE ORDERED BY THE LTA OR PURSUANT TO LEGAL PROCESS.

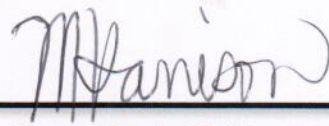
ISSUED THIS 16th DAY OF December A.D. 2016 IN THE TOWNSHIP OF CONGOTOWN, REPUBLIC OF LIBERIA.

<signatures on next page>

Signed:



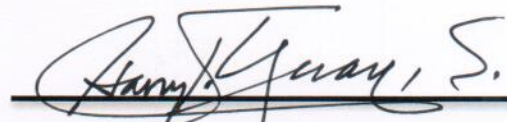
Hon. B. Anthony McCritty Sr.
Commissioner



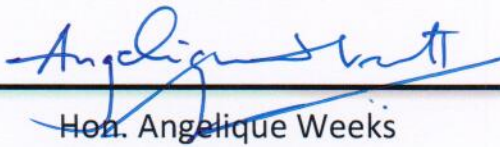
Hon. Maria G. Harrison
Commissioner



Hon. Henry W. Benson
Commissioner



Hon. Harry T. Yuan, Sr.
Commissioner



Hon. Angelique Weeks
Chairperson

Annex A: Methodology

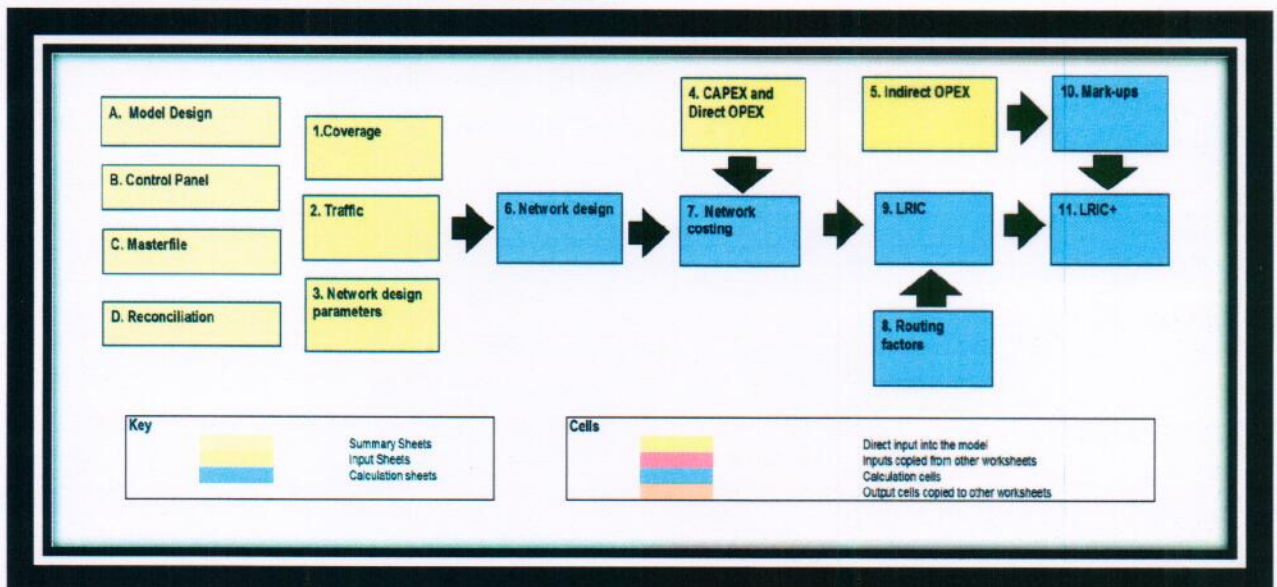
Background

- Since 2009 interconnection rates have been set on the basis of an LTA cost model developed by a World Bank consultant
- Voice call termination rates have converged at 7cpm (USD) for all operators after an initial period of asymmetry (i.e. higher rates for the smaller/newer players)
- LTA has updated the cost model so as to set rates for the period 2016 - 2020.

Data Submission

- Detailed data requests were sent to all operators:
 - Cellcom; MTN; Novafone; Libtelco
- Replies were received from each operator, with varying degrees of completion
- All submitted data has been included in the revised model, supplemented where necessary by international benchmark data:
 - e.g. network design assumptions and unit costs as used in similar cost models in other jurisdictions.

Construction and Overview of the Model



Key Model Characteristics

- An Excel workbook
- A bottom-up model: it is based on an assessment of the assets and associated costs needed to meet actual and forecast demand
- Covers the period 2016 - 2020 based on actual data received from the operators
- Uses tried and tested modelling techniques according to best international regulatory practice
- Results include both direct costs and a proportionate share of common costs (LRIC+).

Key Assumptions

- Subscribers and traffic: historic data and forecasts provided by mobile operators.
- Network design rules – standard industry assumptions with asset totals reconciled with equipment numbers provided by the operators.
- Equipment costs based on local data where provided, supplemented by international benchmarks.
- Engineering practices (e.g. utilisation, blocking factors) and accounting practices (e.g. asset lives, asset price changes) based on efficient operator norms.
- Tilted annuity depreciation used as proxy for economic depreciation
- WACC estimated using the Capital Asset Pricing Model.

Weighted Average Cost of Capital

Description	Rate	
Risk free rate (US)	1.84%	The Economist (US Treasury 10-year bonds)
US inflation rate	1.10%	The Economist (US consumer prices index)
Liberia inflation rate	9.80%	World Bank (2014)
Risk free rate (Liberia)	10.54%	
Debt premium	2.50%	International benchmark
Cost of debt	13.04%	
US equity risk premium	4.29%	Damodaran online. Average of premiums (DDM and FCFE)
Liberia country risk premium	13.42%	Damodaran online (http://people.stern.nyu.edu/adamodar/) based on Caa2 Moody's rating
Market Risk premium	17.71%	
Equity Beta	1.00	International benchmark
Cost of equity	28.25%	
Gearing	35%	International benchmark
Equity %	65%	
Effective tax rate	25%	World Bank
Post Tax WACC	22%	
Pre Tax WACC	29.0%	

 Input
 Calculation
 Output

Key Changes to the Model Design

- Four operators rather than five; modern efficient operator (MEO) has 33% market share
- Inclusion of 3G and 4G network technology; although coverage remains limited and 4G is embryonic.
- Networks modelled by county – since 2009 significant roll-out beyond Monrovia
- Radio network modelled by geotype (city, town, rural)
- Gradual transition from microwave to fibre transmission network.

Data Input Assumptions

Base Case Parameters

Category	Key assumptions	Unit	MEO
Financial	Pre-tax WACC	%	29.0%
	Economic asset life - default for hardware	years	8
	Economic asset life - default for software	years	5
	Economic asset life - default for transmission	years	10
	Annual asset price trend - default for hardware	% pa	-2%
	Annual asset price trend - default for software	% pa	-4%
	Annual asset price trend - default for transmission	% pa	2%
	Annual installation/opex cost trend	% pa	3%
Technical	Voice/text - Busy days per annum	#	300
	Voice/text - Busy day traffic in the busy hour	%	9%
	Average voice channel capacity	kbps	64
	Data/video - Busy days per annum	#	300
	Data/video - Busy day traffic in the busy hour	%	9%
Market	Market share - subscribers (2016)	%	33%
	Market share - subscribers (2020)	%	33%

Traffic – MEO Scenario

Based on Aggregation of data provided by operators

Service	Millions	2016	2017	2018	2019	2020
On Net calls	Voice Minutes	1,262	1,298	1,335	1,374	1,415
Outgoing Calls to Other Networks	Voice Minutes	14	15	16	17	18
Outgoing Calls to International	Voice Minutes	75	77	80	83	86
Incoming calls from Other Networks	Voice Minutes	14	14	15	15	16
Incoming calls from international	Voice Minutes	21	21	22	22	23
Roaming Calls (all types of outbound roaming calls)	Voice Minutes	0	0	0	0	0
Roaming Calls (all types of inbound roaming calls)	Voice Minutes	0	0	0	0	0
Voice mail	Voice Minutes	0	0	0	0	0
Calls to Operator	Voice Minutes	0	0	0	0	0
Video Call	Video minutes	0	0	0	0	0
MMS on net	MMS	0	0	0	0	0
MMS outgoing to other network	MMS	0	0	0	0	0
MMS incoming from other network	MMS	0	0	0	0	0
SMS on net	SMS	27	28	28	29	30
SMS outgoing to other network	SMS	3	3	3	3	3
SMS incoming from other network	SMS	5	5	6	6	7
Data services	Mbytes	1,153	1,321	1,513	1,729	1,975
End of list	End					

District name	
Bomi, all	1%
Bong, Gbarnga	3%
Bong, other	1%
Gbarpolu, all	0%
Grand Bassa, Buchanan	4%
Grand Bassa, other	0%
Grand Cape Mount, all	1%
Grand Gedeh, Zwedru	2%
Grand Gedeh, other	1%
Grand Kru, all	0%
Lofa, Voinjama	2%
Lofa, other	0%
Margibi, Kakata	6%
Margibi, other	1%
Maryland, Harper	1%
Maryland, other	0%
Montserrado, Monrovia	67%
Montserrado, Bensonville	0%
Montserrado, Other	0%
Nimba, New Yekepa	5%
Nimba, other	2%
Rivercess, all	0%
River Gee, all	1%
Sinoe, all	1%
	100%

Radio Network Parameters (a)

Based on data provided by operators

2G planning		Unit	
Quality of service at the radio interface	%		2%
Channels per GSM TRX	#		8
TRX channels reserved for signalling	#		1
Typical utilisation	%		60%
Voice channels per GSM TRX	#		4

3G planning		Unit	
Maximum Capacity per Radio (Mbps)	Mbps		2
Typical utilisation	%		70%
Mbps to BH MByte	BHM / Mbps		450

4G planning		Unit	
Maximum Capacity per Radio (Mbps)	Mbps		15
Typical utilisation	%		70%
Mbps to BH MByte	BHM / Mbps		450

Where 3G and 2G are available		Unit	2016
% of voice traffic on 2G	%		80%
% of data traffic on 2G	%		10%

Where 4G, 3G and 2G are available		Unit	2016
% of voice traffic on 4G	%		0%
% of data traffic on 4G	%		30%

2G	Average cell	Unit	
	City	Km	4.0
	Town	Km	6.0
	Rural	Km	9.0

3G	Average cell	Unit	
	City	Km	3.0
	Town	Km	4.0
	Rural	Km	6.0

4G	Average cell	Unit	
	City	Km	3.0
	Town	Km	4.0
	Rural	Km	6.0

3G Node B collocated with 2G BTS

	Unit	2016
City	%	80%
Town	%	80%
Rural	%	80%

4G eNode B co-located with 2G BTS or 3G Node B

	Unit	2016
City	%	100%
Town	%	100%
Rural	%	100%

Radio Network Parameter (b)
Based on data provided by operators

Average number of 2G TRXs per BTS

Sector	2016	2017	2018	2019	2020
City	24.0	24.0	24.0	24.0	24.0
Town	16.0	16.0	16.0	16.0	16.0
Rural	10.0	10.0	10.0	10.0	10.0

Average number of 3G TRXs per NodeB

Sector	2016	2017	2018	2019	2020
City	16.0	16.0	16.0	16.0	16.0
Town	10.0	10.0	10.0	10.0	10.0
Rural	4.0	4.0	4.0	4.0	4.0

Average number of 4G TRXs per eNode B

Sector	2016	2017	2018	2019	2020
City	7.0	7.0	7.0	7.0	7.0
Town	4.0	4.0	4.0	4.0	4.0
Rural	2.0	2.0	2.0	2.0	2.0

Average number of sectors per cell

Sector	2G	3G	4G
City	3.0	3.0	3.0
Town	2.0	2.0	2.0
Rural	1.4	1.4	1.4

Reconciliation of Asset Inventory

The model roughly reproduces the operators' reported equipment numbers

Operator 1

Network Element	No. of equipment deployed 2015/16		Difference	Variation (%)
	Operator	Model		
Transceivers (all)	5,040	4,675	365	7%
BTS (2G Base station)	204	200	4	2%
BSC (2G Base station controller)	3	3	0	0%
Node B (3G Base Station)	108	90	18	16%
RNC (Radio Network Controller) - 3G network	1	1	0	0%
eNodeB (4G Base Station)	48	40	8	17%
End of list				

Operator 2

Network Element	No. of equipment deployed 2015/16		Difference	Variation (%)
	Operator	Model		
Transceivers (all)	4,140	4,385	-245	6%
BTS (2G Base station)	206	189	17	8%
BSC (2G Base station controller)	3	2	1	33%
Node B (3G Base Station)	81	81	0	0%
RNC (Radio Network Controller) - 3G network	2	1	1	50%
eNodeB (4G Base Station)	35	40	-5	14%
Cell sites	208	205	2	1%
End of list				

Asset Cost Data

Network Element	Manufacturers design unit	Capacity (number of design units per equipment)	Purchase price per unit of equipment: Year 1 USD
2TRX (2G Transceiver)			1,500
BTS (2G Base station)			74,000
BSC (2G Base station controller)	125	BTSs	365,976
3TRX (3G Transceiver)			2,700
Node B (3G Base Station)			30,000
RNC (Radio Network Controller) - 3G network	250	Node Bs	300,750
4TRX (4G transceiver)			4,190
eNodeB (4G Base Station)			21,875
MSC (Mobile switching centre)	500,000	Subscribers	575,104
HLR (Home location register)	500,000	Subscribers	575,104
INP (Intelligent network platform)	500,000	Subscribers	463,577
GGSN (Gateway GPRS Support Node)	100,000	BH Mbytes	250,727
SGSN (Serving GPRS Support Node)	100,000	BH Mbytes	230,000
SGW (Serving Gateway)	100,000	BH Mbytes	313,024
MME (Mobility Management Entity)	100,000	BH Mbytes	1,250,000
PDN (Packet Data Network Gateway)	100,000	BH Mbytes	562,500
PCRF (Policy Charging & Rules Function)	100,000	BH Mbytes	150,000
SMSC (SMS Control Centre)	25	Messages/sec	60,777
MMSC (MMS Control Centre)	25	Messages/sec	857,059
VMS (voice mail system)	5,000,000	Subscribers	32,400
NMS (Network management system)	5,000,000	Subscribers	756,521
INT (International Gateway)	100,000	BH Mbytes	60,000
IGW (Interconnect Gateway)	100,000	BH Mbytes	180,000
RBIL (Retail Billing system)	5,000,000	Subscribers	1,798,816
IBIL (Interconnection Billing System)	5,000,000	Subscribers	2,504,986
End of list			

Indirect OPEX and Common Cost

Mark-up based on data from two operators

Summary of mark-ups (applied sequentially)	2016	2017	2018	2019	2020
Indirect network opex	4.1%	4.5%	4.3%	4.1%	3.8%
Common costs	19.2%	20.6%	20.1%	19.1%	18.0%
Working capital	6.0%	6.5%	6.3%	6.0%	5.6%
Overall mark-up	32%	34%	33%	31%	29%

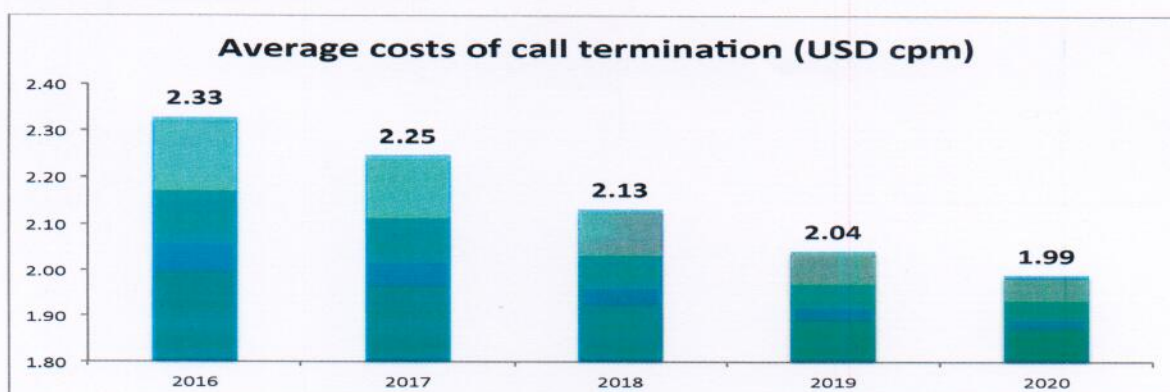
Results of the Cost Model

Interconnection Pricing Scenario

- The same call termination rates should apply to all operators:
 - The period of asymmetry in favor of small new entrants is past.
- This means that the rates should be set on the basis of the MEO rather than for individual network operators.

The model outputs should be checked against various sensitivity scenarios and against regional benchmarks.

Base Case Results for MEO



These results compare with the current call termination rate of 7 cents per minute.

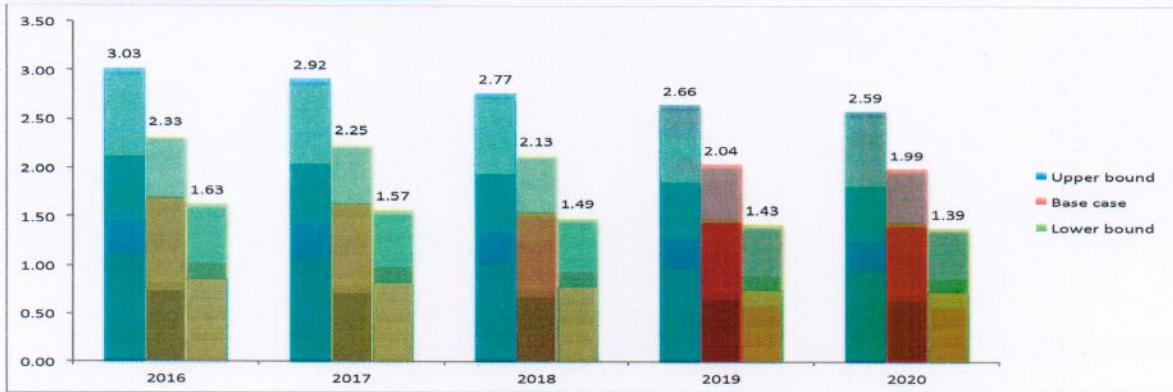
Sensitivity Analysis

Sensitivity	Base case assumption	Revised assumption	% change in termination rate
Market share	33%	50%	-25%
WACC	29%	26.1%	-5%
Asset lives	Various	20% longer	-2%
Price trends	Various	1% p.a. higher	-1%
Asset utilisation	60-80%	70-80%	-2%
Peak voice	300 busy days; 9% BH	365 days; 8% BH	-9%
Peak data	300 busy days; 9% BH	250 days; 10% BH	-6%

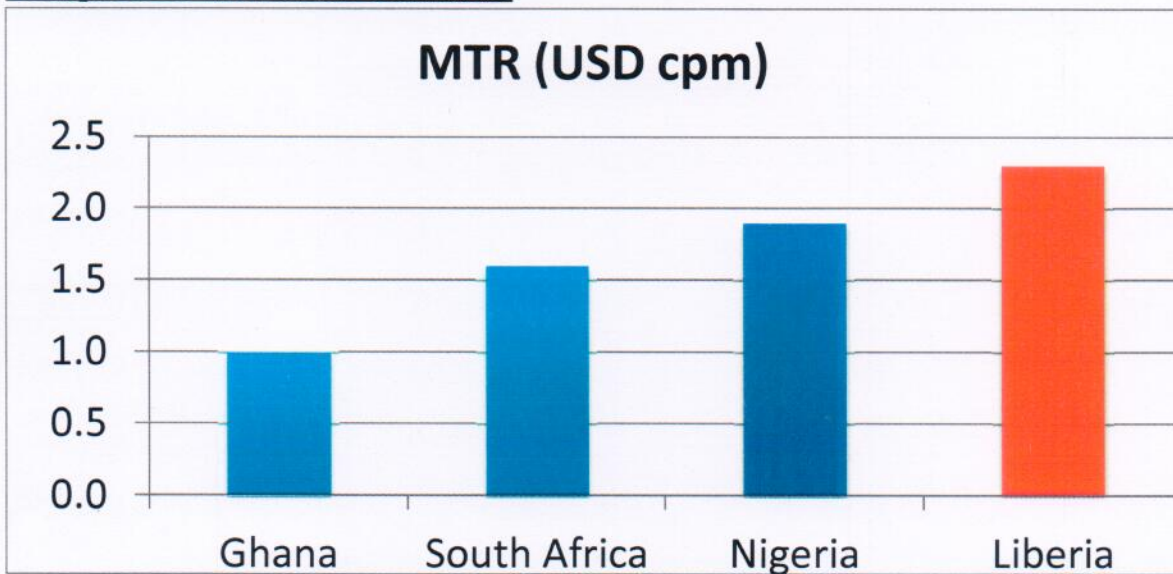
Using the Sensitivity Analysis

- Sensitivity analysis gives a reasonable range for cost-based termination rates.
- In total all the sensitivities suggest a reasonable range of +/-50%
- However, the last two sensitivities are already calibrated through the reconciliation of asset numbers with real networks (MTN, Cellcom & Novafone).
- Consequently we propose a reasonable range of +/-30% of the base case outcomes (although this might reduce to +/-10% once the market share assumption is fixed).

Reasonable Range for MTRs



Comparison with other Countries



Proposal/Recommendations

1. The voice call termination rate should be reduced from the previous rate of 7cpm to 2.3cpm for 2016*.
2. There should be a further reduction to 1.7cpm in 2017*.
3. Other cost-based interconnection charges may also be set by LTA:
 - 1cpm for SMS termination
 - 2.5cpm for international transit
 - 3cpm international roaming

Annex B: Report on Public Consultation

Comments from Cellcom

Cellcom's comments are contained in two letters submitted to LTA on 5 July 2016 and 27 July 2016.

Cellcom is generally supportive of the modeling approach used, the data and the assumptions that it believes fall in line with international best practice. However, Cellcom argues that the results were still too high, and suggests three specific changes to bring them more in line with international norms (of USD 1 – 1.5 cpm).

- Increasing the MEO market share to 50%, consistent with the market reality in which there are essentially only two main players with about 45% and 55% market share respectively.
- Lowering the WACC from 29% to something below 20%
- Setting prices on the basis of Pure LRIC (as opposed to the proposed approach of LRIC+).

Cellcom also suggests that the LTA should lower three other interconnection tariffs:

- For SMS termination from 2.5cpm to 0.5cpm
- For international roaming from 14cpm to 5cpm
- For national/international transit from 14cpm to 5cpm.

LTA's Response

1. Given the immaterial market share of Libtelco it does appear to establish the MEO market share on the basis of three operators (33%) rather than 4 (25%). Further, if the acquisition of Novafone goes ahead as planned, then the proposal to use 50% makes sense.
2. Cellcom has given no objective justification for reducing the WACC from 29% to below 20%. It is true that the proposed rate is high by international standards, but this reflects the higher risk of investment in Liberia. We do not propose any change to the WACC figure without supportive evidence being provided.
3. The Pure LRIC cost standard derives from the European Union, and has been copied in other countries, Kenya amongst them. However, it is an artificially low cost standard that does not allow for all reasonably incurred costs to be recovered. This can be supported in a stable and mature market, but in Liberia where there are significant investments in coverage and teledensity still to be completed, it is better that interconnection prices include a share of common and joint costs. LRIC+ was the approach followed in 2007, and there is no reason to change it at this stage.
4. The proposal to reduce SMS termination, international roaming and transit interconnection charges is to be welcomed. In fact the cost model results would suggest that charges for these services could/should fall further than Cellcom has suggested. LRIC+ outcomes would be 1cpm for SMS and 2.5cpm for transit and 3cpm for roaming.

Comments from MTN/Lonestar

MTN's comments are contained in a letter submitted to LTA on 7 July 2016.

MTN is appreciative of the consultative approach adopted by LTA but made five suggestions of changes that ought to be made when using the cost model to set interconnection prices.

- Reducing the transmission asset life from the current default figure of 25 years.
- Pricing so as to enable further investment in regions of the country that are currently unserved or under-served.
- Increasing the proportion of OPEX from 18%, this being far below actual levels.
- Reviewing the international benchmark figures in light of recent currency devaluations
- Establishing changes by means of a glide-path to ensure that the industry is covered in the event of future changes in market conditions.

LTA's Response

1. The default asset lifetime of 25 years was, in fact, only applied to passive transmission infrastructure (e.g. poles, trenches, sites). It is arguable that these rates should be lowered, and in Release 2 of the cost model we have revised the approach so that all transmission assets share the same asset lifetime, which has been set at 10 years. However, this has negligible impact on call termination rates.
2. We acknowledge the need to encourage on-going investment in regions that are currently unserved or under-served. Note, for example, the response to Cellcom's request for use of Pure LRIC rates: one risk of such an approach is that it might reduce investment incentives. However, the model already takes the need for network expansion into account, with coverage projected to increase across all regions.
3. It is not clear from where MTN derives the 18% OPEX estimate. In the presentation given to stakeholders the total indirect OPEX mark-up was around 30% (with around 18% being related to common costs). In addition there is direct OPEX included within the annual costs, amounting to roughly 10% of capital investment. So OPEX in the model is indeed much higher than 18%, and is actually based primarily on the data provided by MTN.
4. The benchmark figures presented to stakeholders were intended to give a rough comparison of the proposed Liberian rates to those of other administrations within the region. If the benchmark figures were being used to establish rates, then they would need to take account of issues such as currency devaluation and all the other relevant factors that vary between nations. However, that was not the purpose of the comparison, and it remains valid to say that even the proposed new rates are higher than in other regional economies.
5. It is reasonable to use a glide-path to protect against modeling projections and forecasts that may prove inaccurate. However, it is very clear from the cost modeling work that the current call termination rates are much higher than they should be; hence there is really no need to use a glide-path for the delta between the current call termination charge and the current call termination cost as modeled.