MOBILE MODEL CALCULATION FOR MOBILE OPERATORS IN ROMANIA

A report summarising responses to the Public Consultation document related to the Mobile Model

PUBLIC VERSION

Purpose: Provide ANCOM's answers to the responses received by ANCOM following the Consultation related to the Calculation of the costs of efficient provision for some electronic communications services provided at the wholesale level in Romania – Mobile Model.

June 2013

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2 Introduction

1. ANCOM ("National Authority for Management and Regulation in Communications") presented a Mobile Model Documentation (A4 - documentatie model LRIC mobil) for the mobile operators in Romania and the associated Mobile Model (A3 - model LRIC mobil) prepared by TERA Consultants.
2. These files were sent to the Romanian operators on November 14th 2012, together with operator specific confidential versions of the model and were presented and discussed during an industry group meeting on the 30th and 31st of October 2012.
3. Following the public consultation, ANCOM has received a set of comments. ANCOM thanks the operators for the time taken in this Public Consultation and is glad that several operators took this opportunity to bring several additional data that helped to better calibrate the Mobile Model. The comment were received from the following stakeholders:
    a. Cosmote Romanian Mobile Telecommunications (Cosmote);
    b. Orange Romania (and Analysys Mason); and
    c. Vodafone Romania S.A. (Vodafone).
4. The following section summarises the analysis of all stakeholders' comments and the responses of TERA Consultants and ANCOM.

3 Main changes made to the Mobile Model as a result of the comments received

3.1 Type of answers provided

The answers provided for each comment provided by the respondents can be classified in 6 types:

1. Comment accepted
2. Comment accepted but limited impact on the calculations and results
3. Comment will be dealt with in the next phase of the consultation process
4. Comment cannot be accepted (incompatible with standard approach)
5. Comment cannot be accepted (absence of necessary supporting data)
6. Comment cannot be accepted (unclear or incorrect or inconsistent)

3.2 Main impacts on the model

Several comments were received from the operators. The main consequences relate to the following issues:

1. **Issue 1: General comments:** No major changes
2. **Issue 2: Network dimensioning – Cell radii:** cell radii have been updated
3. **Issue 3: Network dimensioning – Traffic (2G & 3G) and subscribers inputs:** traffic migration profile from 2G to 3G has been revised to be more conservative
4. **Issue 4: Network dimensioning – Busy hour and traffic parameters:**
    a. BH calculation has been revised
    b. BH calculation has been disaggregated between services (voice/data) and technology (2G/3G)

c. New traffic data provided by respondents have been implemented

5. **Issue 5: Network dimensioning – Design parameters (2G):** No major changes apart from the implementation of utilisation factors
6. **Issue 6: Network dimensioning – Design parameters (3G):** No major changes apart from the implementation of utilisation factors
7. **Issue 7: Network dimensioning – Design parameters (general):** No major changes
8. **Issue 8: Network dimensioning – Geotypes:**
    a. Geotypes definition has been revised
    b. An additional geotype has been implemented
9. **Issue 9: Network dimensioning – Utilisation factors:** Utilisation factors for 2G and 3G radio access network have been implemented and calibrated to fit the number of sites provided by the operators
10. **Issue 10: Network dimensioning – Coverage *versus* capacity sites:** Due to the implementation of utilisation factors, densification sites for the generic operator now amount from ~25% to ~85% for 2G and from ~0% to ~80% for 3G.
11. **Issue 11: Network dimensioning – Transmission dimensioning:** the dimensioning of the transmission network has been revised
12. **Issue 12: Cost inputs – CAPEX:** some CAPEX cost have been corrected
13. **Issue 13: Cost inputs – Cost variability:** No major changes apart from the review of coverage versus capacity sites
14. **Issue 14: Cost inputs – Site collocation:** Site collocation assumptions have been revised.
15. **Issue 15: Cost inputs – OPEX:** OPEX trend has been reviewed
16. **Issue 16: Depreciation methodology:** A revised economic depreciation methodology has been implemented.
17. **Issue 17: Cost allocation – Cost allocation to subscribers:** Cost allocation to subscribers was implemented to reflect the fact that mobile operators provide access services alongside traffic services.
18. **Issue 18: Pure LRIC – General comments:** Comment will be dealt with in the next phase of the Consultation Process
19. **Issue 19: Pure LRIC – Design parameters:** No major changes

4 Responses to the Mobile Model and TERA & ANCOM view and position

Issue 1: General comments		*Table of contents*
Respondent	Comments received	Response
✂	The model should be expanded to include the following: • The split between 2G and 3G termination to check the reasonableness of the rates • The amount of equipment that is assumed to be incremental. This will allow an assessment of the incremental network compared to the total network • The calculation of the incremental cost in each period. This will allow an assessment of the interaction between the pure LRIC calculation and the depreciation methodology adopted.	**Comment accepted** This is now implemented in the different sheets of the model: • 8.2 Termination Cost: column B for 2G/3G distinction • 8.3 Pure LRIC: range AK45:BE70 for incremental equipment • 8.3 Pure LRIC: revised sheet to display incremental cost for each period and calculate economic depreciation with output profile as well as constant pure LRIC
✂	The respondent disagrees with the value of the weighted average cost of capital (WACC) taken into account in the Mobile model (11.1% instead of 12.58% according to the respondent).	**Comment cannot be accepted (incorrect)** The latest results on WACC have been published on ANCOM's site (see "*WACC Calculation for fixed-line and mobile operators in Romania*", October 2012)

✂	The respondent states that several data used in the model was not asked during the data request phase.	**Comment cannot be accepted (incorrect)** The data request Word document repeatedly stated that the operators could adapt their answers to better reflect their specificities. Other operators took the opportunity of the data request to add additional items and data: • Data request, section "*1.7 Additional relevant information*": "*Any other piece of information which has not been covered by the present information request but which the operator considers as potentially relevant to the cost model project should be also submitted as part of the response*." • Data request, question 13: "***Please fine-tune the list of equipment to better reflect your network*.**" (bold in the text) • Data request, section "*3.2.2.3 3G radio access capacity*": "*Our goal is to use the engineering rules that will be provided to us in order to determine the number of required carriers depending on the busy hour for voice and data and particularly when an additional carrier/software/other elements is added. This is why the following questions are here for illustrative purposes*." • Data request, question 47: "*In order to calculate the pure LRIC of the wholesale call termination service, which assets should be scaled down when the associated traffic is no longer provided? Please elaborate (assets, relationship to call termination traffic volumes, etc.).*" • Data request, question 53: "*If the respondent considers that there are other pieces of information that could be relevant to mobile costing and which that have not been covered by this data request, the respondent is invited to provide such information with detailed technical and economical justifications.*" Moreover, this Public Consultation provided the opportunity for the operators to provide additional data for the parameters of the model which have thus been considered (see the different issues below). This is why as a general rule comments that did not provide explanations or supporting data could not be accepted.

The respondent asks why several parameters for the generic operators have a different value than the ones submitted for his network. The respondent submits a study measuring mobile data service QoS for 12 criteria for each Romanian operator.	**Comment cannot be accepted (inconsistent)** The data submitted by the different operators sometimes show some strong discrepancies, even after harmonisation for comparison (capacity in minutes or MBytes). This can be explained because of different factors: network architectures, contract packaging, bargaining power, equipment manufacturer, etc. As there is no *independent study* that could show a strong difference in quality of service between operators (referring to the mobile data service QoS study, the respondent appears to be in first place on 4 criteria, first equal with other operators on 6 criteria, and second on 2 criteria), the model had to rely on some averages between the different parameters and on international benchmarks as a cross-check. In any case it would be incorrect to populate the generic operator model directly with the parameters of the respondent because of: • A discrepancy issue (difference in data submitted by operators, with no data or study supporting a strong difference in QoS between operators) • A confidentiality issue (the data of the respondent would be disclosed to all the other operators) It is also reminded that the model calculates costs for each operator, using corresponding data from each respondent and based on a yearly approach. The cost for the generic operator is calculated by relying as much as possible on data provided by operators. This will enable to understand cost differences and better inform ANCOM for the setting of regulated rates in the second consultation, using standard QoS levels.

Issue 2: Network dimensioning – Cell radii		Table of contents
Respondent	Comments received	Response
✂	The respondent has performed analysis performed by its radio planning department and suggests revised radii.	**Comment accepted** The suggested cell radii have been implemented for the respondent.
✂	The respondent disagrees with the use of the "scorched-node coefficient" (SNC), stating that "*in the context of the Mobile model, if cells radii are based on realistic networks, there is no need to take into account a scorched-node coefficient, as the operational inefficiencies are already factored in the design of the realistic networks that are used to calibrate the model*."	**Comment accepted** As new inputs and data have been submitted on cell radii, the SNC has been set equal to 1 (i.e. no impact on cell radii).
	The cell radii used to estimate coverage in the current version of the Mobile model are therefore under-estimated.	**Comment accepted (partially)** The respondent does not provide supporting data on its estimation of average cell-radii per geotype. The model will thus rely primarily on data provided by other respondents, but the model ensures that the number of sites in the model is calibrated – through the utilisation factors (see Issue 9: Network dimensioning – Utilisation factors) – to the number of sites provided by operators.

✂	The respondent asks for the references related to the scorched node coefficient for 900 MHz and 2100 MHz. As it appears in the document, the UMTS cell radius is higher than the GSM 900 cell radius which seems contradictory.	**Comment cannot be accepted (incorrect)** It should be noted that the respondent's own submission provided radius that in some geotypes were higher in 2100 MHz than in 900 MHz. The scorched-node coefficient SNC was established in line with the cell radius to perform a first calibration of the model and illustrate the fact that an optimal 900 MHz radio access network deployment with theoretical radius could prove difficult to achieve. This is why the 900 MHz radius *after* application of the SNC was lower than the one for 2100 MHz. Finally the cell radii of a site can be subject to very detailed studies, as the one performed in Denmark (Gert Frølund Pedersen, *Limit values for Downlink Mobile Telephony in Denmark*, November 2012) that demonstrates that "*from the worst to best phone, there is factor 10 difference in how well the individual phones compete* [and that] *the antennas inside the best phones are up to ten times better than those in the worst phones*." (source *i-Newswire.com*, January 2013) Performing a thorough study of the cell radius of the operators is not part of the project so the model will rely as much as possible on data provided by operators (if an operator did not provide values the model has to rely on data provided by its competitors).

The respondent asks for the references of the benchmark for cell radii to cross-check the values provided by the operators.	**Comment accepted** Benchmarks are used as a secondary cross-check on top of data provided by operators, and come mostly from public models and documentation available in: • France (ARCEP & Analysys model 2011), • UK (Ofcom, Wholesale mobile voice call termination, March 2011) • Australia (ACCC & Wik, Mobile Termination Cost Model for Australia, 2007) • Netherlands (OPTA & Analysys BULRIC model, 2006) • Sweden (PTS & Analysys model 2010) • Israel (Ministry of Communications & NERA, Examination of charges of mobile network elements in Israel, 2010) • Jordania (TRC & Ovum model 2011) • and other non-public data available through TERA.

Issue 3: Network dimensioning – Traffic (2G & 3G) and subscribers inputs		Table of contents
Respondent	Comments received	Response
✂	The respondent states that the traffic migration profile from 2G to 3G may be unrealistic because they imply that the generic operator would deploy a large 2G network to then immediately deplete it by migrating traffic to 3G, rather than using the capacity provided by its 2G network for at least one lifetime of the 2G network elements providing this capacity. The respondent thus suggests that the migration profile from 2G to 3G should therefore be adapted in order to reflect the network optimisation constraints of an efficient operator.	**Comment accepted** The traffic migration profile has been recalibrated to be more conservative. The new traffic migration profile now ensures that there is no 2G voice traffic decrease in absolute value (although the share of 2G traffic still decreases over time) and that the 2G voice traffic still amount to a large share (50%-65% depending on the operators) of the total traffic in the long-term due to the 2G-handset constraints.
✂	The respondent asks that the Romanian population be in line with ANCOM's publications and that the penetration rate should remain constant whereas the population should increase by a constant rate for the entire period.	**Comment accepted but limited impact on the calculations and results** The exercise of the Mobile Model entails to forecast traffic and subscribers for the modelled operators for the coming years up to 2020. This implies to forecast population for the coming years up to 2020. The most reliable data available which enables international comparison is the *Eurostat* historical and forecasts data which predicts a population decline in Romania, dropping from 21.57 million people in 2007 to 21.36 million people in 2011 to 21.26 m people in 2014 to 21.01 m people in 2020. The Eurostat data thus provides the best reliable data for consistency between past and future; this is why the model will keep these data. However ANCOM agrees that forecasting population decline may be a difficult issue even for Eurostat, and as the respondent rather expects on the contrary a population growth the total population has been kept constant after 2012 and the penetration rate increases from 112% in 2011 to 115% in 2020.

	The respondent states that the traffic is not in line with the one submitted.	**Comment cannot be accepted** The traffic data is first based on data provided by ANCOM, and second on data provided by the operator.
✂	The respondent is concerned that the balance of traffic in the model between 2G and 3G technologies is not appropriate for the Romanian situation and does not reflect accurately the data submitted by the respondent. The respondent states that in other EU countries the penetration of 3G devices and coverage is higher than that in Romania at present and substantial economies of scope may exist as a result. For example, the German NRA recently commented that the continuing reduction in modelled voice termination costs was driven primarily by a continuing rapid growth in data usage, leading to a greater proportion of shared costs being borne by data services.	**Comment accepted** As stated above, the traffic migration profile has been reconsidered to be more conservative and better reflect the 2G constraint for Romanian operators.
	The respondent is concerned that the traffic figures in the model are significantly different from those that it provided. • The split between 2G and 3G traffic is substantially different to that provided by the respondent. • The model assumes a higher percentage of voice traffic carried on the 3G network than is indicated by the data that the respondent provided. The respondent has taken the opportunity to review its inputs in the areas of subscriber and traffic forecasts in the light of developments and information that has become available since the original submission earlier in the year and submits new data.	**Comment accepted (partially)** It is unclear which traffic split is inconsistent with the respondent's previous submissions as the model relies as much as possible on the data provided by the operators. Nevertheless the model now implements the new data traffic submitted by the respondent (some minor inconsistencies in roaming traffic split between 2G and 3G was corrected).

	Given the low level of data usage assumed and the relatively large capacity increments that apply to 3G, it is likely that the 3G network would have a low sensitivity to the incremental traffic. An assumption of a significantly higher proportion of traffic being handled by the 3G network than is actually the case would therefore tend to lead to an underestimate of termination costs on a Pure LRIC basis.	**Comment accepted** As detailed above the traffic migration profile for voice is much more conservative with a higher share of voice transiting on 2G. ANCOM agrees with the fact that the 3G network should have a relatively lower sensitivity to the incremental *voice* traffic in a situation where data traffic is highly increasing.
	The model also shows considerable differences in the traffic assumed for the generic operator compared to the data provided by the respondent.	**Comment cannot be accepted (incorrect)** By definition, the traffic of the generic operator should reflect the characteristics of the entire market and not the mix of a particular operator, which can reflect numerous factors (for example prepaid/postpaid distribution, retail pricing, on-net/off-net pricing, voice+SMS+data bundles, peak/off-peak and/or weekdays/weekend rates, “free minutes”, promotional offers, etc.).
✂	The generic operator is assumed to have less customer but a higher proportion of on-net traffic.	**Comment cannot be accepted (incompatible with standard approach)** See response above

Issue 4: Network dimensioning – Busy hour and traffic parameters

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Respondent	Comments received	Response
✂	The conversion of annual traffic to the level of traffic that the network is dimensioned to is incorrect because the model assumes the network is dimensioned based on an average network-level busy hour instead of a cell-by-cell basis. Based on analysis performed by the respondent, the difference between cell-specific peaks and average busy day network level peaks is in the region of 40%.	**Comment accepted (partially)** The model already assumes a busy hour on a cell-by-cell basis, for data and for voice, hence the respondent's comment is incorrect. Moreover busy-hour breakdown which was already performed on a geotype basis is now performed on: • service basis (voice/data) • and a technology basis (2G/3G) to better calibrate the model. Finally the model now implements conservative utilisation factors for the 2G and 3G radio access network (as well as for the other components of the network) as detailed in Issue 9: Network dimensioning – Utilisation factors.
✂	The 2G voice BH calculated in the model is lower than the real 2G voice BH provided by the respondent and should be adjusted. As a consequence: • 2G BH Erl & Mbps per network node with security mark-up is lower than the real one. • 2G BH Mbps & Erlangs Core volumes are considered lower than the real ones.	**Comment cannot be accepted** The traffic which is pointed out by the respondent is not the traffic used to dimension the 2G RAN as this is the BH before considering the routing factors. In consequence it cannot be compared to the traffic provided by the respondent: the dimensioning 2G BH Erlang for the access in 2011 is in cell O494 (sheet 4.1), where it can be seen that the BH is higher than the one reported by the respondent. In consequence the model is more conservative.
	The 3G BH Mbps access calculated in the model is lower than the real 3G BH and should be corrected.	**Comment cannot be accepted** The same answer as above applies for 3G traffic. The dimensioning traffic is not the one indicated by the respondent. The used traffic for the dimensioning in 2011 is ✂ Mbps at the BH.

The respondent states that the definition of the non-overlapping parameter is inconsistent between the different deliverables (model documentation and Excel file). The respondent states that the implementation of the non-overlapping parameter is incorrect. The respondent has provided the voice BH and its corresponding data traffic and the data BH and its corresponding voice traffic and the model should use this data without needing the so-called 'non-overlapping parameter'. The maximum between voice BH+corresponding data traffic and data BH+corresponding voice traffic.	**Comment accepted** This has now been corrected, and the parameter is set at a conservative stance of 90% (meaning that the network is dimensioned by taking into account the maximum BH voice and the maximum BH data and reducing it by a 0.9 factor to translate the fact that the voice BH and data BH does not occur at the same time). It should be noted that the BH traffic is reassessed with conservative utilisation factors as detailed in Issue 9: Network dimensioning – Utilisation factors.
The respondent states that the percentage of voice busy day traffic in total voice traffic for the generic operator is lower than the value provided by the respondent and requires justification for the figure used.	**Comment cannot be accepted (inconsistent)** The data submitted by the different operators sometimes show some strong discrepancies, even after harmonisation for comparison. This can be explained because of different factors: network architectures, contract packaging, bargaining power, equipment manufacturer, etc. The generic must thus reflect as much as possible the situation of all operators without favouring one over the others.
The respondent disagrees with a 5% traffic mark-up offloaded to in-building solutions (IBS) and does not understand why the IBS traffic is extracted from the total traffic per geotype.	**Comment cannot be accepted (absence of necessary supporting data)** The traffic flowing from in-building solution is offloaded from the outdoor radio access network. These are conservative assumptions which in absence of relevant data from the operators, have been based on benchmarks. Furthermore, the significance of IBS traffic is going to increase with the traffic surges accompanying mobile data traffic.

The respondent considers that the traffic offloaded to IBS is only relevant in urban areas.	**Comment accepted but limited impact on the calculations and results** As it is reasonable to assume that IBS are limited to urban area this has been implemented for the three first urban geotypes (see Issue 8: Network dimensioning – Geotypes). Thus, the model assumes no IBS in the rural areas.
The respondent considers that busy hour traffic profiles and requirements may change in the future and should be adjusted accordingly.	**Comment cannot be accepted (absence of necessary supporting data)** No other operators submitted such a comment and the respondent does not provide supporting data.

Issue 5: Network dimensioning – Design parameters (2G)

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Respondent	Comments received	Response
✂	Due to spectrum limitation and refarming, the model should consider a maximum of 4 TRXs per cell in the model and not 6 TRXs per 900 MHz cell. Due to spectrum limitation, the generic operator should also have maximum of 4 TRXs per cell instead of 5 TRXs per 900 MHz cell.	**Comment cannot be accepted (incorrect)** The model already implements the TRX limitation due to spectrum constraints. The model assumes that each 2G TRX requires 200 kHz of paired spectrum to deliver 8 communication channels (the control channels are included in those 8 channels, see response below). As a consequence for 12.5 MHz of paired spectrum available the maximum TRX per sector is 5 with a spectrum reuse factor of 12; this limit drops to 4 in case of 10.0 MHz of paired spectrum.
	On the 2G network dimensioning the respondent states that the number of max simultaneous communications is lower than the number provided by the respondent. Practically, no resources for the control channels are reserved.	**Comment cannot be accepted (unclear and incorrect)** The model implements the control channels provided by the respondent: the respondent stated that the Max available communication channels for a sector with 1/2/3 TRX was respectively 7/12/19, meaning that the reduction from 8/16/24 translates into resources for control channel.
	The respondent states that the number of simultaneous communications for a 3-sector BTS is inconsistent (for a 2TRX/sector BTS, the number of simultaneous communications is 38 instead of 39 (3*13).)	**Comment accepted but limited impact on the calculations and results** Because of internal technical rules, the simultaneous communications per channel provided by operator are not equal. The value for the generic operator was intended to cope with this discrepancy with “unrounded” values, and this has been corrected.

The respondent asks details on the SGSN and GGSN dimensioning rules and states that the model output on these equipment is inferior to the current ones.	**Comment accepted but limited impact on the calculations and results** The SGSN dimensioning is based on Simultaneous Attached User (SAU) and the GGSN is based on traffic output and SAU. In the model the number of SGSN is equal to the one in the respondent's network. In the alternative, these equipment have a very limited impact on the final costs.
The respondent states that the rate for the MMS sent over 2G was not achievable and should be revised to 240 kbps.	**Comment accepted** The initial data was provided by another respondent, the more conservative value provided by the respondent is implemented.
The respondent asks for the meaning of "position of blocking probability column in Erlang table".	**Comment accepted** This is not a network parameter but an internal calculation parameter to select the appropriate column given the blocking probability provided by the operator.
The respondent states that a coverage sites should not be fully loaded with both GSM 900 and DCS 1800.	**Comment accepted** See responses below
The respondent states that the 1800 cell radius should not be used because the 1800 MHz sites are used primarily for traffic densification and not coverage.	**Comment accepted (already implemented)** The cell area is the area where a call can be performed from a subscriber. As detailed in the model documentation, the model first deploys a 900MHz coverage radio access network and then adds additional densification sites to cope for additional traffic that cannot be managed by the coverage network. As a consequence the 1800 MHz sites are assumed to be collocated with the 900 MHz sites and only used for densification.

✂	The model calculates 2G coverage network capacity on the basis of using the maximum possible number of TRX given available spectrum and technical constraints per sector on a three-sector site. In effect the model assumes that coverage sites are fully configured with the maximum capacity. The "optimization" process only appears to consider a reduction of 1 TRX from this maximum. The respondent would expect that a minimal capacity coverage network would have only 1TRX per cell as a minimum configuration, and wonders why any additional TRX would be required for coverage only. The model should use a method of calculation that properly captures the minimum level of capacity of a coverage network and that gives proper scope to traffic-sensitive costs by allowing capacity elements of the network to be built up as needed.	**Comment accepted (already implemented)** The model was defined to implement densification sites, however with the first set of data the model calculated only very few densification sites, and this has been corrected (see Issue 10: Network dimensioning – Coverage *versus* capacity sites). The model is thus based on 900 MHz coverage sites that are fully loaded so no optimisation should occur on coverage sites (however there is still an optimisation process occurring on coverage sites, as an example for the generic operator there is some optimisation occurring in 2006 for the rural 2 area (i.e. number of 900 MHz TRX is decreased). Principally, when the model calculates the number of required densification sites, as a first step it calculates the maximum number of fully loaded sites required to cope with the additional traffic and as a second step optimises the number of TRX per site. As a consequence over-optimising the number of TRX would not make sense as this would lead to a reduction of the maximum number of coverage sites in the first step. In the alternative, all the operators have repeatedly warned against over-optimisation in model as deploying a mobile network is performed on a long-term perspective (e.g. it seems more efficient and less costly to build directly a 4/4/4 sites than building a 3/3/3 site to upgrade it as a 4/4/4 the year after). Finally it should be noted that 1800 MHz sites are used for densification only (see response above).

Issue 6: Network dimensioning – Design parameters (3G)

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Respondent	Comments received	Response
✂	When the average voice traffic per cell is computed in the mobile model, the voice traffic is averaged also over the HSPA cells. However the HSPA cells are mainly used for data, the volume of voice traffic carried over the HSPA cells (UMTS cells 4, 5 and 6), being very low in comparison to the voice traffic carried over the R99 cells of the same site. As a consequence voice traffic should not be averaged over HSPA cells.	**Comment cannot be accepted** As the respondent can see in the sheet "4.3 Nwk Design 3G Access", in the table "3G BH traffic per bearer" from line133, the BH traffic is correctly split over the different bearers. Voice bearer is completely separated from HSPA bearers. Each of these bearers has a specific weight in terms of channel elements in our dimensioning protocol. As the respondent can see in both the model and the documentation, HSPA bearer only contains data traffic. No voice traffic is averaged in HSPA bearer.
	The respondent states that HSUPA appears not to consume CE.	**Comment cannot be accepted** Both of the respondent and the generic operator have CE for HSUPA bearers. The comment of the respondent is not relevant.
	The respondent asks for clarification on the "*CE pool size".*	**Comment accepted** This value represents the number of available channel elements per site for downlink and for uplink. This means there is 64CE for downlink and 64CE for uplink per carrier per site. During the dimensioning process, the model calculates the number of required CE to handle all the BH traffic at the site level. The required CE is compared to the available pool CE (64/64 per carrier) in order to know whether there is a need for densification or not.
	The respondent disagrees with the UL/DL data traffic ratio of 0.1, the real value being 18%.	**Comment accepted** This has been implemented (the respondent did not provide this data before, see Issue 1: General comments).

The respondent asks for the reference of the simultaneous attached user BH driver percentage for GGSN dimensioning.	**Comment accepted** Since operators did not provide such parameters, the sources used in the model are based on public available models in Europe as well as from industry experts and manufacturers papers. The SAU BH driver comes from CMT mobile model (2.1 to 2.5 sheets, cell S600).
The respondent asks for clarification on the Erlang B table in the *4.0 Design Parameters* sheet: "Column E has no label" and "also the label for column G is missing."	**Comment cannot be accepted** The label is just at the side (cell C355): "channel numbers" (i.e. the number of input channels required to deliver the output channel for a given blocking probability). The column G is an internal model labelling for calculation, values starting to 1 and increasing at 1 at a time.
The respondent wishes to implement a Multidimensional Erlang B principle based on a Stochastic Knapsack approach.	**Comment cannot be accepted (absence of necessary supporting data)** No other respondent suggested this approach and the respondent did not provide necessary supporting data to implement it (it is the first time the respondent mentions this approach). As detailed below the model dimensions the network on a geotype level as defined by telecom experts and manufacturers papers (such as Ericsson and Huawei) and is in line with best practices from other public models. The Stochastic Knapsack is a very complex theoretical approach to dimension a site provided several probabilistic parameters. While it can better fit a local approach to local network dimensioning, it would be disproportionate to model at the scale of the entire network and would add limited value to its robustness.

The respondent argues during traffic peaks, the UMTS cells shrink and coverage becomes lower. Therefore, a margin to model UMTS cell breathing during peak traffic should be introduced..	**Comment cannot be accepted** As detailed in *Issue 9: Network dimensioning – Utilisation factors* and *Issue 10: Network dimensioning – Coverage versus capacity sites*, the model implements utilisation factors which already integrate a strong security margin and long-term network dimensioning anticipation and this is in line with best practices in other models. Adding the cell-breathing factor would be theoretical in a context where data submitted by operators on network dimensioning was scarce for a marginal gain as the utilisation factors would automatically be raised.
The respondent states that the number of UL must be calculated as the maximum of CE_CS_peak_UL, calculated with Multidimensional Erlang B principle and CE_CS_average_UL+CE_PS_UL+CE_HSUPA. CE_CS_average_UL is calculated by multiplying the traffic by a CE factor (the CE consumption per bearer that we provided). CE_PS_UL must take into account the following: user's traffic profile, bearer rate, PS CE utilization rate, number of users, soft handover, traffic burst and the effect of retransmissions (TCP based). CE_HSUPA must be calculated using similar principle. In the end, the maximum of CE_CS_peak_UL and CE_CS_average_UL + CE_PS_UL + CE_HSUPA is computed.	**Comment cannot be accepted** The model already considers the UL CE as the max between *CE_CS_peak_UL and the sum of CE_CS_average_UL, CE_PS_UL, CE_HSPA_UL*. CE_CS_peak is already calculated using Erlang B table. CE_PS_UL and CE_HSPA_UL are calculated using BH traffic in R99 and HSPA in Erlangs which already includes markups over BH traffic to reflect the real dimensioning traffic, as well as usage factors of equipment and the soft handover traffic, and bearers CE factors. The model dimensions the network on a geotype level and engineering rules as defined by telecom operators, telecom experts and manufacturers papers (such as Ericsson and Huawei) and is in line with best practices from other public models.
The respondent states that the number of DL CE must be calculated as the maximum of CE_CS_Peak_DL and the sum of CE_CS_Average_DL + CE_PS_DL. The CE_CS_Peak_DL and the CE_CS_Average_DL are calculated using the same principles used for their uplink correspondents. Soft handover must be taken into account to calculate the technical traffic used to dimension the network.	**Comment cannot be accepted (unclear and incorrect)** The same response as above apply for this comment. As detailed in the Model Documentation a 3G soft handover percentage is already implemented in the model.

The respondent states that per each PS bearer, the number of needed CE must be calculated taking into account the following parameters: user's traffic profile, bearer rate, PS CE utilization rate, number of users, soft handover, traffic burst and the effect of retransmissions (TCP based).	**Comment cannot be accepted (unclear and incorrect)** As detailed in the two previous responses above, for the PS bearers the number of needed CE is already calculated using a set of parameters provided by experts of the industry as well as manufacturers. These parameters include dimensioning traffic mark-up of BH traffic in order to include non-commercial traffic, soft handover mark-up, utilization factors for equipment, BH traffic in Erlang, and the CE factor for each bearer. As the respondent did not provide all the necessary supporting data, the proposed alternative implementation is unclear, especially as the respondent did not provide such data and explanation beforehand (see Issue 1: General comments).
The respondent states that in the Mobile Model Documentation, *"#CE peak (…) corresponds to the number of channel elements to handle peak traffic in busy hour. It is function of the number of simultaneous users per site for the service, and the channel element factor for the radio bearer".* However the number of simultaneous users per site for a given service was not requested. As it is explained in the 4.3 Network Design 3G Access section, the CE peak is only calculated for CS services.	**Comment cannot be accepted (incorrect)** There is no contradiction between the model and documentation. As explained above, the #CE peak is only calculated for CS services. As for the data requested, please refer to Issue 1: General comments.

Issue 7: Network dimensioning – Design parameters (general)		Table of contents
Respondent	Comments received	Response
✂	The respondent disagrees with the use of uniformly loaded cells (for both voice and data traffic).	**Comment cannot be accepted** As detailed in the Conceptual framework, the model relies on a yearly approach that "*estimates the number of assets for each year for a given year without taking into account what was previously built*" which implies that the model performs some network optimisation to a certain extent (which implies that as a first step some traffic homogeneity arises for a given area). However the "homogeneity" of the first version of the model has been strongly disaggregated with the implementation of: • A revision of the BH parameter on a service/technology basis (see Issue 4: Network dimensioning – Busy hour and traffic parameters) • A revision of geotypes and the addition of a new geotype (see Issue 8: Network dimensioning – Geotypes) • An introduction of conservative utilisation factors, both for 2G and 3G RAN (see Issue 9: Network dimensioning – Utilisation factors). All these revised parameters are calibrated to achieve the number of equipment as provided by the operators and are intended to be conservative in order to not underestimate their costs.

The respondent states that the definition of aggregation sites is unclear.	**Comment accepted** Aggregation rate has been modified to be in line with the respondent's aggregation equipment number(see *0. Control* sheet, section '*Transmission params*'). The model implements a common transmission network structure based on the different architectures observed for the operators. The architecture implemented implies to define a set of parameters. The model defines a "share of aggregated sites", which represents the share of sites which are not directly linked with BSC/RNC but go first through aggregation nodes. The model also defines an "aggregation rate", which represents the capacity of aggregation of each aggregation node in terms of BTS/Node B. E.g.: 10% means that each aggregator can handle 10 sites. The other terms refer to the adopted architecture. In order to reflect as much as possible the transmission network of the operators, the model implements an architecture based on aggregation rings which are interconnected with BSC/RNC equipment with aggregation hubs. Each aggregation ring contains a specific (calculated number of aggregation nodes) and one aggregation hub to interconnect with BSC/RNC (please refer to the Model Documentation). No other respondents raised the concern of the definition, because they provided directly a description of their network architecture (detailed scheme and diagram) with the explanation of their network components so that the model could be adapted to their network architecture. The respondent did not provide such network architecture layout before July 2012 (whereas that was asked during meetings in March 2012 and other operators provided such information much earlier).
The respondent disagrees with the parameters used for the generic operator, especially regarding the capacity margin.	**Comment cannot be accepted (inconsistent)** See response in Issue 1: General comments

The respondent states that one important limitation of the MSC is the BH voice traffic and this limitation should be implemented.	**Comment accepted but limited impact on the calculations and results** The respondent did not provide such information beforehand. However, this additional constraint has been implemented but it does not change the number of requirement equipment.
The respondent states that the "*IuB of 416 Mbps (cell O577) is unrealistic. At this moment, the average installed IuB capacity is 34Mbps, more than 10 times lower that what ANCOM assumes in the model. The MW link cannot accommodate the 416Mbps.*""	**Comment cannot be accepted** The value was provided by other respondents and corresponds to the limitation in terms of IuB capacity for the RNC equipment and not the required capacity of the MW links for the RNC. Moreover the IuB is only one of the 4 parameters used to dimension the network and the number of dimensioned RNC is at this stage equal or higher than the number currently installed in the respondent's network.
The respondent asks that its own engineering margin be used for the generic operator.	**Comment cannot be accepted** As explained in Issue 1: General comments, as there is no *independent study* that could show a strong difference in quality of service between operators, the model had to rely on some averages between the different parameters and on international benchmarks as a cross-check for the generic operator.
The respondent states that the number of calculated HLR is below its current number.	**Comment cannot be accepted** The dimensioning factors were based on engineering rules provided by the respondent, which also submitted that its number of HLR will decrease nine fold between 2011 and 2013. At this stage the number of modelled HLR is superior in 2013 than the one forecasted by the respondent.
The respondent states that the number of subscribers is required to dimension the VMS	**Comment accepted but limited impact on the calculations and results** This has been implemented (low impact on voice termination cost).

The respondent states that the number of MMS/s is required to dimension the MMSC	**Comment cannot be accepted** The MMSC dimensioning is in effect based on the BH MMS which is thus derived by the capacity required by the MMS traffic. The impact is null as several operators have stated that a single MMSC is required for the coming years. Moreover the MMSC has no impact on wholesale voice termination cost.
The respondent considers that the generic operator should not be modelled with 3G in the 900 MHz frequency band as it has only 10 MHz in this band.	**Comment accepted** It is unclear why the generic operator could not have 5MHz dedicated to 2G and 5MHz dedicated to 3G in the 900 MHz band and the respondent does not provide additional data or additional analysis to support this view. No other respondent raised this issue. However since 3G in 900 MHz is a reality for the Romanian market and already implemented by 2 large mobile networks, the generic operator will be investigated both with and without 3G in 900 MHz..
The respondent considers that having the core elements uniformly loaded is incorrect.	**Comment cannot be accepted (absence of necessary supporting data)** No other respondent submitted such a comment and the respondent does not provide supporting data.
The respondent asks for the definition of NMS, and asks why ANCOM did not request for information on this as well as the STP and number portability platform.	**Comment cannot be accepted (incorrect or inconsistent)** The NMS is the Network Management System. Other operators took the opportunity of the data request to add additional items and data (see response above in "*Issue 1: General comments*"). The respondent provided an updated cost for the NMS the 18th of January 2013 and this new cost has been implemented.
The respondent provides updated figures for the 2G microcell/IBS and 3G microcell/IBS costs.	**Comment accepted** The new cost has been implemented.

✂	The respondent states that the routing matrix should be revised for the generic operator for MGW, MSC-S and HLR	**Comment accepted** The routing matrix has been revised for the generic operator for these three equipment.

Issue 8: Network dimensioning – Geotypes

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Respondent	Comments received	Response
✂	The respondent criticises the definition of the geotypes, especially because of their unbalance: "*While the combination of the „dense urban" and „urban" geotypes includes less than 16% of the population and less than 0.3% of the area of Romania, the „rural" geotype includes close to 55% of the population and more than 96% of the country's area, which seems clearly unbalanced.*" The respondent has performed a thorough analysis and suggests to adapt the geotypes with the following values: 1. Urban 1: localities with density over 3000 hab./km² 2. Urban 2: localities with density over 1000 hab./km² 3. Urban 3: localities with density over 300 hab./km² 4. Rural 1: localities with density over 100 hab./km² 5. Rural 2: localities with density over 30 hab./km² 6. Rural 3: localities with density over 10 hab./km² 7. Rural 4: localities with density below 10 hab./km².	**Comment accepted** The 4 geotypes have been adapted according to the suggestion of the respondent. The number of geotypes (7) seems however quite important regarding the difficulty to obtain data among operators (for instance coverage and cell radii). It is thus suggested to merge the geotypes Rural 2,3 & 4 into a single geotype. The definitive geotypes are thus defined as detailed in the table below.

	Before			After		
Geotype	Pop threshold	Pop. percentage	Area percentage	Pop threshold	Pop. percentage	Area percentage
Dense urban	6500	9.1%	0.1%	3000	15.9%	0.3%
Urban	3000	6.8%	0.2%	1000	16.2%	0.9%
Suburban	300	29.7%	3.3%	300	13.4%	2.4%
Rural 1	0	54.4%	96.4%	100	14.9%	9.1%
Rural 2	N/A	N/A	N/A	0	39.5%	87.3%
Total		*100.0%*	*100.0%*		*100.0%*	*100.0%*

	In the site localisation process the respondent has found 5 mistakes due to wrong locality identifications.	**Comment accepted but limited impact on the calculations and results** The 5 locations have been corrected. Some localities provided by operators do not match the localities list of the Census Office; however the mismatch amounts to less than 3% of the total number of sites and less than 3% of the total traffic so the impact is marginal. Moreover the respondent provided updated locations to its sites which helped to reduce the amount of mismatches.

	The respondent disagrees with the lack of distinction in the traffic split between voice and data traffic and between 2G and 3G networks. The respondent details how the traffic split between voice and data differs significantly between geotypes.	**Comment accepted** The split of traffic between geotypes is now performed on a service/technology basis (see Issue 4: Network dimensioning – Busy hour and traffic parameters).
✂	The respondent states that it appears that the model geotypes were used in preference to those of operators in classifying base stations in the data provided by operators. The respondent states that this approach is unusual, may introduce distortion and makes it difficult to compare the model results with an operator's own figures (such as average cell radii).	**Comment cannot be accepted (inconsistent)** The respondent provided for each of its site the "geoype cluster" but did not detail the characteristics of each geotype. The common definition of geotypes among operators enables comparison. Moreover the model is calibrated to reflect the actual number of sites as calculated in each geotype (see Issue 9: Network dimensioning – Utilisation factors).

Issue 9: Network dimensioning – Utilisation factors

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Respondent	Comments received	Response
✂	The respondent suggests to update the utilisation factors in order to better capture the "*need to take into account both short term spikes of traffic and the time needed to react between when a given network element reaches an alert load and the time when it is operationally upgraded*." The respondent furthermore states that "*when dimensioning the average traffic capacity of a BTS in a geotype, a model needs to take into account both the fact that the average BTS capacity in terms of TRXs will be below the maximum capacity of an individual BTS and the fact that the average capacity of these TRXs will be below the maximum capacity of an individual TRX.*" The respondent provides a benchmark where the cumulated utilisation factor (for BTS and TRX) ranges from 10% to 74%.	**Comment accepted (partially)** A utilisation factor is added for the radio access network dimensioning. As no data was submitted on the utilisation factor used internally by the respondent, the Model relies on a calibration of the utilisation factors based on the current number of sites for each operator.

Issue 10: Network dimensioning – Coverage *versus* capacity sites

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Respondent	Comments received	Response
✂	The model calculates a number of 2G sites that are almost constant for the period 2006 - 2012. However in the period 2006 - 2012 the respondent's traffic has grown significantly as well as the number of sites, whereas coverage has stayed relatively stable (the respondent current level of coverage was achieved in 2006).	**Comment accepted** The respondent's comment and data has been used to better calibrate the model.
	The respondent strongly warns against the lack of capacity (densification) sites, both in 2G and 3G	**Comment accepted** As detailed in the model documentation: "Considering the above 2G/3G sites dimensioning results, it appears that the coverage provided by operators is sufficient to deliver the traffic demand, which in turn leads to a low number of densification sites. Although these results may be correct, it is nonetheless expected from the operators to provide comments on this matter and if needed to fine tune the inputs in order to better reflect their RAN structure (coverage vs. densification)" The inputs provided during this Public Consultation were thus considered to better calibrate the model, especially for the coverage versus capacity sites.
✂	In 2G, the respondent strongly warns against the lack of capacity (densification) sites. The respondent states that "*in all the public pure LRIC models used for comparison, in the long term, the generic operator's 2G capacity sites represent 20% to 70% of all 2G sites, with national specificities*."	**Comment accepted** This has been corrected with the utilisation factors. For the generic operator the 2G densifications sites amount to ~25% of total 2G sites in 2006 and rise up to ~85% of total 2G sites in 2020.

	In 3G, the respondent strongly warns against the lack of capacity (densification) sites. The respondent states that "*for 3G, the public pure LRIC models used by other European NRAs to regulate mobile termination rates can be divided in two groups:* • *In Sweden, Portugal, France and the UK, 3G capacity sites are calculated in order to increase the network capacity. The portion of such capacity sites amongst total sites depends mainly on the forecast share of traffic that will be carried by the 3G network. As an example, in the UK, the portion of capacity sites among total sites in 2020 is assumed to exceed 60%.* • *In Denmark and the Netherlands, densification to carry 3G traffic is not modelled using additional sites but rather through a 'breathing factor', which models the fact that 3G cells reduce their coverage radii when traffic increases (and therefore a higher number of cells is needed but they are not labelled as capacity sites, although they do generate costs that are taken into account in termination costs).*"	**Comment accepted** This has been corrected with the utilisation factors. For the generic operator the 3G densifications sites amount to 0% of total 2G sites in 2006 and rises up to ~80% of total 3G sites in 2020. The utilisation factors are added on top of the spare-capacity mark-ups for the traffic. The spare capacity mark-up have been kept in the model, the rationale being that the spare capacity mark-up is a macro strategic planning parameter whereas the utilisation factor is a micro technical engineering parameter. The RAN usage factor is deduced from the past "real" traffic and past "real" network of the operator so it is calculated only once. In fact it should have been an input by the operators, not a calculation by the model (the RAN usage factor is thus a technical input and not a free parameter). The RAN utilisation factors are used to achieve the correct amount of sites for the operators with a calibration for 2011/2012. However the utilisation factors are not used to dimension the number of 2G TRX or 3G transceivers as this would unnecessarily over-dimension the network (the spare capacity mark-ups are however kept for the dimensioning of the 2G TRX and 3G transceivers).
✂	The respondent criticises the approach of taking the average of the coverage of each operator to define the coverage of the generic operator. This is potentially problematic, because operators plan coverage with reference to a number of factors, including the amount of incremental traffic a new site might be expected to generate. A simple average of operators' coverage might therefore not accurately reflect the coverage that an operator with 25% share of the market would deploy.	**Comment cannot be accepted (absence of necessary supporting data)** It is difficult to assess the coverage strategy of the generic operator but it can be assumed that coverage is relatively independent from the market share: it is of utmost importance for operator to deliver a sufficient coverage so as to be competitive on the retail market (consumers may prove reluctant to subscribe to an operator with insufficient coverage). This is why (as detailed in Issue 1: General comments) the coverage of the generic operator has to be based on the coverage of all Romanian operators.

The respondent states that establishing the coverage of the generic operator may be problematic because there is no guarantee that the definitions of land area coverage used by different operators are consistent, as the signal strength criteria and indoor or outdoor coverage differentiation was not asked.	**Comment cannot be accepted (absence of necessary supporting data)** As detailed in *Issue 2: Network dimensioning – Cell radii* the coverage area of a site can be subject to very technically detailed and thorough studies which would not be relevant in the project given the level of data that the operators can provide. The model relies as much as possible on data provided by operators with consistency check as well as measures performed by ANCOM (such as the "M7 market analysis" round 2 and 3). Based on the data submitted by operators and best practices in cost modelling, TERA Consultants is of the view that the modelling assumptions used to dimension radio access networks for a given level of coverage and traffic are fit for the purpose of deriving the costs of some wholesale services under standard QoS levels.
The respondent states that using average cell radii for the generic operator is a serious error, because base stations maybe built either for coverage or to increase traffic capacity (densification). If the cell radii are tuned to the total number of base stations an operator has, then there is a serious risk of over-estimating the number of coverage base stations. If that happens, then an excessive proportion of costs will be allocated to coverage, at the expense of traffic capacity.	**Comment cannot be accepted (absence of necessary supporting data)** While the comment was relevant when the issue of coverage *vs* densification was not tackled, this has been revised (see Issue 10: Network dimensioning – Coverage *versus* capacity sites, where it is detailed that the model delivers a strong share of 2G and 3G densification sites). Moreover the respondent did not provide cell radius so the Model relies on data provided by other operator.
The respondent states that the model may have misinterpreted the data provided by the respondent on the numbers and types of base stations. The respondent has provided revised figures.	**Comment partially accepted** The model correctly interpreted the data initially provided by the respondent. The model now considers the new data provided in the sheet "Revised 3.2" of the excel file Annex 2.xls provided by the respondent.

The respondent summarises its criticism by stating that a better approach might have been to start with cell radius information provided by operators in relation to their own networks, in relation to their own geotype definitions and with properly defined and consistent coverage criteria. It would also be appropriate to give most weight in considering the coverage of the generic operator to real-life operators with a similar market share.	**Comment accepted** As detailed in the model documentation: "Considering the above 2G/3G sites dimensioning results, it appears that the coverage provided by operators is sufficient to deliver the traffic demand, which in turn leads to a low number of densification sites. Although these results may be correct, it is nonetheless expected from the operators to provide comments on this matter and if needed to fine tune the inputs in order to better reflect their RAN structure (coverage vs. densification)" The inputs provided during this Public Consultation were thus considered to better calibrate the model, especially for the coverage versus capacity sites.

Issue 11: Network dimensioning – Transmission dimensioning

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Respondent	Comments received	Response
✂	Transmission network in the LRIC model is based exclusively on microwave links, while the mobile networks in Romania use both optical fibre and microwave.	**Comment cannot be accepted** The model implements leased lines, fibres and MW (the respondent stated that its RAN backhaul was ~✂% MW).
	No IP transport equipment is being considered in the LRIC model whereas the respondent's network contains IP transport equipment.	**Comment cannot be accepted** The model implements the equipment as provided by the respondent. It considers an access transmission network (backhaul) and a core transmission network (backbone). The backhaul is implemented considering aggregation nodes and hubs using wireline and wireless links as provided by the operators.
	Most of the MW links are built with less than 16E1 and does not reflect the reality of mobile networks in Romania. In the respondent's network there are only few MW links with less than 16E1, the MW equipment being mainly with hybrid technology (IP&TDM). The MW links with less than 16E1 requests 7MHz bandwidth, while the other ones with hybrid technology (IP&TDM) request more bandwidth: 14MHz or 28MHz corresponding to traffic needs. Because the proposed model doesn't include the IP technology, they consider only MW in 7MHz.	**Comment accepted** The transmission network calculation has been reviewed to reflect more accurately the network of the operators. As a consequence although the RAN backhaul is mostly made of 7MHz MW links, there are 14 MHz links and 28 MHz links further upstream in the network to cope with aggregated traffic.
	The respondent finds a huge discrepancy in terms of the number of 7 MHz MW links between the generic operator and the respondent.	**Comment cannot be accepted** The difference is explained by a different link distribution between leased lines and wireline: there are less MW links for the generic operator but more wireline links.
	According to telecom standards (SDH standard), the STM1 can transport only 63E1 and STM4 can transport 252E1, the model should be corrected accordingly.	**Comment accepted** This has been corrected in the 4.0 Design parameters sheet.

	When modelling transmission between BSC and MGW, the BSC in the model has ~ 7400 Erl; but this traffic cannot be transported on only 2 STM1: 2 STM1 x 63 E1 x 31 TS = 3906 Erl <7400 Erl. And even more, this connection is protected, so the number of STM1 considered should be doubled. The correct calculation is as follows: 7400 Erl/31 TS/63 E1 = 3.8 STM1 - meaning 4 STM1 needed for connecting 1 generic BSC to MGW. 4 additional STM1 are needed for protection. Considering the above, the total STM1 required for transmission are as follows: • 8 STM 1 ports in BSC • 8 STM1 ports in MGW • 8 STM1 links between BSC & MGW	**Comment accepted** The comment is accepted and a minimal 8 STM1 per BSC and BSC/MGW is implemented in sheet 4.5 Nwk design transmission (cells J11 and J13).
✂	The respondent states that the model only models 14 MHz microwaves bandwidth links whereas the respondent's network is made of 7/14/28 MHz links.	**Comment cannot be accepted** The model already implements 7/14/28 MHz dimensioning and provides 7 and 28 MHz links for the respondent.

The respondent states that the spectrum fees for the MW links have not been implemented.	**Comment accepted** The model implements on top of the equipment OPEX the (weighted average yearly) spectrum fees due by the operators given their MW frequency endowments, valid for the years 2011 and 2012, (alternatively, under the conservative assumption that all MW links use the frequencies between 3 GHz and 12 GHz) as provided by ANCOM (cells M650-Q656 in the operators sheets 2.1 to 2.6). For the generic operator : • 79.6€/annum per station for 7MHz links (159.3€/annum per link) • 129.6€/annum per station for 14 MHz links (259.3€/annum per link) • 179.1€/annum per station for 28 MHz links (358.2€/annum per link) These values are kept constant over the entire period.
The respondent states that the transmission for IBS is not 100% wireline but is made of MW and wireline.	**Comment accepted but limited impact on the calculations and results** At this stage the model implements a 100% wireline transmission for IBS, however the impact of having a wireline & MW transmission would be minimal for the final result.
The respondent states that no leased lines links have been modelled.	**Comment cannot be accepted** The Model does integrate leased lines. A blended unit cost is calculated for the wireline links, taking into account the share of LL and owned links for each transmission speed. The data is implemented in the model in sheets 2.1-3.0.

The respondent states that the number of E1 links over a 7, 14 and 28 MHz links as it appears in the model was calculated considering a 64QAM modulation whereas in a real network, the most common modulation is 16QAM so the model should follow conservative capacities: for 7 MHz link 10 E1, for a 14 MHz 20 E1 and for a 28 MHz 40 to 45 E1.	**Comment accepted but limited impact on the calculations and results** The model implements these new values.
The respondent states that the transmission cost is underestimated and is not based on all the costs provided.	**Comment accepted** The model implements the updated costs provided by the respondent.
The respondent states that no OPEX related to the MW spectrum was included in the model.	**Comment cannot be accepted (incorrect)** The model is based on the MW spectrum Opex provided by the operators and by ANCOM on an aggregated level.

Issue 12: Cost inputs – CAPEX		Table of contents
Respondent	Comments received	Response
✂	Costs were all provided in Euros, however some cost have been misinterpreted as being labelled in RON leading to significant cost decrease (especially for BSC and RNC).	**Comment accepted** This has been corrected.

The model considers separately the economic life for software equipment only for MSC-S asset category. Considering that the software component is a very significant part of the respondent's equipment we believe that economic life should reflect the mix of assets (hardware and software) that comprise the asset categories.

Comment accepted

Based on other operators' submissions the economic lives have been revised to be more conservative and in line with the 2006, and this has been applied for all operators as well as the generic : the minimum value of the economic lifetime calculated for the generic operator and the 2006 values is applied.

Evolution of economic lifetime for the generic operator (applied as Min. of both values)

		Before	2006 Model	Min. of both values
BTS		8	9	**8**
Node B		8	N/A	**8**
2G TRX		8	9	**8**
3G Transceivers		8	N/A	**8**
Repeaters		8	N/A	**8**
BSC		8	5	**5**
RNC		8	5	**5**
MGW		8	5	**5**
MSC-S	HW	8	5	**5**
	SW	4	5	**4**
HLR		8	8	**8**
VLR		8	8	**8**
VMS		7	8	**7**
VAS		7	8	**7**
SMS-C		7	8	**7**
MMS-C		7	8	**7**
SGSN		8	8	**8**
GGSN		8	8	**8**
Intelligent Network		7	8	**7**
Billing Platform		7	3	**3**
MW link		7	6	**6**
FO		15	N/A	**15**
Site - Pole/Mast/Pylon		10	N/A	**10**
Site - Building		10	N/A	**10**

✂ The respondent states that the formula used to extrapolate the price from the past is incorrect (multiplication by 1-Price_trend instead of dividing by 1+Price_trend).

Comment accepted

The formulae has been corrected.

✂	The respondent states that civil works for the radio access have not been implemented	**Comment cannot be accepted** The model does include all the costs provided by the respondent (provided costs are similar or above costs provided by other respondents, which include civil works,).
	The exchange rate used in the model for conversion from RON to Euro (4.45) is different than the one used by the respondent for conversion from Euro to RON (4.24) in 2011.	**Comment accepted but limited impact on the calculation and on the results** The exchange rate has been changed accordingly.

Issue 13: Cost inputs – Cost variability

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Respondent	Comments received	Response
✂	The respondent asks to consider its input on variable components: in general, the telecom equipment is designed to have internally different functional blocks, each block having its own functions and responsibilities: • BSC • MSC / GMSC / MGW • STP • Mobile Number Portability Platform • HLR • VMS • IN • NMS • Billing platform (Interconnect billing module - PRM)	**Comment cannot be accepted (incorrect or inconsistent).** Operators have repeatedly stated that the dimensioning of a network is performed on a long term basis and that the model takes a too short-term view by adjusting the dimensioning on the current traffic without taking into account the expected traffic growth. As a consequence, on these specific equipment, the model considers: • BSC are fully variable to the (incremental) traffic • MSC / GMSC / MGW are partly variable to the (incremental) traffic • STP is not variable to the (incremental) traffic • Mobile Number Portability Platform may only be incremental with regards to the outgoing traffic, as such it is not included in the Pure LRIC calculation which is focused on the incoming traffic increment. • HLR is dependent on the number of subscribers and is partly incremental to traffic services • VMS has a low impact on the cost of voice termination (this is a service provided first and foremost to the operator's retail customer) • IN is not variable to the (incremental) traffic • NMS is not variable to the (incremental) traffic • Billing platform is not variable to the (incremental) traffic since mobile operators have a single billing platform for both retail and wholesale, whose cost is largely driven by the complex retail billing schemes.

The respondent states that general business costs (number of staff, premises, rent, facilities) depend indirectly on volumes of traffic and should be included in Pure LRIC calculation.	**Comment cannot be accepted (inconsistent)** As the respondent states it, the general business costs have only an indirect relationship to volumes of traffic and there is no clear explanation provided as to why the removal of (incremental) voice termination traffic would impact these costs (apart from the dedicated interconnection staff cost). See also Issue 19: Pure LRIC – Design parameters for more details.

Issue 14: Cost inputs – Site collocation

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Respondent	Comments received	Response
✂	The respondent disagrees with both the level of cost reduction percentage applied of 30% and the way it is applied in the model. The respondent estimates savings on civil works due to collocation account between 21% in case of rooftops to 71% on greenfield pylon sites.	**Comment accepted but limited impact on the calculations and results** Out of efficiency considerations, various degrees and forms of site collocation and access are generalised practices among communications operators in Romania, including between mobile operators. With further investments in sites to match forecasted demand levels, it is also expected the significance of site collocation to increase. Furthermore, a study performed by ANCOM in 2011 has indicated that a 30% cost saving can be reached through site access. The inter-operator site collocation reduction cost was implemented as to capture the economies of scale performed by operators with *de facto* inter-operator site collocation. The model assumes 20% of the site pylons are collocated, using the site distribution per geotype and the cost savings as indicated by the respondents, 70% of civil works. As for the rooftops, ANCOM does not believe 10% collocation would be an overestimation of an efficient access network. As a conclusion, 10% of sites are now collocated with a 30% cost saving. This leads overall to a 3% decrease of the total cost of all the sites. For example if there are 1000 sites and each site cost 100, the total is 100k. If there are 10% of the sites (100 sites) with a cost reduction of 30% (they cost 70), the total cost is 900*100 + 100*70 = 97k (i.e. 100k less 3%).
✂	The respondent states that the percentage of collocated sites is higher than its own current value and should be adjusted accordingly.	
✂	The model assumes that *de facto* collocation is available to operators at 20% of sites and that where it is in operation a saving of 30% over the costs of a sole-occupancy site can be achieved. The respondent views this as excessively ambitious for a number of reasons: 1. Site-sharing is only likely to lead to savings on tower sites. 2. Different commercial models exist for sharing tower sites 3. smaller operators may not be able to obtain sharing agreements in as many locations and are likely to have a smaller proportion of shared sites. The respondent provides updated data to better fine tune the collocation parameters: ✂% of all sites are collocated, all of them pylons The distribution of collocated pylons per geotype is ✂% rural, ✂% urban, ✂% sub-urban.	

Issue 15: Cost inputs – OPEX

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Respondent	Comments received	Response
✂	The model calculates OPEX based on the mark-ups applied to CAPEX for each network component, resulting in a descending trend for OPEX associated to network equipment The respondent considers that OPEX trend in the model is not acceptable and must be reviewed. There is a minimum 5% annual increase as per the respondent's estimations.	**Comment accepted** The CAPEX and OPEX trends have been harmonised between operators and the generic operator, the CAPEX trend is now set at a -5% pace and the OPEX markup trend at a +10% pace (leading to a unitary OPEX trend in absolute value of +4.5%).

Issue 16: Depreciation methodology		Table of contents
Respondent	Comments received	Response
✂	The respondent recommends the use of an economic depreciation.	**Comment accepted** As referred to in the Conceptual framework the model now implements an economic depreciation in sheets 8.2 and 8.3. In slide 69 of the conceptual framework, ANCOM explained that it "*intends to calculate depreciation for the mobile model either with the economic depreciation approach or with the tilted annuity approach, depending on the outputs of the discussions with operators because these depreciation methods provide appropriate economic signals".* NRAs need to send appropriate economic signals to the operators, and they generally use economic depreciation when setting regulated charges. The use of tilted annuities and adjusted tilted annuities can be a good proxy for economic depreciation (cf. Norwegian NRA and Danish NRA that state that in "*a fixed network, circuit-switched traffic levels are generally stable, and so tilted annuities are often chosen as a proxy for economic depreciation*"[1]). However tilted annuities need sometimes to be adjusted in order to take into account increasing/declining levels of output and OPEX trend. Based on operators' comments, as well as the strong traffic growth and the OPEX trend, it appears that the most appropriate depreciation approach from an economic point of view in the context of mobile networks in Romania is the economic depreciation approach. Moreover the Pure LRIC economic depreciation in sheet 8.3 is calculated both for a constant cost over the calculated period (2006-2030) and with an output profile that takes into account a CAPEX and OPEX trend.
✂	The respondent criticises the implementation of a tilted annuity depreciation and requests the implementation of an economic depreciation.	

[1] NPT, Conceptual approach for a LRIC model for wholesale mobile voice call termination Consultation paper for the Norwegian mobile telecoms industry and 27 February 2006 Analysys, LRAIC model of mobile termination: specification consultation paper for industry, 2007

✂	The earlier consultation on modelling methodology concluded that a tilted annuities methodology was appropriate. Currently the model has also implemented economic depreciation. The respondent considers that the use of tilted annuities is appropriate for the modelling exercise.	**Comment cannot be accepted** Although the model implements both a tilted annuity and a pure LRIC depreciation, only the economic depreciation is used for setting regulated termination rates.

Issue 17: Cost allocation – Cost allocation to subscribers

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Respondent	Comments received	Response
✂	The respondent states that a portion of the MSC cost is driven by subscribers rather than traffic. Given that processing is only one of the two key constraints for MSC dimensioning and given that subscribers only account for no more than 25% of the processing, the portion of MSC cost that should be allocated to subscribers should be no more than 12.5%.	**Comment accepted but limited impact on the calculation and on the results.** The model provides an option to allocate costs to subscribers in order to reflect the situation where mobile networks provide their customers access services alongside traffic services. The approach also ensures a level-playing field between fixed operators and mobile operators, at the same time taking due account of the variability of mobile access networks to traffic. This is kept as an option for stakeholders to perform analysis on the cost structure.
✂	The respondent disagrees with the allocation of a portion of cost to subscribers and considers that costs should be recovered through the traffic services (per minute, per SMS, per MB and similar).	

Issue 18: Pure LRIC – General comments		Table of contents
Respondent	Comments received	Response
✂	The respondent remains of the opinion that "*LRIC+ or LRAIC is the most appropriate methodology for setting MTRs as it strikes the appropriate balance between consumer welfare (and Romania already has among the lowest prices for mobile communications), sustainable competition and incentives to invest*." The respondent also states that "*whilst the European Commission recommendation on termination rates clearly advocates a pure LRIC approach, it is still necessary to take national circumstances into consideration*."	**Comment will be dealt with in the next phase of the Consultation Process** The principle of pure LRIC methodology is not discussed during this phase of Consultation Process.
✂	The respondent argues against the use of Pure LRIC methodology because of several drawbacks: 1. *"Prevention of cost recovery"* 2. *"No net benefit to consumers"* 3. *"Negative impact over specific category of end users: low income end users and mobile users"* 4. *"International payment flow imbalances"* 5. *"Member states should choose the most appropriate method for their national circumstances"*	

✂ The respondent argues against the use of Pure LRIC methodology, and provides some insights on several aspects, especially:

1. *"Ensure fair competition, promote sustainable competitive markets and ensure undistorted and unrestricted competition"*
2. *"Protect user and consumer interests"*
3. *"The failure of Pure LRIC to ensure proper cost recovery"*
4. *"Likely adverse consequences of reducing interconnection rates too far"*
5. *"Retail prices and service usage"*
6. *"Investments"*

Issue 19: Pure LRIC – Design parameters

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Respondent	Comments received	Response
✂	The respondent disagrees with the split of traffic between 2G and 3G. Due to very low adoption of terminals with UMTS capabilities in Romania (only 29% in 2012), voice traffic distribution between 2G and 3G networks is currently 75% 2G - 25% 3G. In the hypothetical model scenario of no call termination service, a higher proportion of voice traffic will be carried by the 2G network.	**Comment cannot be accepted (inconsistent)** Whereas the model is now based on a more conservative traffic migration profile (see Issue 3: Network dimensioning – Traffic (2G & 3G) and subscribers inputs) it is unclear why the removal of (incremental) voice termination would have an impact on the traffic distribution between 2G and 3G: operators have repeatedly stated that a large share of their subscribers have 2G-only handsets so the 2G/3G traffic distribution is driven by this constraint rather than by a 2G/3G optimisation process. Moreover other respondents have stated that given the capacity available on 3G network, pure LRIC applied on 3G network is lower than pure LRIC on 2G network (see Issue 3: Network dimensioning – Traffic (2G & 3G) and subscribers inputs); the suggestion of the respondent would thus have the effect of reducing the calculated pure LRIC cost, it is thus conservative not to implement a dynamic 2G/3G traffic ratio
	The respondent asks for the implementation of cell breathing. Within 3G networks the cell size is determined by the level of traffic At lower levels of traffic the cells will grow and a significantly lower number of 3G cells will provide the same level of coverage compared to the scenario where all traffic services are provided.	**Comment cannot be accepted (absence of necessary supporting data)** Operators did not provide any data on which the model could rely to implement cell breathing. Moreover as another respondent has stated (see Issue 10: Network dimensioning – Coverage *versus* capacity sites) some other public mobile models implement directly densification sites that capture 3G pure LRIC cost, and the revised version of the Romanian model now calculates such sites.
	The respondent believes spectrum should be a variable asset. The optimal amount of spectrum and associated value is determined by the network's capacity requirements and its ability to generate revenue. At lower levels of traffic there will be a different optimisation of spectrum and spectrum value - e.g. the efficient operator might require 2x2.5 MHz less spectrum at actual prices, or would only value its existing spectrum	**Comment cannot be accepted (incompatible with standard approach)** The Commission recommendation on termination rates (2009/396/EC) assumes that a large share of the cost incurred for spectrum is not traffic-driven and should not be allocated to pure LRIC:

holding at 80% of the price paid under the assumption that all services are offered.

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> *“The costs of spectrum usage (the authorisation to retain and use spectrum frequencies) incurred in providing retail services to network subscribers are initially driven by the number of subscribers and thus are not traffic-driven and should not be calculated as part of the wholesale call termination service increment.”*

However the Commission states that the costs of acquiring additional spectrum for additional capacity should be taken into account **where possible**:

> *“Spectrum to increase capacity (above the minimum necessary to provide retail services to subscribers) for the purposes of carrying additional traffic resulting from the provision of a wholesale voice call termination service should be included on the basis of forward-looking opportunity costs, where possible.”*

In fact there are rather some strong arguments against the inclusion of "variable spectrum costs" for the pure LRIC:

1. First, there is no thorough economic study on this differentiation between "non-traffic driven" and "traffic driven" spectrum cost, which is quite theoretical.
2. Second, spectrum scarcity is a widespread trend in Europe with operators complaining of huge increase in capacity demand, especially for <u>data</u>. In this context there is no basis for an operator acquiring less spectrum because of less <u>voice</u> traffic (i.e. wholesale voice termination)

These arguments are included in the recent 2011 British regulatory authority (Ofcom) decision on MTR (15 March 2011, “*Modelling Annexes 6-10*”) where it states that when removing wholesale termination, the operator faces a trade-off which can be summarized as :

1. Either keeping its spectrum and reducing the size of its networks because of a lower capacity demand...
2. ...or releasing some spectrum but keeping the same network size (a lower amount of spectrum leads to a higher amount of densification sites)

Ofcom believes that it is reasonable to assume that the two approaches lead to the same result, i.e. the additional cost of spectrum for additional capacity should not be different from the additional cost of the network for

*	(the same) additional capacity :
*	(Ofcom *op. cit.*, page 110): "*at the margin, the willingness to pay for additional spectrum required to deliver a given amount of traffic would be no more than the network costs otherwise required (i.e. if network equipment rather than spectrum were used to provide the additional capacity). As our MCT cost model determines pure LRIC based on the network costs with and without termination volumes, it explicitly measures the avoided network costs for the traffic increment in question*".
*	(Ofcom *op. cit.,* page 115): "*the willingness to pay for spectrum needed to provide MCT would not be more than the network costs avoided if MCT were not provided*".
*	The methodology is thus in line with Ofcom's view not to include spectrum cost in pure LRIC, both for theoretical and practical reasons (performing an economic study on this differentiation between "non-traffic driven" and "traffic driven" and providing a valuation of the cost of "traffic driven" spectrum would be very difficult and highly sensitive).
*	(Note: of course for the backhaul links microwave fees are variable and included in the calculation).
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*	
*	
The respondent believes that site rental costs should depend on the traffic level. A major constraint that network operators are increasingly exposed to is the scarcity of sites in urban areas. As a result the site rentals that are paid to landlords are a function of the number of required sites which in turn is a function of traffic.	**Comment cannot be accepted (absence of necessary supporting data)** Implementing such a site rental increase due to traffic increase is without precedent in the modelling practice, would prove difficult as no supporting data was provided by the respondent and the final impact on the results would probably be low. Furthermore, while there's no indication scarcity of urban sites is indeed traffic driven, efficient access network provision allows for collocation.
The respondent notes that the pure LRIC calculation should include a share of support function costs. Whilst these costs are often termed as overheads, they are in fact fully scalable with respect to traffic. The respondent produced an analysis of support function costs related to traffic, for different operating companies.	**Comment cannot be accepted (incompatible with standard approach)** Although support function costs are indirectly related to traffic volumes, traffic volumes are themselves related to other factors such as the size of the subscriber base. It is thus unclear why the removal of (incremental) voice termination traffic would impact these costs (apart from the dedicated interconnection staff cost). The Ofcom for instance does not

		include a contribution to such costs as they would not be affected by the end of voice call termination (see Ofcom, Wholesale mobile voice call termination, Modelling Annexes, 15 March 2011). Analysis of the individual operators' financial accounts indicates overheads are not scalable to traffic. Finally the analysis produced by the respondent compares operators in different countries with the voice traffic (in minutes) and the Opex (GDP adjusted). It is difficult to conclude that the scalability is evident because there is no information on which countries are involved and on the specificities of the operator (size, commercial launch date, etc.) Moreover the correlation is not established as the R^2 is of 0.63 for 13 points, which is not statistically significant.
✂	Spectrum represents a very substantial up-front cost for operators and it is reasonable to assume that they would buy sufficient to meet their expected needs over the license period in the same way that they would buy, for example, switching capacity. Under LRIC methodologies, a long-term view of cost is taken, so that as many costs as possible can be treated as being variable. This should apply to spectrum cost as much as to anything else. ANCOM should in due course and in consultation with operators calculate with reference to the cost model to what extent the notional operator's traffic without terminating minutes could be carried using less spectrum and apply a proportionate cost saving to the spectrum license fee assumed in the model.	**Comment cannot be accepted (incompatible with standard approach)** The comment is similar to the one provided by another respondent above, see answer above.