Calculation of the costs of efficient provision for some electronic communications services provided at the wholesale level in Romania

A report summarising the responses to the Public Consultation document related to the fixed core model

PUBLIC VERSION

Purpose: To summarize 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 – Fixed core model.

August 2013

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2 List of acronyms

ANCOM	National Authority for Management and Regulation in Communications (Romanian NRA)
ARCEP	French regulatory authority
BH	Busy Hour
CAPEX	Investments
EC	European Commission
FTR	Fixed Termination Rate
LRAIC+	Long Run Average Incremental Cost
LRIC	Long Run Incremental Cost
MEA	Modern Equivalent Asset
MPLS	MultiProtocol Label Switching
NGN	Next Generation Network
NRA	National Regulatory Authority
OPEX	Operating costs
OPTA	Dutch regulatory authority
PSTN	Legacy network
SDH	Synchronous Digital Hierarchy
VoIP	Voice over IP
WACC	Weighted Average Cost of Capital

3 Introduction

1. ANCOM ("National Authority for Management and Regulation in Communications") published on the 14th of November 2012 a Consultation document related to the calculation of the costs of efficient provision for some electronic communications services provided at the wholesale level in Romania and the associated Microsoft Excel model called the fixed core module.
2. In the frame of this consultation. an analytical cost model of an efficient core network of a fixed operator (Core Model / Annex 1 – model LRIC fix core) together with the associated Core Model Documentation (Annex 2 – documentatie model LRIC fix core), have been prepared by TERA Consultants. For the purposes of public consultation, all confidential information has been removed from these files.
3. These documents were presented to the Romanian operators during an industry group meeting on the 5th of November 2012, together with the operator specific confidential model version for Romtelecom.
4. Following the public consultation, ANCOM has received a set of comments from Romtelecom.
5. The following section summarises the analysis of all stakeholders' comments and the responses of TERA Consultants and ANCOM.

4 Main changes made to the Fixed Core Model as a result of the comments received

Several comments were received from Romtelecom and Ernst & Young in December 2012. They relate to the following issues:

- **Issue 1: Model size.** Significant reduction of the size of the model by off-setting calculations in order to enable sensitivity analysis in rapid manner.
- **Issue 2: Transparency of the model.** Off-set of several calculations that may render the model more transparent.
- **Issue 3: Modelling errors.** Adjustment of the model in order to take into account the different points listed.
- **Issue 4: Sensitivity of the model.** The model is sensitive to traffic as it re-dimensions the network and more particularly equipment at the different nodes when traffic changes. In case of termination, the comparatively lower sensitivity of termination cost to traffic is related to the use of the pure LRIC approach which recovers of the avoidable costs of wholesale termination.
- **Issue 5: Forward looking MEA principles.** It should be reminded that two scenarios have been developed in the model as detailed in the Conceptual Framework: the specific and the generic operator scenarios. MEA principles have been therefore applied in an appropriate manner.
- **Issue 6: Scorched node approach.** The model resizes the network, including ring dimensions and capacities, when traffic is adjusted. The argument regarding the invariance of the model in respect of traffic is therefore not relevant.
- **Issue 7: Treatment of VoIP and PSTN traffic.** All types of traffic have been well implemented in the model, especially on-net and off-net traffic for VoIP.
- **Issue 8: Network demand calculation.** The model retains now the respondent's suggested calculation for voice and leased line demand. But for demand related to data, the respondent's proposal cannot be retained as it leads to undermine the associated volume of traffic. Regarding the application of a CVR to transmission equipment, it is considered that this type of equipment is already resized in the model.
- **Issue 9: Switching.** The model has been adjusted so that the costs of the PSTN main equipment, as well as of the IMS platform, are relative to traffic volume.
- **Issue 10: Fibre and trench costs**. As observed in best practices, fibre and trench costs are not sensitive to traffic.

- **Issue 11: Operating costs.** OPEX shall vary in using the percentage mark-up to capital costs observed in 2011. Moreover, decommissioning costs shall vary in respect of traffic. However the level of costs to be considered cannot be taken into account in the model.
- **Issue 12: Interconnection specific costs.** According to best practices around Europe, these cost items do not vary in respect of traffic volume.
- **Issue 13: Indirect costs.** The model implements the last percentage provided. Regarding the number portability and supporting infrastructure costs, the model did not take into account the respondent's proposition as it has not been justified.
- **Issue 14: Working capital.** The methodology proposed for determining the ratio to be applied to the calculated reduction in annualised asset costs cannot be retained. The percentage proposed results from top-down accounting calculations whereas it is more appropriate to consider a bottom-up methodology, as it has been explained in the Conceptual Framework. Besides, the payment term shall remain as it is in the model.
- **Issue 15: Specific vs. generic operator.** Comment not retained since the implementation of the generic operator scenario is appropriate. Assumptions related to trench sharing, reduction in operating costs and the treatment of voice demand shall be maintained as it is in the model as Romtelecom did not provide any necessary supporting data.

As a consequence of the model changes to incorporate received comments, results of the model are as follows:

Results from the core network module – Specific scenario				
(Nominal EUR)	Original results	Results post adjustment	Absolute difference	Relative change
Voice termination cost per minute (2015)	0.0012	0.0016	0.0004	33%
PSTN termination cost per minute (2015)	0.0018	0.0018	0.00	0%
VoIP termination cost per minute (2015)	0.0007	0.0013	0.0005	85%
PSTN origination cost per minute (2015)	0.035	0.042	0.007	20%
VoIP origination cost per minute (2015)	0.001	0.004	0.003	300%
PSTN transit cost per minute (2015)	0.007	0.001	0.006	-85%
SDH Leased line <2Mbps cost per Mbps (2015)	25,454	18,462	6,992	-27%

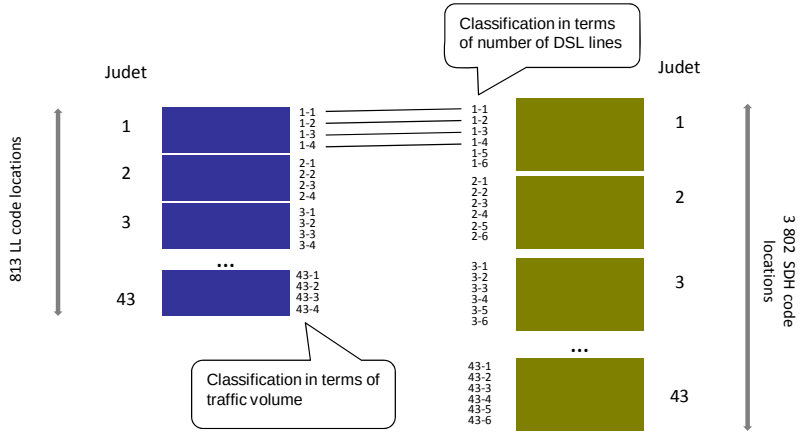
Results from the core network module – Generic scenario				
(Nominal EUR)	Original results	Results post adjustment	Absolute difference	Relative change
VoIP termination cost per minute (2015)	0.0011	0.0015	0.0004	38%
VoIP origination cost per minute (2015)	0.0010	0.0033	0.0023	230%

5 Responses to the Core Model and TERA & ANCOM view and position

Issue 1: Model Size		Table of content
Respondent	Comments received	Response
✂	The respondent states that analysing and testing the model is difficult and time consuming due to its tremendous size. In order to address these issues, the respondent recommends two adjustments: • Rationalization of the model by removing the power calculation and replacing it with a simple percentage mark-up; and • Optimization and or removal of the complex location/route calculations.	**Comment accepted.** The fixed core model uses extensive data and its size is important: almost 67 Megabytes when the model built up in 2005 accounts only for 2.5 Megabytes. However, in the vast majority of European countries, the move from the LRAIC+ cost standard to pure LRIC increased significantly the size of the model used by NRAs[1]. Indeed, the pure LRIC approach requires calculating the avoidable costs. In order to determine the appropriate level of costs with such methodology it is necessary to determine the traffic at each site. As it was not possible with the 2005 core model structure, it was necessary to implement additional calculations by far more numerous (but not exceptionally complex). On top of the use of this methodology, it is also to be noted that the respondent did not provide accurate data in spite of the numerous meetings and conference calls which were organized to explain issues encountered when implementing the model. One of the main concerns was related to the mismatch between the different site lists provided by the respondent for the different services. This issue occurred especially for leased lines, NGN services and the definition of the MPLS architecture. As highlighted during the Q&A session with the respondent in August 2012: • Regarding leased lines (LL), if the respondent specified a list of ✂location codes at which these services were provided, none of these codes corresponded to SDH locations codes (✂), MPLS locations codes (✂location codes for DSLAMs and ✂location codes for switches) or WDM locations codes (✂ WDM sites). The model used therefore assumptions in order to overcome these shortcomings. For SDH LL for example: o SDH leased lines were classified by decreasing traffic output in each judet with the classification code “judet-traffic rank”. o SDH LL with the highest traffic were then allocated to SDH location

[1] The size of the model which enables the pure LRIC calculation amounts to more than 15 Megabytes in France (Source: ARCEP, 2011)

codes (✂) with the highest traffic generated by PSTN voice services.



- Regarding NGN services, the respondent did not provide any information related to the distribution of its NGN customers whereas it was asked in the data request (see question 19, 20 and 21 of the Data request sent by March 2012). Due to this lack of information, the model uses the following methodology in order to determine the number of NGN customers at each site:
  - Romtelecom specified how many DSLAMs are used in each judet. This enables therefore to determine the number of customers per DSLAM in each judet. Besides, Romtelecom specified how many DSLAMs are installed per site. This enables to determine the number of customers per site for each NGN services.
  - The result is that all DSLAM in the same judet have the same number of NGN customers.
- Regarding the MPLS architecture, it shall be outlined that the data provided by the respondent was not accurate. For example, only 48% out of the total number of switches (i.e. ✂out of ✂) had a parent node. The model therefore makes the assumption that the traffic handled by these unassigned switches is distributed on an equally basis on the higher switching level in the same "judet".

The respondent was made aware of the fact that the inaccurate information it had

provided leads to these assumptions, whose implementation requires unnecessary and time consuming calculations in the model, but very few relevant data was sent in return by the respondent.
In this context, it is not fair and reasonable to debate about the size of the model on the respondent's side.
Nevertheless, it is proposed to reduce the size of the model by:

- Simplifying some calculations such as:
  - Space calculation related to MPLS equipment. Associated calculations have been removed from the "Space and Power" sheet and are now in the "MPLS Dimensioning" sheet; and
  - Mux cost calculation in the "SDH Costing" sheet.
- Removing some non-critical calculations from the core module to the service module such as the calculation of terminating and non-terminating minutes for each service.
- Pasting in value static calculations related to the distribution of ISDN lines in the "PSTN topology" sheet.

These adjustments are now sufficient to enable sensitivity analysis in rapid manner as the size of the model has been divided by more than two (now the size of the model accounts for 32 Megabytes).

Issue 2: Transparency		Table of content
Respondent	Comments received	Response
✂	The respondent believes that the model is not transparent as it is not clear enough where inputs shall be updated and how they are used in the model. Such approach does not to render the model comprehensible by a third party and leads then to inconsistent results when updating the model.	**Comment accepted.** The model already distinguishes the different data used. As mentioned in the spreadsheet "Index": • data in green are inputs and might be modified without impacting the model; • data in yellow are inputs copy pasted from the service module; • data in red results of calculations; and • data in black is a copy value. In addition to this, spreadsheets have been distinguished by category: those in green are related to inputs; those in reds carry out calculations and those in blue set out results. The model highlights the data to be updated in case of sensitivity analysis. Moreover, a dedicated spreadsheet now outlines all the data to be copy pasted from the service module which also has a dedicated spreadsheet to output for the core model. These adjustments will make it easier to understand links between both modules.
	The respondent stresses out several inconsistencies in the model, including a difference in the total quantity of voice terminating minutes between the "Voice consumption" sheet and the "Pure LRIC Costs" sheet whereas this parameter is one of the main important. Hence the respondent considers that this undermines the confidence in the model and raises the question of the consistency over all the parameters used.	**Comment accepted** The macro execution process of the pure LRIC calculation considered in the initial version non-terminating minutes out of the total traffic, PSTN plus VoIP, whereas only total PSTN traffic should have been taken into account. The model adjusted therefore so that the calculation is appropriate. The number of terminating minutes was not appropriately displayed in the spreadsheet "Pure LRIC Costs". In order to improve the auditability of the model, a clear split between terminating minutes and non-terminating minutes has been implemented in the service module and is explicitly displayed in the core module.
	The respondent also points out that it is difficult to run simple sensitivities in the core module as many parameters shall be manually copied from the service module. The respondent considers that changes of traffic volumes or busy hour traffic shall automatically change the overall network dimensioning and the final cost calculation in conventional bottom-up models. The respondent recommends including dynamic	**Comment accepted.** As outlined above, a dedicated spreadsheet "Output Service Module" has been created, including all data to be copy pasted from the service module. This allows performing quick copy-paste or direct links between both models.

relationships between subscribers and lines, total traffic and busy hour traffic in the model.	

Issue 3: Modelling errors

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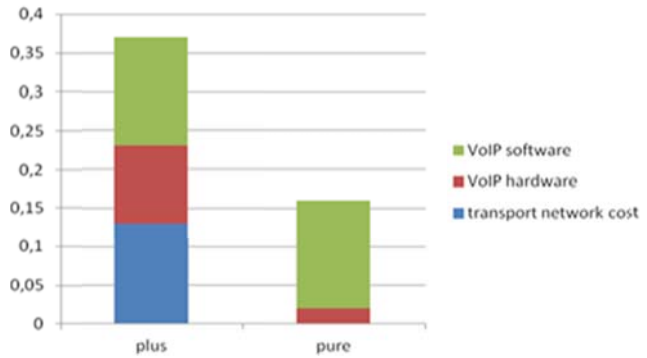
Respondent	Comments received	Response
✂	The respondent identifies several modelling errors related to: • the use of the function VLOOKUP instead of INDEX; • links issues in the "Total Investments" sheet (Lx and Tx equipment cost are incorrectly linked) and in the "Leased line per technology" sheet (The number of STM64 leased lines refers to the number of STM16 leased lines); • an error in the "leased line per technology": the calculated 2Mbit/s capacity is a factor of 1,000 greater than appropriate. The respondent recommends auditing carefully the model in order to correct as appropriate.	**Comment accepted regarding links issues in the ""Total Investments" sheet and regarding the error in the "leased line per technology" sheet. Regarding the other issues comments cannot be accepted.** The model has been modified regarding the links issues in the spreadsheet "Total Investments" and about the calculated 2Mbit/s capacity error set out by Romtelecom. Regarding the function VLOOKUP, this function has no major impact on the length calculation. It is more the function SUMIFS that slows down computations. Nevertheless as it has no impact on final results, there will be no removal of VLOOKUP functions. Regarding the links issues stressed out by the respondent in the "Leased line per technology" sheet, the comment specified in the cell AK29 clearly mentions that the evolution of the number of STM64 is based on the evolution of the number of STM16. As this assumption is considered as reasonable it will remain as it is.
	The respondent points out two additional errors in the model: • the model contains #N/A, #REF and #DIV/0 errors which may affect results; • the traffic evolution of leased lines which shall depend on the relative length and capacity of national versus international leased lines;	**Comment accepted for the leased line traffic evolution and rejected regarding #N/A, #REF and #DIV/0 errors.** Regarding the first set of errors outlined by the respondent, cells with #N/A, #REF and #DIV/0 have no impact on the model as they are not used at all. These cells just stress out the weak accuracy of data provided by the respondent which lead to make several assumptions in order to be able to use in a proper way the data provided (for more details, see Response for Issue 1). Regarding the leased lines traffic evolution, the weighted average value induces distortion as 10 Gbit/s leased lines were included in the calculation. In order to overcome this issue it is proposed to isolate these leased lines from the calculation of the traffic weighted average evolution. The predicted growth rate for the traffic from 2011 to 2015 is now about 172%. With such approach it is to be noted that the total leased line traffic growth rate from 2011 to 2015 is similar to the one of national leased line. This assumption is therefore reasonable and shall be implemented in the model.

Issue 4: Sensitivity of the model		Table of content
Respondent	Comments received	Response
✂	The respondent considers that TERA's model is largely a reproduction of its' own actual network without any sensitivity to traffic. "*The pure LRIC calculation in 2015 reduces demand by 38% of total voice minutes and the annualised costs in the model falls just €2.7m from €414.6m to €411.9m – a decline of 0.66%*". Such cost decrease does not appear to be reasonable for the respondent as it implies too large economies of scale, inconsistent with network engineering principles and similar models in other jurisdictions.	**Comment cannot be accepted** First, the apparent insensitivity of the model to volume changes is objectively explained by two factors: the network in the model has the almost full national coverage, which is fixed throughout the modelled period. This, combined with the geographic distribution of the traffic, makes that in smaller exchanges, equipment quantities are driven by the minimum quantity per exchange for coverage, rather than capacity. Secondly, the NGN model includes a relatively highly distributed call server architecture, which in combination with relatively high-capacity call servers, lead to over-dimensioning of call server capacity. Second, if we narrow the analysis to voice, the apparently underestimated sensitivity of the model to voice is in fact a reflection of the types of traffic carried by Romtelecom's network and of their relative magnitude. Given the relative share of voice as compared with data (broadband internet, leased lines), BH voice represents by far and large 1,1% of total BH traffic in 2015[2], Third, there are indeed very large economies of scale associated with the provision of wholesale voice termination and we believe the model is robust enough to accurately reflect them. Last, the magnitude of the economies of scale modelled seems consistent best practices, where the reduction of demand with pure LRIC induces a very limited fall of annualized costs with fixed networks: • In Netherlands, transport and switching costs are null in pure LRIC, the remaining cost being IMS-VoIP platform. **Distribution of pure LRIC and LRAIC in the Netherlands between the different cost categories**

[2] Traffic at P level, cells Q32569/U32569 of spreadsheet MPLS Traffic

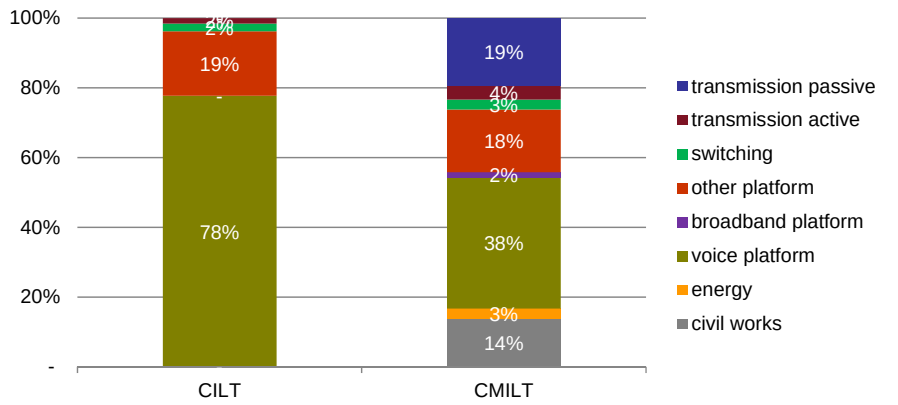


Source OPTA

- In France, the fall of annualized costs with the pure LRIC calculation varies between 0.7% in 2007 and 1.5% in 2015[3]. Transmission and switching costs amount also for 4% only of the total pure LRIC costs[4], the remaining being IMS-VoIP platform.

Distribution of pure LRIC and LRAIC in France between the different cost categories

[3] Source: ARCEP, Pure LRIC model for the fixed core network, 2011.
[4] Source: ARCEP, Pure LRIC model for the fixed core network, 2011.



Source: ARCEP

- In Belgium, annualized costs fall with the pure LRIC calculation by 0.1% in 2012[5]. It is also to be noted that transmission and switching costs are null in the pure LRIC calculation.

In light of this information, the argument developed by the respondent cannot be considered as appropriate and will therefore not be taken into account.

The respondent also argues that cost items used in the model are fixed in respect of traffic which follows a top-down approximation of its' own costs rather than bottom-up principles. To that extent, the respondent states that fibre and trench but also operating costs does not vary in respect of traffic volume.	**Comment cannot be accepted** Best efforts to use as much as possible the data provided by the respondent have been made in order to have a model calibrated to the Romanian realities. Most of the time if not only, cost items provided by the respondent were not sensitive to relatively small changes in total network traffic. As explained above, this is also the case in other countries. This is due to the high capabilities of IP-MPLS networks and the fact that VoIP represents a very small share of total traffic (0.7% of the total traffic in 2015). Moreover in case the data asked was not provided, such as the variable part of the IMS platform, assumptions have been made so that the respondent had the opportunity to challenge by sending

[5] Source: BIPT, Core model, Modules 20+21+22+23, January 2012

	appropriate data. As it is not the case, arguments developed by the respondent cannot be taken into account. Regarding the sensitivity of fibre and trench by also operating costs, these topics are treated thereafter in the section Issue 10 and 11.

Issue 5: Forward looking MEA principles		Table of content
Respondent	Comments received	Response
✂	The respondent considers that the modern equivalent asset principles are not respected as the model mimics its' own actual network with a wide range of technologies. The respondent states that TERA's model does not represent a hypothetical efficiently operated network as it shall be the case for the pure LRIC calculation. The respondent believes that this approach induces various defects on the model including: • the model is unwieldy and inflexible; • the model cannot be stress-tested with real world engineering and network dimensioning rules; and • the network topology is fixed and does not "flex" in response to traffic	**Comment cannot be accepted**. Two scenarios have been developed in the model as detailed in the Conceptual Framework: • The specific operator scenario which corresponds to Romtelecom's actual network, i.e. with all the platforms implemented by Romtelecom. This scenario takes into account as far as it is possible the different engineering rules provided by Romtelecom; and • The generic operator scenario which corresponds to a purely NGN, theoretically efficient operator and which is also used for the pure LRIC calculation. Existence of both scenarios provides fruitful information to ANCOM. Indeed, as part of its role, ANCOM has the duty to understand the costs supported by Romtelecom. It is therefore necessary to set the specific scenario. ANCOM also has the duty to promote competition and operator's efficiency. In that sense, ANCOM is required to develop a generic scenario according to the principles set out above. If it is true that the generic operator uses many elements relative to dimensioning rules, it shall be noticed that the most crucial parameters relative to the demand is specific to the generic operator. The crucial inputs that enable to establish the volume of traffic to be handled by the generic operator takes into account the Romanian market structure and not the respondent's data. In that sense, it is not fair and reasonable from the respondent's side to argue that the generic operator does not represent a hypothetical efficiently operator, the more that dimensioning rules have been modified (see response to next comment) in order to flex the network in respect of traffic. Besides, taking into account the statements in section 5.8 at paragraph 1, the respondent seems to be aware of the two scenarios in the modelling approach. Regarding network topology, see answer below. The argument developed by the respondent cannot be therefore taken into account.
	The respondent points out that the network topology is also invariant to	**Comment not accepted.**

traffic. He believes that there is no PSTN switching rationalization foreseen whereas the traffic decreases significantly the last few years. The respondent specifies that 5 local exchanges will be decommissioned in response to the fall of traffic (total voice minutes fell by 700 million between 2009 and 2011). To that extent, the respondent outlines that given the scale of reduction in traffic under the pure LRIC scenario, the model shall remove at least 9 further local exchanges and 1 additional transit exchange.	It shall be underlined first that the question of the network rationalization has been clearly asked in the data request sent by March 2012: *"Question 3: Please provide internal plans for changes in the network in the next 5 years, mainly for:* • *Evolution of the NGN/IP-MPLS network,* • *Reduction in number of RSU, Local Exchange, Transit Exchange."* However the respondent did not provide any written answer in response to the first data request. The only mention on this point was during a meeting at ANCOM's premises, beginning 2012. The respondent's technical staff orally specified at that time that there will be no removal of equipment in the upcoming years which contradicts what has been written in the respondent's response to Consultation. As specified in response to Issue 9, the model clearly reverberates the fall of traffic on the size of PSTN main switching equipment. Indeed the size of the main equipment is now dependant of the number of Erlangs handled at busy hour and no more of the number of subscriber that are linked to this equipment. This sensitivity therefore already takes into account the rationalization of the network: it is not necessary to consider the remove of some exchanges as it would lead to double count the impact.

Issue 6: Scorched node approach

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Respondent	Comments received	Response
✂	The respondent is of the view that the model is invariant to traffic although TERA described itself as following a scorched node approach. The respondent believes that ring dimensions, equipment and equipment capacities are not sensitive to traffic as the network topography is the same when VoIP customers are less than 1% of the total number of subscribers and when by 2015 they represent 51% of the respondent's total subscriber base.	**Comment cannot be accepted.** The use of the scorched node approach means that existing network nodes are kept. This does not mean that it will not impact ring dimensions and equipment capacities. The respondent cannot make any relation between the scorched node approach and the sensitivity to traffic of rings and equipment. Besides, contrary to what the respondent explains, the model resizes the network if the traffic is adjusted. The respondent takes the example of ring dimensions or equipment capacities but both are recalculated in case of traffic adjustment (see sheets "SDH dimensioning" row 4663 to 8446: Ports cards, ADM and rings are re-dimensioned relative to traffic, DWDM dimensioning, MPLS dimensioning). It is true that the removal of termination traffic has almost no impact on the different items suggested by the respondent, but this is more related to other reasons rather than because of the scorched node approach: the fact that the VoIP traffic represents only 0.3% of the total network traffic in 2012 and 0.7% in 2015. The crucial factor to be analysed is not the evolution of the percentage of VoIP customers relative to the total number of subscribers but the evolution of the percentage of VoIP traffic relative to the total traffic in the respondent's network. The argument relative to the invariance of the model to traffic cannot be therefore taken into account. Regarding the migration of the respondent's total subscriber base towards NGN, in the absence of relevant data provided by the respondent, the evolution taken into account has been established based on the evolution that has been observed in other European countries in the past. This evolution shall therefore remain as it is.

Issue 7: Treatment of VoIP and PSTN traffic		Table of content
Respondent	Comments received	Response
✂	The respondent believes that the model does not assign costs to different VoIP traffic streams (especially between on net and off net calls) as it is the case for the 71 call categories and associated route factors of the PSTN traffic. The result is that the model does not accurately reflect the BH load of VoIP traffic on the different network components.	**Comment not accepted.** The respondent provided 71 call categories but there are only 20 different call routes for the PSTN traffic. Regarding VoIP traffic, there are two types of call category: on-net and off net calls. Associated routes have been clearly mentioned in the model documentation based on the understanding of the respondent's previous explanations: for VoIP the traffic always goes from the customer to the IMS. This latter assumption is confirmed by other bottom-up models implemented around Europe[6]. In the model, the traffic calculation is based on the number of active lines at BH as provided by the respondent. In addition, an active line corresponds to 100kbps traffic between the active customer and the IMS which means that the model takes into account two active lines for on-net calls and only one active line for off-net calls. Both categories of calls have been therefore taken into account contrary to what specified the respondent. The argument developed by the respondent therefore appears to be not relevant.

[6] Source: BIPT, 4th January 2012, Fixed BU model, Modules 1+2+3+4+6 - Core spreadsheet "RF" from column G to column Q http://www.ibpt.be/ShowDoc.aspx?objectID=3658&lang=FR - ARCEP; 7th January 2011, BU model Module "Dimensionnement réseau" spreadsheet "Charge réseau" row 866, http://www.arcep.fr/?id=8080

Issue 8: Network demand calculation

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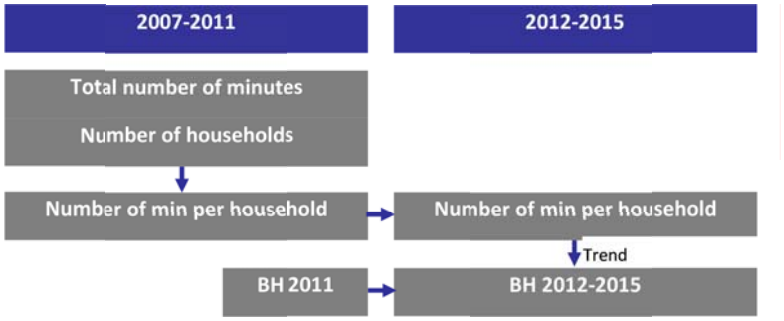
Respondent	Comments received	Response
✂	**Voice** The respondent specifies that TERA's model is not established according to bottom up principles and believes that it is more appropriate to derive the BH demand for voice from total voice minutes than from actual data at each exchange as it is the case in TERA's model. The respondent adds that the voice BH demand shall be uplifted by the factor 1.2 in order to reflect the prioritisation over other traffic.	**Comment accepted regarding the uplift factor.** The respondent shall refer to the calculation of the BH demand in the service module which already relies on the evolution of the total number of minutes. As specified in the spreadsheet "3.3.2 Romtelecom" row 167 to 281, the BH demand is adjusted at each switching level with the evolution of the demand. The method used to evaluate the busy hour evolution for the 2012-2015 period is described in the diagram below:  Whereas the respondent's method is based only on the evolution of total number of minutes, the method implemented in the model is based on the evolution of the total number of minutes and the number of lines. In addition, we do not understand why the respondent's BH traffic split per switches should be disregarded. Therefore the approach used in the model is more reliable. Regarding the uplift factor, the model should take into account the prioritisation of voice traffic. Modifications have been therefore implemented in order to be consistent with the former model.
	Leased lines The respondent agrees with TERA's calculation for the traffic induced by SDH leased lines where no contention ratio has been implemented. However regarding leased lines provided over the IP-MPLS network,	**Comment accepted.** Regarding contention ratio, the first assumption made in the model was that all MPLS leased lines were uncontended. This means that the model

the respondent considers that it is more relevant to dedicated only 50% of the leased line capacity. Besides, the respondent is of the view that TERA's approach for the distribution of leased line traffic on the transmission rings is far too complex and does not correspond to the reality. To that extent the respondent provides several approximations on routing factors that might be able to avoid the geographic issue encountered by TERA's model.	considered 100% of the leased line capacity. As it is not the case in practice and based on the respondent's additional data, the model now considers only 50% of the leased line capacity[7]. Regarding the geographic issue, it was previously considered that a local leased line (in the same county) used 1 local ring which is apparently not the case. Based on the respondent's additional data, the model now considers that this same leased line uses 1.5 local ring and 0.5 regional ring. The following routing factors as approximated by the respondent have been implemented in the model:

	Local ring	Regional ring	National ring
Local LL	1.5	0.5	0
Regional LL	2	1	0
National LL	2	2	1

Data The respondent used the same approach for the BH demand calculation but included two additional factor: • % of subscribers active at the BH:65%; and • % of non-concurrence BH factor: 85%. The respondent recommends including both factors.	**Comment cannot be accepted.** The respondent first argued that the capacity used per broadband subscriber in the BH amounts to 310kbits/s[8] and that this value shall be reduced by the percentage of active broadband subscribers at the BH. However, according to similar data provided by other operators, the capacity of 310kbits/s is the capacity per broadband subscriber and not just per active broadband subscriber as suggested by Romtelecom. This factor is therefore not relevant and shall not be applied. The respondent also stresses out that a 85% non-concurrence BH factor should be applied on the BH demand *"as voice is prioritised in the network"*. However, it cannot be reasonable to consider a 85% non-concurrence BH which represents a fall of 46,5kbit/s per broadband subscriber, as voice BH demand amounts up to 4.8kbit/s per voice subscriber[9]. It has already been agreed that a factor shall be applied in order to take into account the prioritisation of voice traffic. But the factor provided by the

[7] According to the respondent: *"Within one hour, only 70% of the leased lines are active. Out of the active ones, only 70% are used within that hour"* therefore the capacity to be considered is equal to 70% x 70% = 49%.
[8] Source: ✂, ✂comments on the bottom-up LRIC model prepared by ANCOM for the calculation of costs of fixed voice call termination in Romania, December 2012.
[9] 4.8 kbit/s = VoIP bitrate x % of active lines at BH x uplift factor = 100 kbit/s x 4% x 1.2

	respondent is by far too high and would artificially reduce the broadband traffic. At best, it is proposed to subtract the uplift voice BH demand[10] from the broadband BH demand. This would correspond to a prioritisation factor of 99.7%. If the approach proposed by the respondent can be agreed in principle, it is not the case for the level of both factors, since there is no clear justification of these levels. Significantly undermining the total broadband traffic is not realistic.
Modelling the impact on costs The respondent conducted an analysis to assess the sensitivity of revising the demand calculations, by applying an externally sourced cost volume relationship to total transmission costs in order to measure the impact of removing the voice termination increment. The respondent used BT's CVR related to core transmission equipment and adjusted it in order to take into account economies of scale that BT benefit of. The conclusion is that it would lead to an increase of 20.6% of the pure LRIC 2015.	**Comment cannot be accepted.** ANCOM understanding is that the proposed CVRs are of top-down nature and reflect assumptions about the way the cost of high level network components change as traffic rises or falls. For example, the maximum point in the SDH CVR assumes the GRC of the entire SDH network, while the minimum point one single SDH ring in the entire network, valued at the relevant unit price. Such CVR cannot be applied for the sole reason that the respondent is unlikely to provide appropriate data for evaluating the forward looking avoidable costs when traffic is the final increment. It would also consider that the model does no re-dimension the network in respect of traffic whereas it is the case. The argument developed by the respondent is therefore not relevant and cannot be taken into account. In addition, it is worth mentioning Ofcom in the UK does not use BT CVRs for the bottom-up model it develops. To estimate how much network equipment is needed for the forecasted level of traffic, Ofcom relies instead on the network build blocks, typical to bottom-up modelling.

[10] The uplift voice BH demand = 0.2 x 4% x 100 kbit/s = 0.8 kbit/s which corresponds to 0.3% of the broadband BH demand

Issue 9: Switching

Table of content

Respondent	Comments received	Response
✂	**PSTN switching** The respondent details arguments on the three distinct switching elements: i) line and interconnection cards, ii) interconnection ports and iii) the switch block. i. Regarding line cards the respondent points out that the associated cost is driven by the number of subscribers. For interconnection cards the respondent believes that the one implemented in the core model are of a high capacity as the associated total cost is almost invariant with traffic which shall not be the case in the reality. The removal of incoming traffic leads to a decrease of only 2% of the investment costs. ii. Regarding ports, the respondent stresses out that 2 out of the 108 exchanges use STM1 ports in the model. However Romtelecom recommends using only E1 ports for the interconnection as it is the standard technical solution. iii. Regarding the switch block, the respondent states that the cost shall vary with traffic which is not the case in the model. This option has been adopted by BT which main equipment cost varies linearly with the traffic.	**Comment rejected for i) and iii) and accepted for ii).** i) If is relevant to consider that the cost of line cards and interconnection cards is sensitive to traffic, the conclusion held by the respondent which specifies that the model uses high capacity for interconnection cards is not appropriate. In spreadsheet "PSTN costing" it is mentioned that the model uses different capacities for interconnection cards: ✂E1 cards[11] with 32 ports at the Rx, Lx and Tx levels; and ✂ STM4 cards with 2 ports at the Tx and gateway levels. The argument developed by the respondent cannot be therefore relevant. The only reason why the total investment costs related to interconnection cards decreases by only 2% when removing 38% of the traffic is that the vast majority of equipment uses less than the 32 ports. The removal of traffic has therefore no impact or very little on total costs. The point set out by the respondent is inappropriate and shall be not taken into account. ii) Regarding ports, the model has been updated accordingly. Nevertheless, it was noticed that the impact is very low. iii) Taking into account the respondent's comment relative to the insensitivity of the cost of the main equipment when removing termination minutes, a more flexible dimensioning method has been implemented in the model. The size of the main equipment is now relative to the number of Erlangs handled by the equipment and no more relative to the number of subscribers that are linked to it. The impact of such modification is that the removal of traffic volume is clearly reverberated on the size of this equipment and on the cost which was less the case previously. With such assumptions, the total costs of LXs are reduced by approximately 10% in 2015, compared to 2011.

[11] It is the sum in SpreadSheet PSTN Costing, cells O166, O654, O2619 and O2720

IP switching

Although it is charged by suppliers on the basis of the number of subscribers, the respondent believes that its costs should be entirely considered traffic driven with the consequence that a portion of the IP switching platform should be included in the voice terminating increment. Indeed, the majority of components of the IMS platform are used for processing calls and their size is driven by the volume of traffic and not the number of subscribers.

For the pure LRIC calculation, the respondent recommends multiplying the annualised investment of the IMS platform (number of subscribers multiplied by the cost of subscribers – €1.50) by the proportion of traffic without termination minutes.

Comment accepted.

The respondent provided initially only a fixed cost. However, as specified by the respondent in its latest answer, ANCOM acknowledges that there might be some incremental cost in respect of traffic incurred by the IMS platform, even if suppliers' tariffs are generally based on the number of subscribers.

In order to establish the relevancy of the level of incremental cost provided by the respondent, a comparison of the annualized incremental unit cost (per minute) of the IMS platform over the period 2011-2015 with best practices in Europe (France[12], Denmark[13], Ireland and Belgium[14]) has been carried out. For Romania, this cost is set by annualizing the cost specified by the respondent which leads to 0.007EURcent/minute[15]. It is to be noted that this level of cost is similar to what can be observed in other countries such as France and Belgium.

Benchmark of incremental unit cost of the IMS platform

	Unit	2011	2012	2013	2014	2015
Belgium	EURcent/min	0,0028	0,0031	0,0020	0,0019	0,0018
France	EURcent/min	0,0050	0,0043	0,0029	0,0039	0,0052
Ireland	EURcent/min					0,0610
Denmark	EURcent/min		0,012			
Romania	EURcent/min	0,007	0,007	0,007	0,007	0,007

Source: BIPT, ARCEP, ComReg, NITA

ANCOM therefore agrees with the respondent's level of cost and will adjust the model accordingly as recommended.

[12] Source: ARCEP, 7th January 2011, BU model,Module "coûts réseaux", spreadsheet "CILT". http://www.arcep.fr/?id=8080 The incremental unit cost is determined by summing the cost items "SBC d'accès – chassis", "SBC d'accès - carte 1GE", "Call server (MGC) – traffic" and "Call server (MGC) – abonnés".

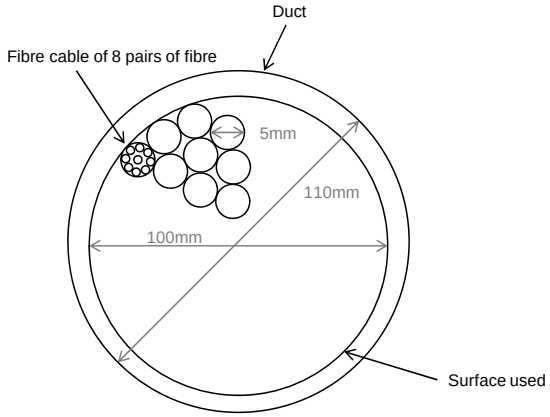
[13] Source: NITA, BU model, module "Pure LRIC v4.2", spreadsheet "B3_C_Services". The incremental cost taken into account is equal to the average traffic sensitive voice unit cost specified at cells AP391 to AP417.

[14] Source; BIPT, 4th January 2012, BU LRIC model modules 20+21+22+23 service costing, spreadsheet "Pure LRIC" http://www.ibpt.be/ShowDoc.aspx?objectID=3660&lang=FR . The annualized variable unit cost is determined first by estimating the difference of economic cost "with" and "without" voice termination traffic for each type of equipment. These results are then divided by the number of terminating minutes (row 1561 to 1590). The annualized variable unit cost of the IMS platform is established by summing cost related to the following cost items "Core IP nodes: interco SBC – Chassis", "Core IP nodes: interco SBC – 1GE port card", "Core IP nodes: Call server processor" and "Core IP nodes: Call server software call-control".

[15] The asset life used for the IMS platform is 12 years, and the WACC is the regulated one: 10.7%

Issue 10: Fibre and trench costs		Table of content
Respondent	Comments received	Response
✂	The respondent considers that fibre and trench costs have been treated as fixed costs in respect of volumes whereas these cost items shall be sensitive to traffic. The respondent justifies this sensitivity on the basis of its own experience of the management of PSTN traffic and on the variability of BT's trench costs in respect of volume.	**Comment cannot be accepted.** The respondent argues that the standard approach regarding fibre and trench cost is that it shall be driven by the traffic volume. Hence the removal of 38% of traffic for the pure LRIC calculation shall lead to a fall of the associated costs. *"The costs for fibre and duct in the model are sourced directly from top down information provided by […], and are treated as fixed costs in respect of volumes. This approach is inconsistent with standard bottom up modelling principles, which instead calculates all costs dynamically and assumes that, in the long-run, all costs are variable in respect of network demand."*[16] It is to be noted that the standard diameter of one duct is 110mm of which 100mm only are used. If we consider that fibre cables of 8 pairs (5mm diameter) which are a technical standard and that the effective surface is equal to 85% of the used surface, it is possible to include 340 fibre cables that is to say 2,720 fibres[17]. Each fibre has a capacity of 1Gbps, this means that the maximum capacity of one duct can reach 2,720 Gbps. **Section of a standard duct**

[16] Source: ✂ comments on the bottom up LRIC model prepared by ANCOM for the calculation of costs of fixed voice call termination in Romania, p.21, December 2012.
[17] Number of fibre used in one duct = Surface used of one duct x 85% / surface of one fibre cable x Number of pairs in one fibre cable = $(100/2)^2$ x 85% / $(5/2)^2$ x 8= 340 x 8 = 2,720



According to the core model, the PSTN traffic amounts up to:

- 54Mbps per national ring[18] which corresponds to 756Mbps for all national rings which value is more relevant to consider in this case;
- 28Mbps per regional ring on an average basis[19]; and
- 2Mbps per local ring on an average basis[20].

The removal of terminating traffic corresponds at worst the removal of 380Mbps[21] at the national level. Being aware of the capacity of one it is therefore inappropriate to consider that fibre cost shall be traffic dependent and the more irrelevant to consider that the removal of incoming traffic will have an impact on trench cost.

Besides, the pure LRIC calculation has been already carried out in many European countries (e.g. France, Ireland, Denmark, Malta and Belgium[22]) and in none of these countries fibre and trenches costs are traffic

[18] Cell F997 of spreadsheet SDH Traffic
[19] Line 990 of spreadsheet SDH Traffic
[20] Lines 856-898of spreadsheet SDH Traffic
[21] The terminating PSTN traffic represent less than 50% of PSTN voice traffic
[22] Source: Belgium - BIPT, Draft presentation of NGN/NGA models, 4th January 2012. France – ARCEP, Decision n°2011-0926, 26th July 2011 – Ireland, ComReg, Final Decision Mobile and Fixed Voice Call Termination Rates in Ireland, 21 November 2012 – Malta, MCA, Bottom-up Cost Model for Fixed Networks and Proposed Interconnection Prices, October 2012 – Denmark, EC response to notification DK/2011/1264

	dependent. Moreover, the associated decisions have not been contested by any incumbent on this topic in these countries. Therefore the respondent cannot say that it is a standard practice to have fibre and trenches sensitive to volumes. For all these reasons, the argument developed by Romtelecom – Ernst & Young is not relevant. these costs are invariant of traffic and shall not be included in the pure LRIC costs.
The respondent also specifies that TERA used an incorrect value for the costs of installing fibre, 929€/km instead of 1,255€/km.	**Comment cannot be accepted.** In order to be consistent with the data implemented in the access network cost model that has been already developed, this value was taken into account in the model. The respondent does not provide any justification for this adjustment. The cost level considered in the access model for the core model will be maintained.
The respondent adds that this installation costs shall increase by 5% on an annual basis which is in line with the past trend.	**Comment accepted.** The model will be adjusted accordingly.

Issue 11: Operating costs		Table of content
Respondent	Comments received	Response
✂	The respondent believes that *"a standard bottom-up model exhibits a clear relationship between operating costs in traffic"* whereas TERA considered these costs as invariant of volume. The respondent is of the view that the position of TERA is unreasonable as less traffic would generate fewer network staff to maintain a smaller network, smaller human resources department and so on. The respondent recommends therefore implementing operating cost as a percentage mark-up to capital costs.	**Comment accepted.** OPEX may vary with respect to the number of platforms, the number of exchanges, the number of subscribers, but with traffic to a lower extent. However, when traffic decreases, the number of equipment also decreases. As the associated maintenance is generally outsourced, in this case and only in this case, it is true that operating costs are sensitive to traffic. It is to be noted that on this specific topic, the respondent is not consistent with the other points where it stresses out the use of British telecom's CVR. Indeed, the respondent did not mention the CVR905, combined network OPEX, according to which at zero traffic there is 36% OPEX. In addition to the less relevancy of the use of such CVR, the lack of consistency from the respondent is one of the reasons why CVRs in general has not been implemented in the model. As a conservative view, it may be therefore assumed with a certain degree of confidence that OPEX shall vary when traffic is removed for the pure LRIC calculation.. The respondent argues that OPEX shall be set as a percentage mark-up to capital costs, this latter varying with traffic. Indeed, other countries that already implemented pure LRIC calculation established OPEX with the same methodology[23]. The model has been adjusted accordingly.
	The respondent also considers that given the migration profile assumed by TERA, it will face significant decommissioning costs incurred by the removal of the legacy network. The respondent noted that the level of costs considered in the model rises up to around 6.0M€ in 2015 starting from 5.5M€ in 2011. Due to the migration plan set by TERA, the respondent is of the view that decommissioning costs should be significantly higher in 2015 compared	**Comment accepted regarding the variability of decommissioning costs but rejected regarding the level of costs to be considered.** Migration costs may vary in a larger manner than the one implemented in the first version of the model. However, if the variability of these costs relative to traffic can be recognised, it is not the case for the level of costs suggested. There is no clear justification, nor submission of accurate information relative to the amount of decommissioning costs proposed for

[23] Source: ARCEP, 7th January 2011, BU model, Module "coûts réseaux" spreadsheet "Actifs" column K. – BIPT, 4th January 2012, BU LRIC model, module 1+2+3+4+6 spreadsheet "TotalOpex" row 15 to 114

to 2011. The respondent suggests therefore to consider 10M€ of which 50% should be incremental costs to voice.	2015. As for OPEX, decommissioning costs may vary in respect of capital costs that also vary with traffic[24].

[24] Decommissioning costs have been integrated into the OPEX costs mark-up calculation. The mark-up is calculated in the dashboard, cells E33 to E37

Issue 12: Interconnection specific costs		Table of content
Respondent	Comments received	Response
✂	The respondent states that the proportion of specific costs taken into account for interconnection is not realistic. Instead of 50%, the respondent suggest the use of at least 75% since the origination represents a small proportion of traffic, less than 1% of the total traffic in 2011.	**Comment accepted** In absence of accurate information, the first percentage applied on specific costs was set on an arbitrary basis and has been set on a conservative side to draw attention of the risk of double recovery of these costs. It is to be noted however that even at this stage, accurate information on the way these costs are being recovered (from per minute interconnection and from ancillary interconnection services) is not being submitted. As this last percentage has not been justified, the model will take into account 50% of the total specific costs. .
	The respondent also considers that a proportion of the number portability and supporting infrastructure costs should be included in the terminating increment. Indeed, the respondent assesses that it had not to invest €2.9M if the provision of interconnection services would not exist.	**Comment cannot be accepted** In the pure LRIC calculation only the incoming traffic is removed, while the costs of the portability platform may have been impacted only if the outgoing traffic would have been removed but it is not the case here. The argument developed by the respondent is therefore not relevant and cannot be accepted.

Issue 13: Indirect costs

Table of content

Respondent	Comments received	Response
✂	The respondent believes that at least a portion of certain cost items such as lands, buildings and vehicles used for telecoms services should be variable in respect of traffic. The adjustment on of these costs may lead according to the respondent to an increase of 9.1% of the pure LRIC costs.	**Comment cannot be accepted.** The respondent did not provide any necessary supporting data regarding the variability of indirect costs with respect of interconnection traffic volume. Furthermore, the percentage as such does not have a direct relationship to the costs, being a doubtful mix between staff time and interconnection minutes. According to best practices around Europe[25], these cost items do not vary in respect of interconnection traffic volume. ANCOM therefore considers that the approach suggested by the respondent is not relevant and cannot be accepted.

[25] In the French and Belgium model, there is no mention of this type of cost items when calculating the pure LRICSource: BIPT, 4th January 2012, BU LRIC model modules 20+21+22+23 service costing, spreadsheet "Pure LRIC" – ARCEP, 7th January 2011, BU LRIC model module "coûts réseaux" spreadsheet CILT.

Issue 14: Working capital

Table of content

Respondent	Comments received	Response
✂	The respondent assesses that the most common approach taken in bottom up models to account for working capital is to apply a percentage mark up. The respondent adds that working capital should be considered incremental to voice termination, as when assets are removed following the removal of terminating minutes, the working capital associated with those assets should also be removed. To that extent, the respondent proposes the level of 8.7% to be applied to the calculated reduction in annualised asset costs associated with the voice termination increment.	**Comment cannot be accepted** The methodology used for determining the ratio to be applied to the calculated reduction in annualised asset costs is flawed. The percentage proposed by the respondent results from accounting calculations whereas it is more appropriate to consider a bottom-up methodology, as it has been explained in the Conceptual Framework. Beginning 2012 operators have been asked to provide any evidence related to the cost of working capital generated by CAPEX and OPEX. Through the discussions with the respondent, it appeared that the only issue was related to the working capital generated by CAPEX. The working capital generated by CAPEX is due to what is called the payment term and corresponds to the delay between the time the investment is completed and the time that revenues are generated. As already explained during conference calls and meetings, the tilted annuity formula implemented in the model already includes a 6 months delay. When the payment term is set to 0 in the tilted annuity formula used in the model, the formula can be written as follows. This means that if the operator starts generating revenues at T=0 from this asset, it will get average revenues over the year at T=1/2 and it can be demonstrated mathematically that, in such a case, this corresponds to a situation where the investment is paid at T=-1/2. As a consequence, there are 6 months between the moment the investment is paid and the moment the corresponding asset start generating revenues: $$A_t = I \times \frac{(\omega - p)(1+p)^{t-1}}{1-\left(\frac{1+p}{1+\omega}\right)^n}$$ When the payment term is set to 1/2 in the tilted annuity formula used in the model, the formula can be written as follows. This means that if the operator starts generating revenues at T=0 from this asset, it will get average revenues over the year at mid-year, that is to say at T=1/2, and it

can be demonstrated mathematically that, in such a case, this corresponds to a situation where the investment is paid at T=0. As a consequence, there is no delay between the moment the investment is paid and the moment the corresponding asset start generating revenues:

$$A_t = \frac{I}{(1+\omega)^{1/2}} \times \frac{(\omega - p)(1+p)^{t-1}}{1-\left(\frac{1+p}{1+\omega}\right)^n}$$

Finally, when the payment term is set to 1 in the tilted annuity formula used in the model, the formula can be written as follows. This means that if the operator starts generating revenues at T=0 from this asset, it will get average revenues over the year at T=1/2 and it can be demonstrated mathematically that, in such a case, this corresponds to a situation where the investment is paid at T=1/2. As a consequence, there are 6 months between the moment the asset start generating revenues and the moment the corresponding investment is paid:

$$A_t = \frac{I}{(1+\omega)} \times \frac{(\omega - p)(1+p)^{t-1}}{1-\left(\frac{1+p}{1+\omega}\right)^n}$$

The payment term shall remain as it is in the model to reflect a reasonable degree of working capital.

Issue 15: Specific vs. generic operator

Table of content

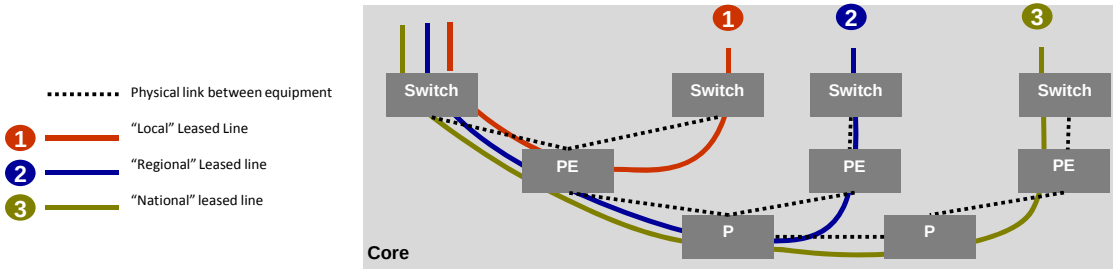
Respondent	Comments received	Response
✂	The respondent points out that it disagrees with the use of a generic operator which operates only under a pure NGN network. This would lead to undermine the pure LRIC costs borne by the respondent. Indeed, in a consistent manner to other European incumbents, the respondent does not intend to remove its legacy circuit switches and SDH network.	**Comment cannot be accepted** As suggested in the Conceptual Framework, the EC specified in its 2009 Recommendation on termination rates that targeted tariffs shall be set on a generic operator with the most prevalent technology. In such a case, it is therefore required to take into account a pure NGN network as it is the case in the model. Alternative operators shall not support the use of inefficient technologies, as the SDH network, by the respondent; the more that rates are symmetric between fixed operators and that many of them are already full-IP. Besides, it is also appropriate to model the specific operator (*i.e.* which mainly operates under the PSTN platform) with the pure LRIC cost standard.
	The respondent adds that even if an "all NGN" assumption were appropriate it would be too complex to predict savings induced by this adjustment as there remain great uncertainty on the deployment of such architecture. To that extent, the respondent recommends several adjustments related to trench sharing, reduction in operating costs and the treatment of voice. According to Romtelecom – Ernst & Young • *"There is no evidence that trench sharing is practical or feasible in Romania. Amending this assumption in the model increases total costs by €47 million from €169 million to €216 million"* • *"No reduction in operating costs should be assumed from the deployment of an NGN as there is little evidence that the expected reduction in operating costs arising from deployment of NGNs have actually been realised. Amending this assumption in the model increases total costs by €46 million from €169 million to €215 million"* • *"BH load for voice traffic should be uplifted to reflect the fact that in an NGN it is prioritised in the network over data traffic."*	**Comment cannot be accepted** We acknowledge that assumptions used for the generic operator scenario are complex. But these assumptions have been justified with economic studies. As detailed in the Consultation document several studies show a decrease of core network OPEX with NGN (average of minus 60%): • 77% decrease of IP and DWDM costs according to Cisco , • 60% decrease according to italtel, • one Cisco study showed a 67% reduction in transit network opex for the TI transit network over three years The respondent did not provide any argument for the three adjustments. In the absence of necessary supporting data, assumptions related to trench sharing, reduction in operating costs and the treatment of voice demand shall be maintained as it is in the model. ANCOM recommends that with the advent of the law on infrastructures, passive infrastructure sharing becomes as practical and as feasible in Romania as is in other EU countries, for the purposes of efficient provision of communication networks.

6 Additional adjustments

In light of the additional data provided by Romtelecom, the need of several adjustments in the model has been identified:

- **The removal of NP routers.**
  - In the initial version of the model, NP equipment was positioned between PE routers and switches. It appears that it is not the case, as NP routers are only used for leased lines connection with Cosmote. It is therefore necessary to remove this type of equipment. However in order to set the appropriate level of costs it has been considered that switches located at the same location as the PE router, aggregate traffic from all other switches at the lower switching level.
  - This leads to reassess the former definition of local, regional and national leased lines as it was not appropriate any more. ANCOM made the following assumptions:
    - (1) Local leased lines pass through 2 switches and 1 PE router;
    - (2) Regional leased lines pass through 2 switches, 2 PE routers and 1 P router;
    - (3) National leased lines pass through 2 switches, 2 PE routers and 2 P routers.

Overview of the different MPLS leased lines provided by Romtelecom



This leads to consider the following routing factors for MPLS leased lines. These last have been specified in spreadsheet "leased lines inventory" row 63 to 68.

Routing factors (MPLS)			
Switch L1	200%	200%	200%
Switch L1-PE	200%	200%	200%
PE router	100%	200%	200%
PE-P link	0%	200%	200%
P router	0%	100%	200%
P-P link	0%	0%	100%

- Based on these new routing factors and on an update leased lines inventory, the cost allocation factors to be used for MPLS leased lines are determined. Calculations are detailed from row 31 to 80 in the “Leased lines inventory” sheet.

- **The use of coaxial cables.**
  - The previous version of the model was using "32 copper cables" for E1. However those were not reflecting the reality as E1 cables that connect equipment inside the exchange are usually coaxial cables. Therefore this latter type of cable for PSTN interconnection has been implemented, instead of copper cables. This adjustment impacts spreadsheets related to the PSTN and SDH platforms.

- **Allocation of cost to 10Gbps leased lines.**
  - 10Gbps Leased lines have been isolated and affected to WDM rings provided by Romtelecom (row 163 to 207 of the "Leased lines inventory" sheet). The traffic has then been affected to the total traffic of WDM rings (lines 335-390 of the spreadsheet "DWDM Dimensioning" column H) and costs related to these leased lines have been allocated and extracted from total costs on lines 10-63 of the spreadsheet "DWDM Costing".

- **Adjustment of traffic from mobile to fixed.**
  - In the previous model traffic forecasts were based on the distribution of the forecasted number of minutes for each service provided by operators. For the specific case of traffic from mobile to Romtelecom, it appears that the proportion of traffic out of the total traffic forecasted was for sure over estimated. The number of minutes per subscriber for this service increased by far too much when compared to other typical services.

Evolution of the number of minutes per subscriber for typical services in the previous model

✂

  - In order to set an appropriate level of cost during the period of charge control the forecasted number of minutes provided by operators for this type of traffic (F2M) has been changed so that traffic per subscriber remains approximately at the same level. (See manual changes in spreadsheet “3.3.2 Romtelecom” cell T332 to W332).

Evolution of the number of minutes from mobile to Romtelecom

✂