INSTITUT LUXEMBOURGEOIS
DE REGULATION

Résultat de la demande d’avis relative au projet de l’élaboration d’un modèle de coûts fixe NGA-NGN

Le présent document clôture le processus de demande d’avis relative au projet de l’élaboration d’un modèle de coûts fixe NGA-NGN et reprend textuellement les contributions des acteurs du marché luxembourgeois transmises durant la période prévue à cet effet.

L'Institut a reçu des contribution de la part de :

1. Entreprise des postes et télécommunications ;
2. Tango S.A.

Le fait d’inclure ces commentaires dans ce document ne signifie nullement que l’Institut approuve ou désapprouve les opinions exprimées. L’Institut n’a pris en compte que les commentaires qui se rapportaient à l’étude en question. Les passages confidentiels et les parties ne se rapportant pas au sujet spécifique qui étaient inclus dans les contributions n’ont pas été publiés.

Luxembourg, le 7 mars 2014

POST LUXEMBOURG Group

Monsieur Paul SCHUH,
Directeur
Institut Luxembourgeois de Régulation
L-2922 LUXEMBOURG

Par courrier et par
FAX : 28 228 229

Dossier traité par
Service Régulation Télécoms

N. réf. : T/1254/R11

Luxembourg, le 23 décembre 2013

Objet : Réponse à votre demande d'avis relatif au projet de l'élaboration d'un modèle de coûts fixes NGA-NGN_**Version non-confidentielle**

Monsieur le Directeur,

Faisant suite à la publication par votre Institut, en date du 31 octobre 2013, de la *« Demande d'avis relatif au projet de l'élaboration d'un modèle de coûts fixes NGA-NGN »*, je vous prie de bien vouloir trouver ci-joint la version non-confidentielle des prises de positions de l'EPT quant aux documents intitulés « *Bottom-up LRIC model specification* » et « *Input data and intermediate calculations* ».

Je vous prie d'agréer, Monsieur le Directeur, l'expression de ma profonde considération.

Jos GLOD
Directeur Général adjoint

VERSION NON CONFIDENTIELLE

EPT comments on ILR fixed network BU LRIC cost model

Review of model specifications

EPT

Ref: 2013-50-DB-EPT– ILR fixed network cost model

TERA Consultants
39, rue d'Aboukir
75002 PARIS
Tél. + 33 (0) 1 55 04 87 10
Fax. +33 (0) 1 53 40 85 15
www.teraconsultants.fr

S.A.S. au capital de 200 000 €
RCS Paris B 394 948 731

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Summary

1 Context

The *Institut Luxembourgeois de Régulation* (ILR) has started the development of a bottom-up long run incremental cost model (BU-LRIC) to assist in assessing the SMP operator's compliance with its cost orientation obligation.

As part of the implementation process, the ILR has organised a consultation process in order to collect the industry's views on the model.

In the context of this consultation, the ILR has not offered access to the draft model and has only provided 4 PDF documents that should be commented on by the industry:

- 1_ILR_ModelConsultationContext_20131031.pdf
- 2_ILR_ModelSpecification_20131031.pdf (hereafter "the specification document")
- 3_ILR_ModelMethodology_20131031.pdf
- 4_ILR_InputData_20131031.pdf

This document will be focused on the study of "2_ILR_ModelSpecification_20131031.pdf" as it details the assumptions implemented within the bottom-up models.

"3_ILR_ModelMethodology_20131031.pdf" is helpful when provided along with the BU-LRIC model. However, the document provided on its own, without the model, is useless.

EPT regrets that the model has not been shared, even in a draft format, with EPT as some aspects of the documentation (like network coverage) are not clear and cannot be checked therefore in the model. EPT hopes ILR understands this difficulty to assess the model specification and will be able to provide answers to EPT queries. It should be noted that the ILR stated EPT that access to the draft model would be provided later on. EPT supports this approach which is line with the approach followed by other regulatory authorities in Europe. EPT would like to draw the attention that the draft model aims at calculating costs of services provided by EPT and in this context it would be difficult to imagine a situation where EPT has no access to the tools that enable to set the prices of the services it sells.

2 Model specification document review

The specification document[1] about ILR's BU LRIC cost model raises a number of questions and comments on the following topics:

- The general approach (see §2.1)
- The scorched node approach (see §2.2);
- The access network topology (see §2.3);
- The core network topology (see §2.4);
- The access network dimensioning approach (see §2.5);
- The costing approach (see §2.6);
- The quality assurance process (see §2.7).

EPT's comments are detailed hereafter.

2.1 General approach

It is to be noted that the EPT has developed in 2010/11 a bottom-up model aiming at assessing the cost of the fixed network.

If the main inputs were similar, the two models should have very similar results and we would appreciate if ILR could investigate and explain any significant discrepancies between the two models. In particular, EPT notes that the approach used by ILR for the access network described in section 5 of the specification document is [redacted]

The ILR's consultant has implemented a FTTH coverage of 60% in 2017 (both P2P & GPON). This modelling is not in line with the forward looking principle and fails at modelling the costs of an operator having a national footprint. As a consequence it may lead to tariffs not enabling the EPT to recover its costs. This major characteristic is not described in details and it is not clear how ILR has modelled this coverage. It is not acceptable that such an important modelling aspect is not described in the model specification. This has huge implications of the level of costs calculated and the ability for the EPT to recover its costs.

As regards networks to be modelled, the ILR states that *"the modelled network is based on a hypothetical scorched node network based on NGN technology, rather than an attempt to replicate EPT's current network"*[2].

[1] 2_ILR_ModelSpecification_20131031.pdf

[2] See §6

Based on that, it is unclear why the ILR tries to model both a LLU COPPER access network and especially a GPON network (while a P2P network would make much more sense).

[redacted] Any inconsistency should be analysed in details which would increase the robustness of the models developed by ILR.

The EPT cannot provide its final views on this modelling exercise as long as the necessary transparency is assured and the model has not been provided and further explanations on the way the model will be used have not been provided.

2.2 Scorched node approach

According to the specification document, the scorched node approach seems to be implemented by keeping the existing location of the highest node level in the access network (MDFs for copper, OLTs for fibre):

"Network topology includes the position and location of nodes in the network (e.g. MDFs in the traditional copper network, OLTs in GPON networks and Ethernet switches and IP routers) as well as links between the nodes." (§2.1.2)

It is unclear if the real location of lower level nodes (e.g. distribution point in the copper access network) is also kept. If not, this can lead to an over-optimized network as nodes will be located in "ideal locations" that are likely to be unavailable in the reality.

Despite the implementation of the scorched node approach, the BU LRAIC model includes an option to have the number of nodes vary:

"In determining the number and location of nodes, the model allows sensitivities to be run on the number and location of nodes, although without running a full scorched node approach. This sensitivity analysis will provide information on the potential impact on costs of variations in the number of nodes." (§2.1.2)

The exact implementation of this sensitivity analysis remains unclear:

- Where are the new nodes located?
- Is the access calculation run again?
- How are the new nodes connected to the existing nodes?

In addition it is not clear that this approach is a best practice as it is usually not implemented in BU LRAIC cost models based on the scorched node approach. The impact of this change remains, according to the ILR, very limited as compared to the base scenario:

"With fewer nodes in the network, the average local loop length increases. This means that cable costs, and jointing costs for copper, also increase. However, the impact on the cost of copper LLU is relatively small – only a 4% increase in costs.

However, costs in the core network decrease. This is because there are fewer nodes requiring fewer pieces of equipment and buildings and fewer transmission routes. Therefore, with 71 nodes in the network, the cost of traffic services such as bitstream and Ethernet services decrease. However, the impact is still relatively small – there is a 4% decrease in the costs of these services."[3]

Also, the ILR's consultants have implemented the model considering only the existing FTTC (about [redacted] FTTCs). This is not in line with the forward looking principle as only with the existing FTTC it would not be possible to cover the whole country with 30 Mbit/s with copper. As a consequence, the best practice would rather be to consider the FTTC to be deployed in the years to come. But here again, no information on coverage and where these nodes are exactly deployed have been provided. Also, the goals to achieve are not provided so it is impossible to comment on this.

Considering only the existing FTTC can lead to recovery issues if unit costs are assessed based on too high number of FTTC customers ([redacted] FTTC does not correspond to a national FTTC coverage).

Exact location of all nodes levels within the network should be kept. Number of nodes should be as in the EPT's network, in line with best practices for fixed network cost models.

Forward looking number of FTTC should be considered.

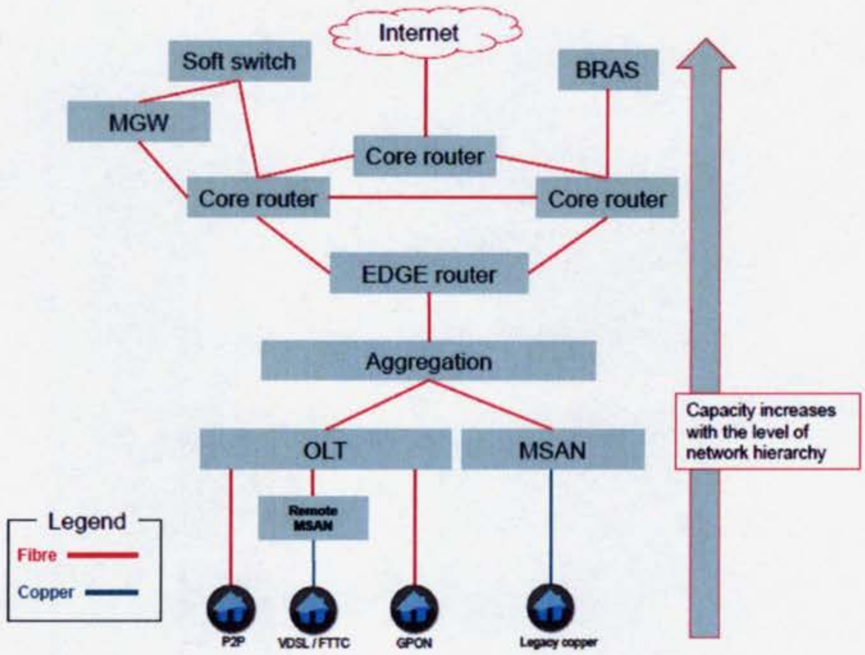
2.3 Access network topology

According to the specification document, remote DSLAMs are connected to the aggregation via OLTs (see Figure 1)

[3] 4_ILR_InputData_20131031.pdf, section 9.5

Figure 1 - Network equipment node overview (Model specification)

Figure 13. Network equipment nodes

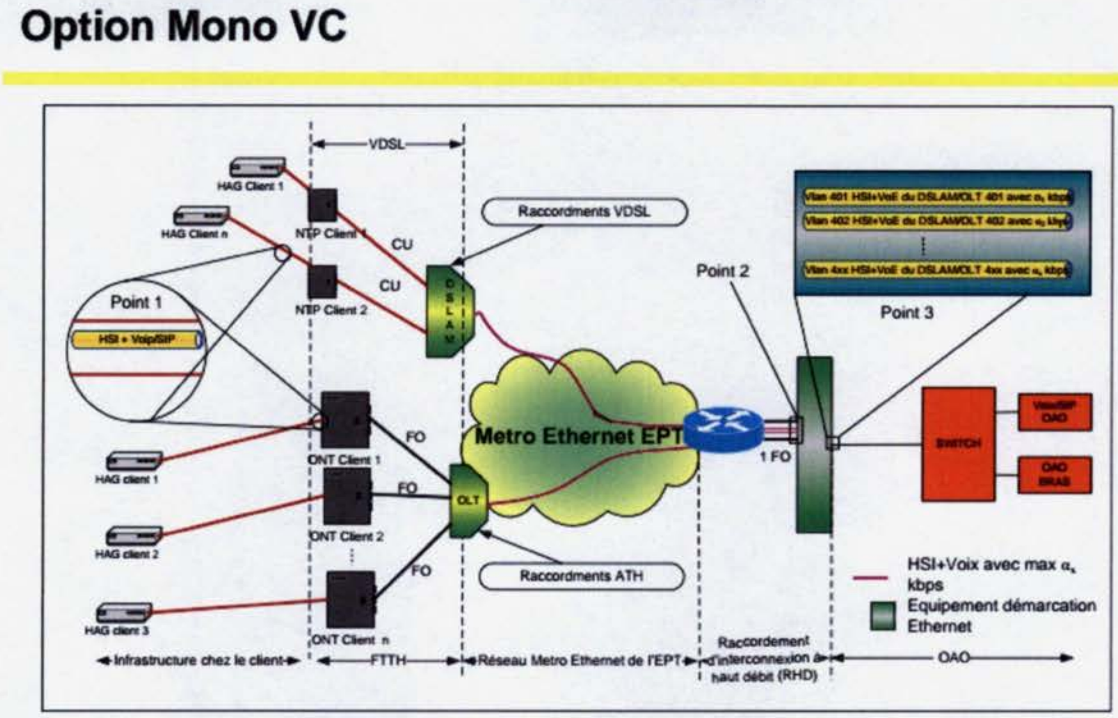


Source: Frontier Economics

Source: Model specification

This is not in line with EPT's network topology where in the case of VDSL, no OLT is required (see Figure 2).

Figure 2 – Wholesale offers description



Source: EPT, Wholesale products presentation (EPT_WS_TERA_20100915.pdf)

As regards the ILR's statement that *"it may be rationale for an efficient network operator to run a number of technologies in parallel, even in the medium to long term"*, the EPT does not share the ILR's view as it is foreseen to have a P2P FTTH network in the long term with 4 FO going to the customer.

In addition, this statement is not in line with the EC recommendation that only a FTTH network should be modelled:

"Where cable, fibre (FttX) and, to a lesser extent, mobile networks (in particular Long Term Evolution or LTE mobile networks) are competing against copper networks, SMP operators react by upgrading their copper networks and progressively replace them with NGA to address this competitive threat. Therefore, since no operator would today build a pure copper network, the BU LRIC+ methodology calculates the current costs of deploying a modern efficient NGA network."[4]

Remote DSLAMs should be directly connected to aggregation (not via the OLT).

[4] COMMISSION RECOMMENDATION of 11.9.2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, §31

2.4 Core network topology

When presenting the core network topology, core sites are said to be connected on a spanning tree topology:

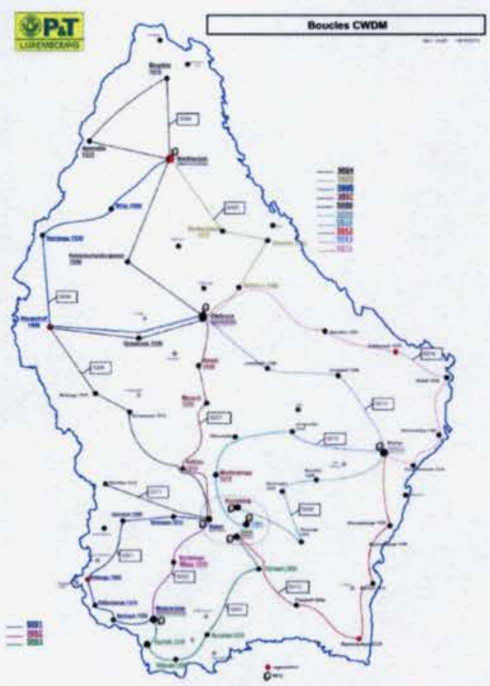
"The model then calculates how the core network is routed (see Section 5.5). This is done in two stages. First, by building an efficient spanning tree that connects all of the nodes in the network (i.e. connecting all PoP sites using the shortest route to the nearest aggregation node site). And second, ***a spanning tree is also used to connect all core sites to a single core site*** *in Luxembourg."* (§5.2)

This approach is not the one traditionally implemented in bottom-up core models where core routers are rather connected on a ring or fully meshed topology.

It is also unclear whether all core sites are linked to a single core site or if all sites are connected together as described in the table 2 page 41 ("IP Core to IP Core" → Fully meshed).

EPT's backbone transmission network is based on a ring technology for the TDM technology (SDH-rings) as well as for the modern DWDM/IP-MPLS (see figure 3).

Figure 3 – P&T's IP-MPLS transmission network (DWDM network)



Source: 2010-52-MR-EPT(Lux)-Specifications vILR.ppt

As regards the resilience, the ILR states that *"sufficient resilience can be built into the network through redundancy in equipment, without route diversity being necessary"* (§5.5)

This is not in line with the EPT's redundancy rule that SPOF[5] should be avoided. Two resilience links should not cross anywhere.

The core network should be based on a ring topology.

Resilience links should avoid SPOFs.

2.5 Access network dimensioning

2.5.1 Access network algorithms

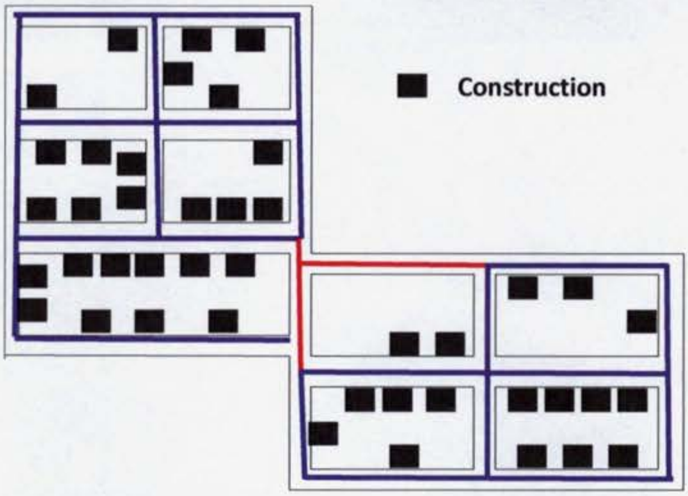
The specification document explains that the road segment algorithm excludes road segments with no building from the calculation:

"The model uses road and mapping data to determine which street segments have buildings on them. The model excludes road segments with no buildings on them since they do not need to be connected to the access network. The model does not consider future buildings in empty streets since it is not possible to forecast where these will be. Further, the number of new buildings over the modelled period is likely to be sufficiently small as to have limited impact on the overall model results." (§5.4.2)

In practice, these street segments can be useful to connect buildings from other street segments to the rest of the network. Disregard them can lead to have road segments with buildings isolated from the rest of the street network (see Figure 4).

[5] SPOF = Single Point of Failure

Figure 4 – Isolated building when road segments with no buildings are disregarded



If the two red road segments (with no buildings) are disregarded, then it will be impossible to connect the left part to the right part of the network.

Source: EPT

In addition, all along the specification, the ILR refers to the "least cost routes" when referring to the outputs of its algorithms. The algorithm details tend to show that the ILR has implemented "shortest routes" algorithms rather than "least cost routes" algorithms (configurations that aggregates the lines in the most efficient fashion are not necessarily the shortest ones).

Road segments with no buildings should not be disregarded.

2.5.2 Assets to be modelled

A number of assets are not mentioned in the specification document. As a consequence, it is unclear if corresponding costs are accounted for in the BU LRAIC model. These include:

- Network Termination Units (NTUs);
- Cables joints;
- Manholes / chambers ;
- Final drop costs;
- Splicing/ testing/ planning costs.

Disregarding these cost categories is likely to lead to underestimated model outputs.

These cost categories should be accounted for if missing.

2.5.3 Dimensioning rules

2.5.3.1 Distribution points (DPs)

In 5.6.2 and 5.6.3, the ILR mentions that fibre will run from the customer's premises to a DP. It should be noted that the FTTH P2P network should be modelled without DP as the fibre goes directly from the customer premises to a PoP.

The following rules are used:

- From each POP there will be 2 fibres per customer;
- from the Curb 4 fibres will enter the customer's premises.

These rules should be considered in the model as this inclusion of spare fibres is mandatory.

The ILR should specify the exact definition of DPs for each case (FTTH P2P, GPON, FTTC, and Copper).

In the case of FTTH, it is stated that "*Given the relatively high costs of splicing fibre cables, the model assumes that a single cable runs from each road segment where potential customers are located, to the DP along the route specified*".

Does it mean that DPs are splicing chambers in the case of FTTH? Are DPs' locations the same for the different scenarios?

DPs engineering rules should be considered in the model and DPs' definition should be specified.

The rules on the number of fibres at the different levels of the network required by the government should be implemented.

2.5.3.2 Cables

The ILR should ensure that the following rules[6] are considered within the model:

- 1 joint per chambre (regard préfabriqué) ;
- Maximum 144 fibres per joint (Flat Fist);
- Maximum 32 Micro-cable per joint (Flat Fist);
- Maximum of 32 customers per splicing chamber (average 20 customers per splicing chamber);
- Number of fibres per duct is limited (security)
- Number of fibres per trench is limited (security)
    - If fibre density is high the construction the construction of a concrete trench has to be considered. In some case, an alternative can be to split the fibre density by deploying trenches on both sides of the road.

[6] Annex 7 Frontier Questionary of 10th December

It is unclear whether the differences between the P2P and the GPON topologies engineering rules have been considered within the model.

- P2P: micro-fibre cables are installed in micro-ducts. Micro-tubes are installed in ducts.
- GPON: hybrid cables (copper cables with fibres inside) are installed in ducts (the costs of those types of cables have not been specified in the input data request. Only the costs of micro-fibres cables have been specified)

The ILR should ensure it has been considered.

The way copper joints have been modelled is also unclear:

"This compares to the approach in the copper networks where it is assumed cables are spliced together such that cables with higher numbers of pairs are used closer to the DP."

The way copper pairs have been modelled should be specified:

- One joint to connect final drop cables for 2 buildings?
- One joint to connect the final drop cable for each building?

EPT's Cables engineering rules should be considered.

ILR's assumptions should be further detailed.

2.5.3.3 Ducts / Trenches

The algorithm developed in order to dimension the trenches may under-estimate their length:

- When 2 trenches are rolled out in a street segment, it is unclear if the trench enabling to connect the 2 side trenches has been accounted for;
- It is unclear if the trench enabling to connect 2 street segments (i.e. at cross-roads) has been accounted for.

For these types of links, more expensive specific trenches are required in order to resist to the car traffic.

In addition, the specification document states that for street segments where buildings are located on one side of the street only, there is only one trench deployed.

"Where there are buildings on both sides of a road segment, duct is assumed to be built on both sides […]. For road segments where there are only buildings on one side […] duct is assumed to be built on one side only." (§5.7.1)

In practice, a second trench sometimes needs to be rolled-out at the same time to anticipate the buildings to be built on the other side of the street or for security reasons.

The following engineering rules should also be taken into account:

- Number of fibres per duct is limited (security);
- Number of fibres per trench is limited (security);
- EPT deploys always at least 1 spare duct.

Ducts across the streets are not well defined. In some cases it will not be possible to cross a street at a given point: it is not clear that this has been implemented in the model?

It is also unclear if final drop trenches are accounted for in the BU LRAIC model.

Missing trenches should be accounted for:

- **Trench enabling to connect the 2 side trenches has been accounted for;**
- **Trench enabling to connect 2 street segments (i.e. at cross-roads).**

2.5.3.4 FTTO

In the specification document, the ILR makes no reference to the FTTO network. In this case, the fibre leased lines costs would be based on the FTTH network. It is not a best practice as this network does not well adapted to fit the needs of business customers (such as redundancy).

The FTTO network should be modelled.

2.5.3.5 Busy hour

As regards the busy hour calculation for the different services, the ILR states that:

"The busy hour for different services may vary. For example, the busy hour for voice services is likely to be during daytime whilst the busy hour for broadband may be during the evening. This effect may be adjusted for it is likely to have a large impact on total and unit costs." (footnote 12 p42)

This is unclear how it has been adjusted in the model.

The ILR states that the traditional leased lines demand is not considered to use the NGN network in the model:

"The model assumes that traditional leased lines do not use NGN equipment although they use the duct and cable transmission network and, in turn, bear a cost of this network." (page 45)

It is unclear how the traditional leased lines demand is accounted for in the model.

The ILR should specify its busy hour calculation assumptions in more details.

2.6 Costing

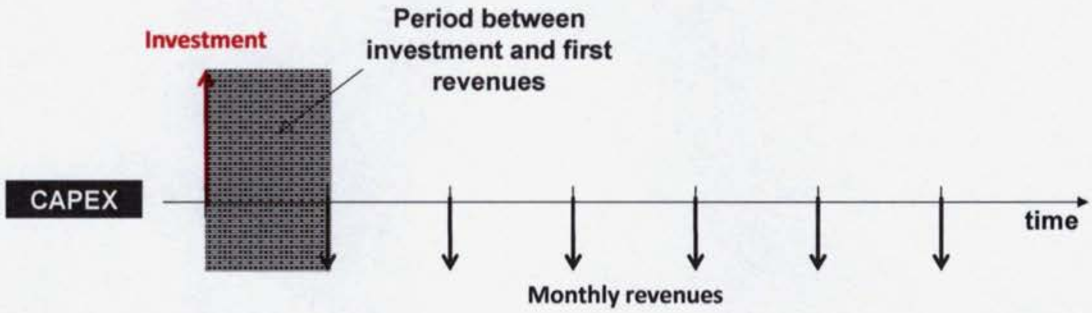
2.6.1 Use of tilted annuities

2.6.1.1 Inclusion of network CAPEX working capital

When making network investments, an operator generally begins earning revenues from its asset several months after the investment is completed (the generated cash can then be used to reimburse shareholders and banks). This period which goes from the payment of an asset to its first operating use generates working capital. This period is sometimes referred as 'time to build'. The 'time to build' period can vary significantly from one asset to another. For instance, it depends on whether or not the supplier allows delayed payment (referred as 'payment term'). 'Time to build' periods are usually taken into account in cost models.

For network CAPEX, working capital is therefore linked to the period that exists between network investment payment and the beginning of network revenue (see figure 5). The associated cost is usually directly taken into account in the annuity formula[7].

Figure 5 - Network CAPEX and working capital (for illustrative purpose)



Source: EPT

When describing the depreciation process (§2.1.3), the model specification document makes no reference to this 'time to build' being taken into consideration.

The time to build should be taken into account. It is typically more than one year for an access network.

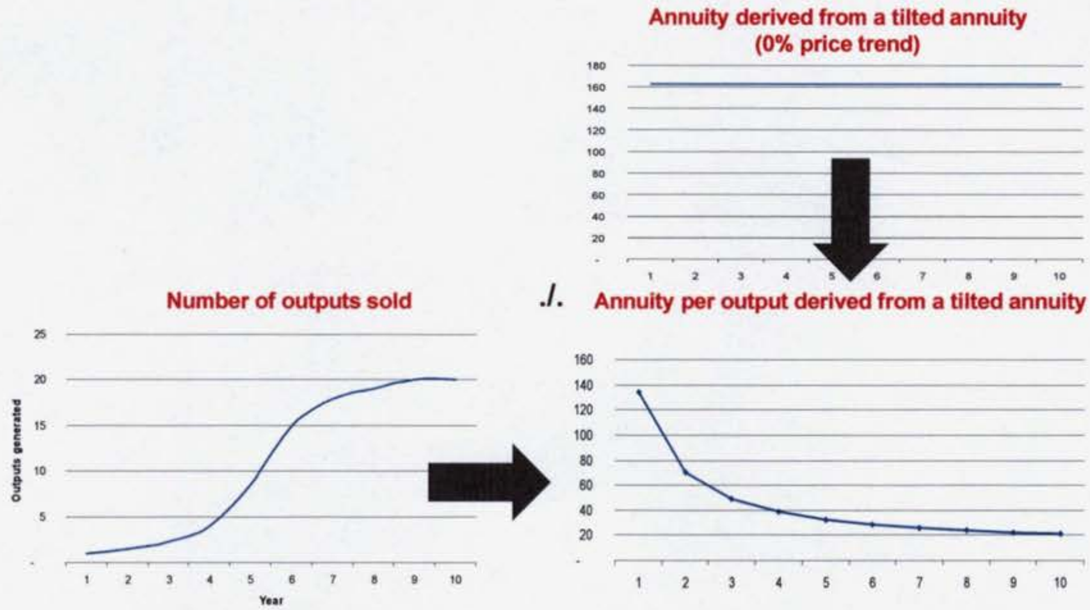
2.6.1.2 Case of the FTTH access network

Section §2.1.3 explains that the tilted annuities formula is used in order to depreciate the assets.

[7] If there is a one year delay between the time the investment is completed and the time that revenues are generated, then it is necessary to multiply the annuities by (1+WACC).

This approach is suitable in a context of stable volume of output (good approximation of the economic depreciation). However for new products such as FTTH, the tilted annuity is not a good proxy for economic depreciation and leads to wrong economic signals.

Figure 6 – Tilted annuities profile (demand take-up context)

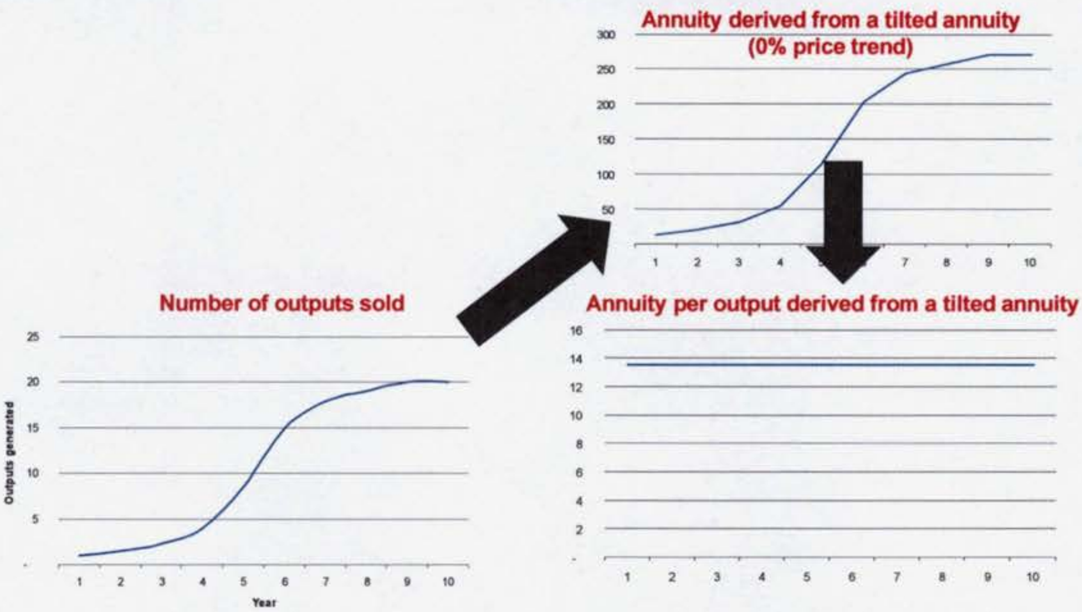


Source: EPT

In this case, the adjusted tilted annuity[8] is more suitable and leads to appropriate economic signals. The cost per output does not vary from a year to another and enables to recover the initial investment.

[8] This approach calculates annuities that follow the evolution of revenues.

Figure 7 – Adjusted tilted annuities profile (demand take-up context)



Source: EPT

Adjusted tilted annuities (or economic depreciation but this should be very similar) should be used in the case of FTTH. This is in line with best practices to use such an approach for a network where demand is growing.

2.6.2 OPEX

In the BU LRAIC model, network opex are assessed as a mark-up over GRC or as a cost per line:

"Direct operating costs can be estimated as a percentage mark-up over GRC or as a cost per line. While it is theoretically possible to estimate operating costs using a bottom-up approach (e.g. estimating the hours required to perform various activities and then estimating the cost per hour of different types of labour), this does not necessarily lead to more robust results in practice. This is because such an approach would require a large amount of data and subjective judgements about input assumptions." (§7.1.3)

Despite ILR's analysis, the mark-up approach is not necessarily a best practice when assessing the network opex as most of the time, these are derived from international benchmark analysis and are not necessarily relevant for the context of Luxembourg.

It is possible to assess costs that are relevant for the Luxembourg context using one of the following approaches:

- **Top-down assessment**: as in the norm of top-down modelling, OPEX costs are based on the operator's actual costs.
- **Bottom-up assessment**: there are two ways to estimate OPEX costs using bottom-up modelling. The first is to use percentages provided by suppliers of telecoms electronic equipment, such as mobile transceiver and receivers for the Luxembourg. The second way is to estimate the cost of every operational task

by multiplying the time required to complete the task by the hourly staff cost in Luxembourg.

The operating costs should be assessed based on the top-down or bottom-up approaches detailed above. Calculations should use inputs that are relevant for the Luxembourg context. If opex calculation was not taking into account the higher wage cost in Luxembourg, then this would mean that ILR does not allow an efficient operator to recover its costs.

2.6.3 Wholesale specific costs

In the current version of the BU LRAIC model, wholesale specific costs are disregarded:

"Wholesale specific costs relate to interconnection and other specific activities not directly related to the network. These include to wholesale billing and product management. However, as these costs are not generally incremental to call termination, they are not considered when calculating the pure LRIC of wholesale call termination." (§7.1.4)

This is not in line with the best practices recommended by the European Commission.

This is not in line with the ILR reference document for mobile networks that states that a share of overhead should be recovered:

"The Pure LRIC approach does not foresee a general mark-up for company-wide overhead. However, overhead cost components that are directly associated with the provision of termination should be included in the cost calculation. The information for such termination-specific overhead cost is to be provided by the operators. As in respect of the preceding position, the resulting cost component would be included in the model run for total output including termination so that it would also be reflected in the Pure LRIC determined for this service."[9]

In the context of its review of the Austrian fixed call termination decision, the European Commission has not commented on the inclusion on wholesale specific costs (the level of costs only is challenged):

*"While **the Commission acknowledges that the recovery of traffic-sensitive wholesale commercial costs is compliant with the pure BU LRIC methodology**, the Commission considers that their level must be within a reasonable proportion to the total costs of fixed termination services."*[10]

[9] ILR_MTR_ReferenceDocument_20131121.pdf

[10] Commission decision concerning Case AT/2013/1457: Call termination on individual public telephone networks provided at fixed location in Austria.

The EC has underlined that wholesale specific costs typically amount to circa 20% of fixed termination costs:

"While the Commission acknowledges that the recovery of traffic-sensitive wholesale commercial costs is compliant with the pure BU LRIC methodology, the Commission considers that their level must be within a reasonable proportion to the total costs of fixed termination services. The Commission does not have sufficient information to question the level (in absolute and percentage terms) of wholesale commercial costs as proposed by TKK. Nevertheless, the Commission notes that the issue of inclusion and treatment of such costs in the BU-LRIC calculations has been recently raised by BEREC. It has been observed that while some NRAs entirely disregard such wholesale commercial costs in their models, others have calculated these costs, ***usually amounting up to 20% of the total fixed termination costs****."*[11]

In the context of Luxembourg, the wholesale specific costs are likely to represent a bigger share of fixed termination costs as:

- Termination traffic is lower as compared to the traffic in other countries. The staff required to manage the interconnection is not significantly lower as compared to other countries (lower economies of scale);
- Wages in Luxembourg is among European countries with highest wages.

Wholesale specific costs should be included in the Pure LRIC calculation and should take into account the specificities of Luxembourg to enable operators to recover their costs.

2.6.4 Common costs no longer recovered by pure LRIC FTRs

In the BU LRAIC model, the common costs no longer recovered with the pure LRIC FTRs have been re-allocated to call origination and on-net based calls:

"In order to ensure that the modelled operator is able to fully recover its efficiently incurred costs, the model re-allocates the common costs that would have been recovered from wholesale termination under the LRAIC approach. These are re-allocated to call origination and on-net calls based on the volume of these calls." (§7.2.3)

This approach has been implemented by NRAs in Europe. However, other options can be envisaged. These include:

Figure 8 - Ways to recover FTR common costs

[11] Idem.

Recovery through	Countries	Rationale
Retail services only	Belgium, Sweden	Retail markets are subject to competition and hence encourage efficiency Smaller number of operators buying origination than buying termination → cause significant surcharge if origination is increased
Call origination	UK, Norway	Ensure that intra-traffic common costs continue to be recovered from call services Do not distort the prices of WLR and LLU determined on the basis of LRIC differential Avoid distributional concerns from WLR charge increase on low spending vulnerable consumers Avoid distortion of competition due to CPS customers on incumbent's network
Wholesale line rental	Denmark, France	A part should be recovered on WLR services (OAO) as they share the infrastructure (the rest is on retail: for incumbent)
All services	(Austria?)	Should be recovered by all other relevant services that use the infrastructure in question (including retail and wholesale)

Source: TERA Consultants

The industry should be consulted on the best way to recover common costs no more recovered in the context of Pure LRIC.

2.7 Quality assurance

As described in section 8 ("Quality assurance"), the quality assurance consists mainly of having a clean and well-structured model (documented model, separated inputs and calculations, different colours for inputs and calculations).

The cross-checks quoted consists in having the model reviewed and make consistency checks (e.g. sum = 100%).

The ILR states that *"in developing the model, it is important to use knowledge of the telecoms industry and the specific Luxembourg operating environment to check outputs and intermediate calculations".*

In this context, the following additional cross-checks seem mandatory to ensure the model consistency:

- **Comparison of the outputs of access network dimensioning with what is expected considering the road section demand**: Access networks calculations are performed on Map-Info and MS Access. These tools are not known to enable straightforward sanity-checks (as can be performed with MS excel). As a consequence, the results of sample road sections should be analysed in depth to check the calculation consistency.

- **Comparison of model dimensioning (asset count) with the EPT's databases**: This should be performed on a per asset basis (km of trenches, km of cables, number of joints…).
- **Comparison of model costing results (cost of the network) with the EPT's accounts**: This activity is mandatory to ensure that no material cost category has been unintentionally disregarded.
- **Comparison with benchmark data**: The outputs of the model should be challenged with public data:
  - Cost oriented wholesale tariffs in other countries: order of magnitude of model outputs;
  - Public BU LRAIC cost models: to check that the cost structure is rational (e.g. check that the cost of trenches represents the same share of costs as compared to other countries).
- **Have the model reviewed by operators.**

The quality assurance process should be straightened with the cross-checks listed above.

VERSION NON CONFIDENTIELLE

EPT comments on ILR fixed network BU LRIC cost model

Input data and intermediate calculations document review

TERA CONSULTANTS

EPT

Ref: 2013-50-DB-EPT– ILR fixed network cost model

TERA Consultants
39, rue d'Aboukir
75002 PARIS
Tél. + 33 (0) 1 55 04 87 10
Fax. +33 (0) 1 53 40 85 15
www.teraconsultants.fr

S.A.S. au capital de 200 000 €
RCS Paris B 394 948 731

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Summary

1 Management summary

The *Institut Luxembourgeois de Régulation* (ILR) has started the development of a bottom-up long run incremental cost model (BU-LRIC) to assist in assessing the SMP operator's compliance with its cost orientation obligation.

As part of the implementation process, the ILR has organised a consultation process in order to collect the industry's views on the model.

In the context of this consultation, the ILR has not offered at this point in time access to the draft model, and has provided 4 documents. One of the document details the inputs of the model. The review of this document raises a significant number of questions because the assumptions are not sufficiently detailed in the document. If the draft model had been provided, the understanding of these assumptions would have been much easier and would have saved time in the consultation process. EPT regrets this. Also, it appears that several misunderstandings occured.

In summary, EPT's comments are:

- With regards to the lack of clarity and transparency in the documentation
  - The ILR should use data of an efficient operator in Luxembourg instead of undisclosed benchmark;
  - The assumptions behind the calculation of broadband customers and voice traffic and leased lines should be documented. Based on the few information available, it appears that:
    - The number of broadband customers has been overestimated;
    - The voice traffic has been underestimated;
  - Many assets have not been documented or have not been modelled;
  - Many unit costs have not been documented by the ILR or have not been modelled;
  - The core assets documented are not sufficiently documented as many dimensioning rules are missing and many core assets are missing;
  - The results presented in the document are aggregated at a level not allowing any cross-checks;
  - The dimensioning parameters used by ILR are not in line with the Luxembourg market specificities and many parameters are missing or are not documented;
- The documentation shows that there are misunderstandings and that some simplification leads to inaccurate results:
  - ILR does not take into consideration the objectives of the Government with regard to the "Stratégie nationale pour les réseaux à "ultra-haut" debit;
  - The network coverage does not reflect [redacted] and is not in line with Digital Agenda Europe;
  - The road network seems to have been simplified;
  - The comparison between EPT data and the model outputs outlines discrepancies showing the model is under dimensioning EPT network;

- The trench sharing has been over-estimating using historical levels instead of current levels;
- The core network hierarchy is not reflecting [redacted] network and the number of nodes is not [redacted] of nodes which is not in line with the scorched node approach;
- The unit costs documented by the ILR have been underestimated. This is particularly true for trenches;
- The opex costs have been underestimated
- The power and air-conditioning costs should be based on assets consumption and the results should be provided;
- The wholesale specific costs should be included and it is not best practice not to include this. This has been recognised by ILR in the mobile cost modelling documentation;
- The mark-up for common costs has been underestimated;
- The cost of working capital should be included;
- The nominal pre-tax WACC should be used and the NGA risk premium should be updated.

EPT findings show that the approach followed by the ILR will not allow the most efficient operator to recover its costs on the Luxembourg market. The ILR should therefore update its model to reflect an efficient operator with real world costs and with a real world network. Also it would be highly appreciated if more explanations and documentation could be provided in order to verify the modelling approach used.

2 Context

The *Institut Luxembourgeois de Régulation* (ILR) has started the development of a bottom-up long run incremental cost model (BU-LRIC) to assist in assessing the SMP operator's compliance with its cost orientation obligation.

As part of the implementation process, the ILR has organised a consultation process in order to collect the industry's views on the model.

In the context of this consultation, the ILR has not offered access to the draft model and has only provided 4 PDF documents that should be commented on by the industry:

- 1_ILR_ModelConsultationContext_20131031.pdf
- 2_ILR_ModelSpecification_20131031.pdf (hereafter "the specification document")
- 3_ILR_ModelMethodology_20131031.pdf
- 4_ILR_InputData_20131031.pdf

This document will be focused on the study of "4_ILR_InputData_20131031.pdf"

It should be noted that the ILR stated EPT that access to the draft model would be provided later on. EPT supports this approach which is line with the approach followed by other regulatory authorities in Europe. EPT would like to draw the attention to the fact that the draft model aims at calculating costs of services provided by EPT and in this context it would be difficult to imagine a situation where EPT has no access to the tools that enable to set the prices of the services it sells. Despite this, EPT regrets that access to the draft model was not provided at the same time of this consultation since many aspects of the documentation are not sufficiently detailed and do not allow to understand how the parameters have been implemented in the draft model.

3 Input data and intermediate calculations document review

The document on input data and intermediate calculations[1] on the ILR's BU LRAIC cost model raises a number of questions on the following topics (organised in the same way as the ILR document):

- General comments (see §4);
- Demand estimation approach (see §0);
- Usage per subscriber (see §6);
- Cable and duct network (see §7);
- Passive network dimensioning (see §8);
- Trench sharing (see §9);
- Core network hierarchy and number of nodes (see §0);
- Equipment cost and network dimensioning (see §11);
- Asset lives and price trends (see §12);
- Other costs (see §13);
- Sensitivity analysis (see §14);
- NGA risk premium and WACC analysis (see §15).

These are detailed hereafter.

[1] 4_ILR_InputData_20131031

4 General Comment

4.1 Overview

When setting the regulated prices, an important part of the regulatory work is to ensure that the operators are able to recover their costs. Many data are lacking in the document published by the ILR to ensure that the prices that will be derived from ILR model will allow EPT to recover its costs. Furthermore, it has been noticed that the ILR consultants do not follow a coherent and systematic approach to select its data but are cherry-picking the data, the engineering rules and the unit costs in order to bring the total cost of the network down.

The model and the document should be reviewed and complemented. Design rules, benchmark values algorithms should be fully described in the documentation. All network assets should be included. All the network nodes should be part of the model.

The ILR should perform cross-checks in order to make sure that the EPT will be able to recover its costs, which in the state of the present document is not possible.

4.2 Use of benchmark

In §1.1.2 of ILR document, it is stated that international benchmark is used. It is believed that the use of benchmark aims only at lowering the costs incurred by EPT as:

- Due to its size, EPT faces significant disadvantages compared to operators from larger countries such as France, Germany, England or Spain:
    - The bargaining power of EPT is considerably lower than other operators in Europe resulting in higher unit capex, higher maintenance unit costs and higher supplier support costs;
    - Economies of scale are considerably lower in Luxembourg than in other European countries resulting in higher capex and opex;
- Wages are higher in Luxembourg than in any other countries in Europe resulting in:
    - Higher opex;
    - Higher installation costs. This latter aspect is of high importance for assets which costs are driven by man work as trenches.

The use of benchmarks may results in EPT not recovering its efficiently incurred costs (over optimisation) which would be a breach in the cost orientation principle.

Furthermore, it should be noted that no benchmark information has been provided at all in this document, not allowing the EPT to cross-check and validate the values used (e.g. check that the countries used are comparable with Luxembourg or that the scope of the assets cost benchmarked is the same as the scope of the assets cost in Luxembourg).

The use of benchmarks is even more questionable as the EPT has provided the contact information as asked by ILR consultants in order to answer to any question.

The EPT takes therefore the view that the EPT's costs have more relevance than any benchmark inputs for the Luxembourg context.

4.3 Former model

It is to be noted that the EPT has developed in 2010/11 a bottom-up model assessing the cost of the fixed network. This model has been shared with the ILR.

[redacted]

5 Demand estimation approach

5.1 Fibre coverage

The documentation regarding the fibre coverage is not sufficient to understand the modelling carried out by the ILR.

The model should include a nationwide copper network reflecting EPT's network and using EPT's nodes following the scorched node approach (the CT and the LV for the copper network).

EPT is not allowed to withdraw access once it has given access to services to alternative operators. The copper local loop can therefore not be phased out on short term to be replaced by the fibre network following the roll-out of this new network. The ILR should thus model a nationwide copper network including all active nodes rolled-out by EPT.

Furthermore, some LV nodes have active equipment allowing EPT to offer FTTN services. These should also be included in the model.

The roll-out of the fibre network is not documented except for the coverage increase:

- Which addresses are passed by the fibre network?
- Which ones with a GPON connection and which ones with a P2P connection?
- How does the ILR select which new addresses are passed by the fibre network as the coverage increases?
- How is it taken into account in the model? Which algorithms are used?

The « ultra-haut débit » (UHD) strategy of the Luxembourg Government foresees the deployment of a multi-fibre network with open access: « *de réaliser chaque raccordement « ultra-haut » débit par au moins 4 fibres optiques* » (p.8 de la Stratégie nationale pour les réseaux à « ultra-haut » débit). Therefore, EPT requests ILR to explain why it is modelling a GPON network while it is not a forward-looking network.

The model should include a copper network with a national coverage. All the nodes of the copper network should be modelled following the scorched node approach.

The fibre coverage modelled should be documented and the impacts on the model should be explained. The fibre coverage should be national and be in line with the Luxembourg Governement's strategy «ultra-haut débit ». It is noted that no sensitivity analysis on this aspect is conducted while it is a major choice.

5.2 Broadband subscribers

The ILR is forecasting an increase of 32% over 4 years of the number of broadband customers from 149,173 to 196,719. This increase is not realistic and not supported by any market study or trend computation. The forecasts should therefore be updated. The EPT anticipates at best that the number of customers will grow by [redacted]% during the next four years.

In the context of pure LRIC calculations, such parameters can be very important.

The forecasts carried out by the ILR should be updated in order to reflect a more realistic approach.

5.3 Corporate subscribers (leased lines)

The ILR should model the exact path followed by the corporate leased lines. The cables used for leased lines are dedicated cables.

The engineering rules for the leased lines roll-out have not been documented. They should be precisely described, especially as all leased lines do not follow the same engineering rules and all leased lines do not enter the core network.

The ILR should publish the detailed engineering rules used for the leased lines.

6 Usage per subscriber

6.1 Voice traffic

The conversion of yearly traffic in minutes to Erlangs is missing many important parameters resulting in underestimating the voice traffic:

- The use of an extra allowance of capacity for variations in traffic in the busy hour is indeed required. But its value should be [redacted]%.
- The network dimensioning is planned in order to support not only current demand but also future demand. The network is typically planned to support the growth over 2 or 3 years. The network should therefore be dimensioned on the maximum demand over two or three years. If the traffic is decreasing, the demand that should be considered is therefore the current demand, but if the demand is increasing the demand to dimension the network that should be considered is the future demand.
- The yearly traffic shown in table 10 is the commercial traffic, i.e. the traffic billed to the customers. But the commercial traffic is not the traffic supported by the network which is the technical traffic. Typically the technical traffic is the commercial traffic uplifted by:
    - The holding time for successful calls: for each successful call, there is a holding time including pick-up.
    - The holding time for unsuccessful calls: for each unsuccessful, there is a holding time.
    - The share of unsuccessful calls in the total number of calls can be deducted from the section §2.3.2 voice calls of the "input data and intermediate calculations" report.

It should be noted that these parameters only dimension the demand handled by the traffic. Other parameters are involved when dimensioning the network especially the utilisation rate, the churn, the spare capacities, the spare elements. These are not taken in account deservedly in this part but should be taken into account in the model.

The evolution of the voice traffic is not clear and this should be justified by ILR too.

The model has underestimated the voice traffic handled by the network. The voice traffic should be dimensioned using the parameters described. The forecasts computation methodology used by ILR should be documented.

6.2 Broadband bandwidth per subscriber

The ILR has overestimated the actual broadband bandwidth per line and the forecast.

EPT measured in 2011 an average usage of [redacted] kbps and [redacted] kbps for the ADSL and VDSL services. The ILR has forecasted a trend of 14% per year which is not justified and not documented.

The ILR should document the traffic forecasts and rely on data from Luxembourg.

6.3 VoD and IPTV traffic

It should be noted that the dimensioning of the VoD and of the IPTV traffic has not be documented while these traffics have significant impact on the costs. This is not acceptable that such a significant share of the traffic handled by the network is not documented at all. This example shows how difficult it is for EPT to fully comment on the model.

The ILR should document the VOD and the IPTV traffic calculation.

6.1 Leased lines traffic

ILR does not specify sufficiently how leased lines traffic is treated while this is a major element in the total traffic. ILR should consider that corporate lines are point to point circuits with guaranteed bandwidths.

It is not clear why ILR model bandwidth requirements for leased lines above 2Mbps and for Metro Ethernet leased lines in a constant way while in the market there is a clear trend to higher capacity. We would appreciate if ILR could justify this.

It is not clear why ILR proposes decreasing bandwidth requirement for leased lines below 2Mbps.

Assumptions around leased lines traffic are quite important in bottom-up models but ILR does not describe properly and justify the assumptions selected.

7 Cable and duct network

7.1 Geographic data

7.1.1 Road network data

ILR consultants are using cadastral database including 44,474 road and 36,360 road intersections and ends.

It should be noted first that the source of the cadastre data has not been provided and therefore the data cannot be checked. The EPT takes the view that the ILR should provide the source and the database to the industry players as the quality of the database has a significant impact on the modelling results. ILR consultants should also provide the full list of quality assurance cross-checks that they have carried out to validate the use of the database. If none have been carried out, this could be done by comparing the accuracy of the database against satellite pictures such as those provided by Google Earth or Administration du Cadastre which are publicly available. These cross-checks should focus mainly but not only on rural areas as databases are generally less accurate in these areas and network unit costs are higher in these areas.

Second, it should be noted that the access part of the fixed network should not be rolled-out along highways as no customers are located there. Nonetheless, the core part of the fixed network (the link between the core nodes) may follow the highways. There is no clear indication on whether an analysis on the type of road has been conducted by ILR consultants leading to exclude some roads for the access part of the fixed network. This analysis should be carried out. Excluding this analysis leads to underestimate the costs of the network as it could overestimate the number of roads where the access part and the core part of the fixed network are sharing the same trench.

Last but not least, the model developed by EPT in 2010/2011 was including 54,066 road/street sections against 44,474 road/street sections in the new database used by ILR consultants and over 50,000 roads intersections and ends against 36,360 in the new database. The reasons for the exclusion of 10,000 roads and 15,000 intersections of the database are not documented.

ILR should use the road network as it is and not modify it. If this difference is the result of merging some roads together, this action leads to underestimate:

- The length of the cables by simplifying the road network;
- The number of jointing equipment required in the network and therefore the number of chambers;
- The number of trenches to cross road (these trenches are the most expensive ones).

The ILR should use in its modelling and provide to the industry the complete road network database with the coordinates of all road intersections. Quality assurance cross-checks should be carried out especially in rural areas and

provided to the industry players. The type of road should be analysed as highways are generally not used by the access part of the fixed network but are used by the core part of the fixed network.

7.1.2 Estimating the number of households

When estimating the number of households in each address it is very important to address the following points:

- The number of households per address should be an integer. Using non-integer values leads clearly to threshold issues impacting downward the size of the final drop cables and then the rest of the access network leading to underestimate the cost of the network.
- The calibration of the number of households in each address should make sure that the total number of households in the model is in line with real life household counts. The calibration should be carried out at the lowest level where data is available.
- Buildings with several entrances (typically the buildings that have several street numbers) have several final drop cables. Reducing such a building to a very large building with the total of the households in each address leads to underestimate the number of final drop cables and therefore to underestimate the costs.

As the number of households is one of the most important dimensioning parameter of the access network modelling, these data and the cross-checks should be provided to the industry players in order to be able to verify the quality and that all households have been included.

The ILR should provide the number of households and the insurance quality cross-checks that have been carried out to the industry players as this one of the most relevant parameters.

Using average value leading to use a non-integer number of households per building is not acceptable as it leads to minimize the threshold effects leading to under-estimated costs.

The household number calibration is a very important step and should be carried out at the lowest level possible and be carried out such that the number of households in the model is not under-estimated.

Buildings with several street numbers should be considered as separate buildings on a modelling point of view as these have several final drop cables. Not considering this point leads to underestimate the costs incurred by EPT.

7.2 Cable and duct network dimensioning

ILR consultants have defined 6 parameters in order to dimension the cable and the duct network. The values used for these parameters may lead to under-estimated costs. In addition, using only 6 parameters is probably not enough to properly model the cable and duct network.

7.2.1 Minimum number of copper pairs per potential subscriber

The minimum number of copper pairs per potential subscriber has been set to 1.2 per households and per business for D-Side and E-Side (and final drop). This is neither in line with EPT engineering rules nor with best practices for a flexible copper infrastructure as deployed in Luxembourg. This leads to under-dimension the whole copper access network and therefore underestimates the cost of the network not allowing EPT to recover its costs.

It should be noted that all households in Luxembourg should be passed, i.e. this parameter should not be applied only to "potential subscriber" but to all households. There are several reasons why all households are passed and not only active customers:

- When rolling-out a building, it is more cost effective to pass all households at once than only the active customers.
- Passing only the active customers leads to a significant under-dimensioning of the whole access network as the under-dimensioning is then propagated to the rest of the network. Therefore when a new customer will require a connection it is possible that not enough copper pairs are rolled-out leading to major complications and significant costs increases which are not reflected in the model.
- The final drop of a household that used to have an active customer is not removed once the household does not have an active customer anymore. The natural churn leads to a network dimensioned based on the number of households in the country and not only on the number of customers.

ILR should confirm if for the dimensioning of the copper network all households and businesses are considered as connected to the network (best practices) or if only the number of active customers is used to dimension the network in ILR's model.

The value of the parameter "copper pairs per household" is not in line with EPT submission and with EPT engineering rules. ILR consultant should therefore split this parameter in three and update its value:

Figure 1 – Update of the parameter "minimum number of copper pairs per potential subscriber"

New parameter	Value
Minimum number of copper pairs per household on final drop	[redacted]
Minimum number of copper pairs per household on D-Side	[redacted]
Minimum number of copper pairs per household on E-Side	[redacted]

Source: EPT

7.2.2 Minimum fibres per customer – D-Side

This parameter, as for the previous parameter, should be applied to all households and not only to customers. The exact same reasons applied.

The value of this parameter is not in line with EPT engineering rules and leads to under-estimated costs. ILR consultant should update this parameter to 4.

This engineering rule is in line with the « ultra-haut débit » (UHD) strategy of the Luxembourg Government (see section §5.1)

7.2.3 Minimum fibres per customer – E-Side

This parameter, as for the previous parameters, should be applied to all households and not only to customers. The exact same reasons applied.

The value of this parameter is not in line with EPT engineering rules and leads to under-estimated costs. ILR consultant should update this parameter to [redacted] to reflect the structure of an open network enabling fibre unbundling and a multi-operator environment.

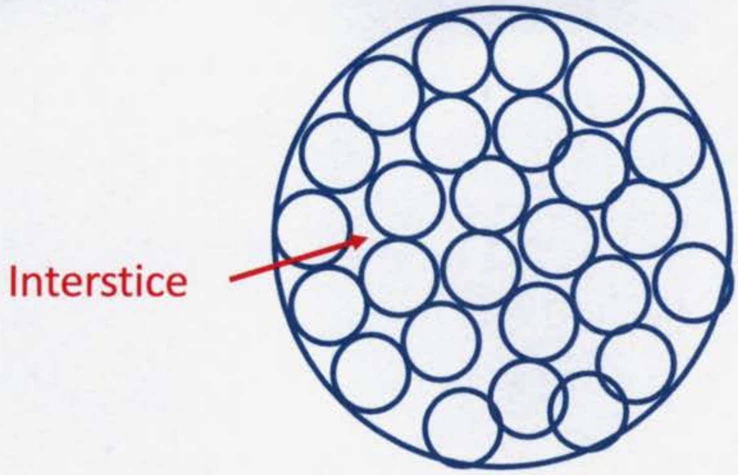
7.2.4 Duct fill factor

This parameter is used to reflect the fact that 20% of the duct capacity is unfilled. As correctly recognised by the ILR, a duct cannot be filled at 100%. However the value chosen by the ILR is overestimating the duct capacity and therefore does not allow the EPT to recover its costs.

It should be noted that 100% of duct capacity is not used due to several reasons:

- When filling a duct with cables and sub-ducts or micro-ducts, empty space remains. This void are called interstice.

Figure 2 – Interstice



Source: EPT

Even with a perfect filling of the duct, there would still be interstices. These interstices are even greater than there are different diameters of cables and of micro/sub-ducts in the duct. The interstice accounts for already 15% of the duct theoretical maximum capacity.

- When filling a duct, there is a maximum number of cables that can be rolled-out as the difficulties of filling the duct increases exponentially with the number of cables due to frictions and leads to:
  - Higher costs of installation of cables inside the ducts;
  - Higher costs of maintenance when a fault occurs on the line[2].

  Due to this effect, there is an additional typical 10% of the duct capacity that is not used.

- When computing the duct capacity required, spare capacity should be taken into account for future needs and for alternative operators. Anticipating future needs is much more cost effective than having to reopen the trench and to install new ducts. This spare capacity accounts for an additional 10% of the duct capacity.

The combination of these three effects leads to a duct fill factor of [redacted]%. ILR consultants have therefore overestimated the capacity of the ducts leading to under-estimate the number of ducts required in the network and to under-estimate the network cost.

It should furthermore be noted, as it is not mentioned anywhere in the documentation provided by ILR and their consultants, that when computing the duct capacity, the inside diameter of the duct should be considered and not the outside diameter. E.g. a 110 mm duct is a duct with an outside diameter of 110mm but the inside diameter is 94 mm. Using the outside diameter instead of the inside diameter for a 110 mm duct leads to overestimate its capacity by [redacted]%.

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[2] When a cable is damaged, EPT requires pulling it out. This is impossible if the duct is filled above a threshold.

Finally, the ILR should use the following engineering rules used by EPT due to security and maintenance reasons:

- the number of micro-ducts per 125mm duct is limited:
  - maximum 2 bundles of 7x14/10 micro-ducts;
  - maximum 1 bundle of 12x10/6 micro-ducts and 1 bundle of 7x14/10 micro-ducts;
  - maximum 2 bundles of 12x10/6 micro-ducts.

  NB: in a bundle of 7x14/10 micro-ducts, one micro-duct remains as reserve, in a bundle of 12x10/6 micro-ducts, two micro-ducts remain as reserve.
- the number of fibre-cables per duct is limited
- the number of ducts per trench is limited. If the number of duct is higher than 4, a concrete trench has to be build.

The ILR should update the duct fill factor from 20% to [redacted]% as many effects have not been taken into account. This effect leads to an under-estimate of the number of ducts required and the therefore the network cost.

The inside diameter of ducts should be used in order to compute the duct capacity and not the outside diameter.

The ILR should implement the engineering rules followed by EPT in Luxembourg which are the results of security and maintenance constraints.

7.2.5 Distance between jointing chambers

The ILR has set a distance between jointing chambers. It should be noted that:

- The purpose of this parameter is not clear as no description has been provided;
- The parameter seems useless as a chamber has to be installed each time a joint is rolled-out. If multiple joints are installed at the same location, only one chamber is required but a larger one. E.g., in a chamber "regard préfabriqué" (as supplied in the input data request by EPT) only one joint can be installed. This type of chamber is deployed by EPT in the FTTH P2P access network in order to splice the final drop fibre cables. Furthermore one joint can only store up to 144 fibres.

The number and type of chambers are therefore derived from the number of joints locations. In order to compute the number of joints, several engineering rules are required:

- A joint is installed each time there is a road intersection. It is indeed very difficult to bend a cable, especially the largest ones and it leads to expensive operations when a fault occurs. This is why a joint is installed at each road intersection allowing also splitting the copper cables.
- A joint is installed each time a copper cable needs to be split.
- There is a maximum distance between two joints. This maximum distance depends on the type of joints (copper or fibre) and on the size of the cables. This is due to several reasons:
  - An operator buys drums of cables. When the drum reaches its ends, an joint has to be installed in order to extend the network;
  - The greater the distance is between two joints, the harder it is to roll-out the cables especially when the cables needs to be install in ducts as the friction and the weight to be pull increase.

For the sake of simplicity, the ILR and its consultants could use only one maximum distance between two joints per technology instead of one per technology and per cable size.

Figure 3 – Update of the parameter "Distance between jointing chambers"

New parameter	Value
Maximum distance between two underground copper joints	250 meters
Maximum distance between two underground fibre joints	2000 meters

Source: EPT

The ILR should re-examine the approach and envisage to abandon the use of the "distance between jointing chambers" parameter as it is useless and may lead to underestimate the number of chambers required in the network.

The ILR and its consultant should instead use the two parameters provided by EPT which allows dimensioning correctly the number of joints required in the network and therefore the number of chambers.

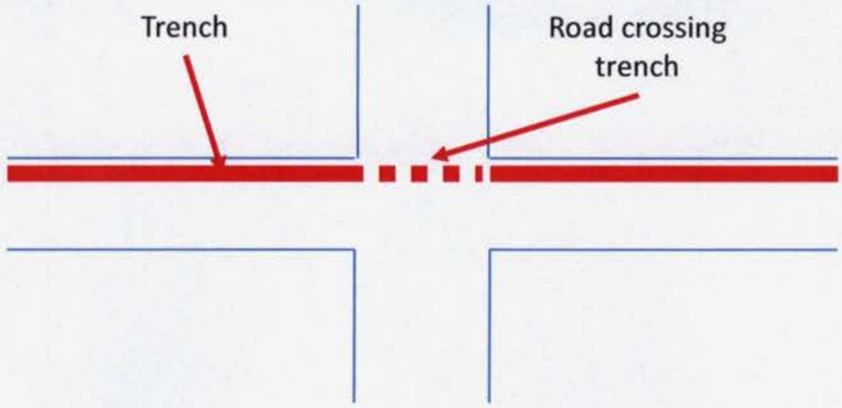
7.2.6 Distance between road crossing with 2-sided duct network

It should be first noted that this parameter is not described in the documentation provided by the ILR and its consultants. A complete description of this parameter should be provided to the industry players in order to fully understand its impact, especially as the value has been set by the ILR's consultants.

Second, many cross-roads are required when rolling-out a network:

- Each time there is a road intersection, crossing the road is required. This is particularly important given the extra cost generated by the type of trench required to cross a road compare to "regular trenches" of same size (these trenches are significantly more expensive are they must resist to the car/truck traffic).

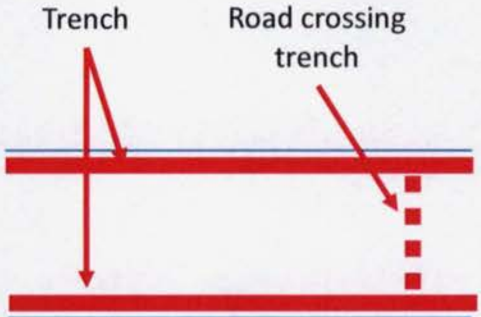
Figure 4 – road crossing at a road intersection



Source: EPT

- On roads that have trenches on both sides, at least one road crossing is required per road in order to connect both sides of the street. When the road is too long, several trenches to cross the road are required.

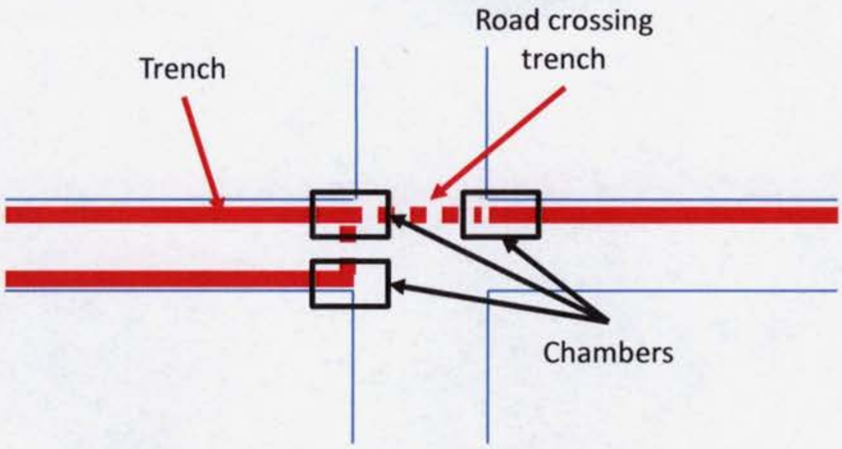
Figure 5 – road crossing on road with trenches on both sides of the street



Source: EPT

In general splicing chambers are installed on both sides of the road. The splicing chambers are then connected by road crossing trenches.

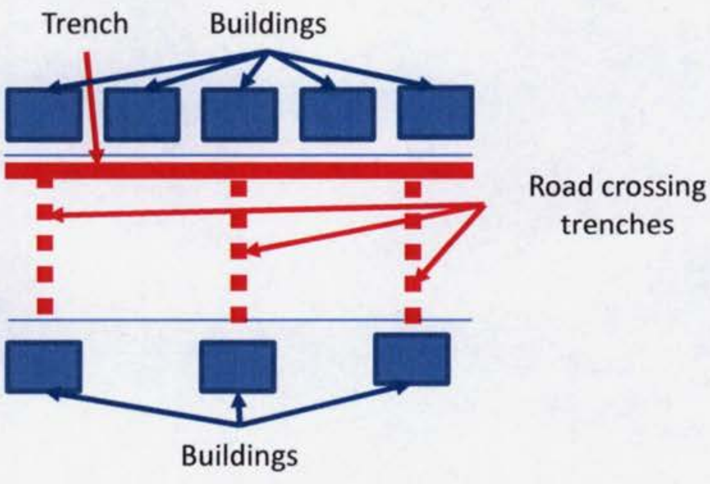
Figure 6 – chambers installed on both sides of the road



Source: EPT

- On roads that have trenches on solely one side, at least one road crossing is required per building located on the side of the street where there is no trench. However these cases are rare. In general a trench is built on both sides of the roads. If the buildings on second side are separated by long distances or if a trench on second side is not feasible (e.g. in narrow lanes with no sidewalk on the second side of the road), it can be necessary to install road crossing trenches to connect the buildings on the second side of the street.

Figure 7 – road crossing on a road with trenches on solely one side of the street



Source: EPT

The ILR should update the model in order to take into account sufficient number of cross road trenches as described above.

Underestimating the number of cross roads required leads to underestimated costs.

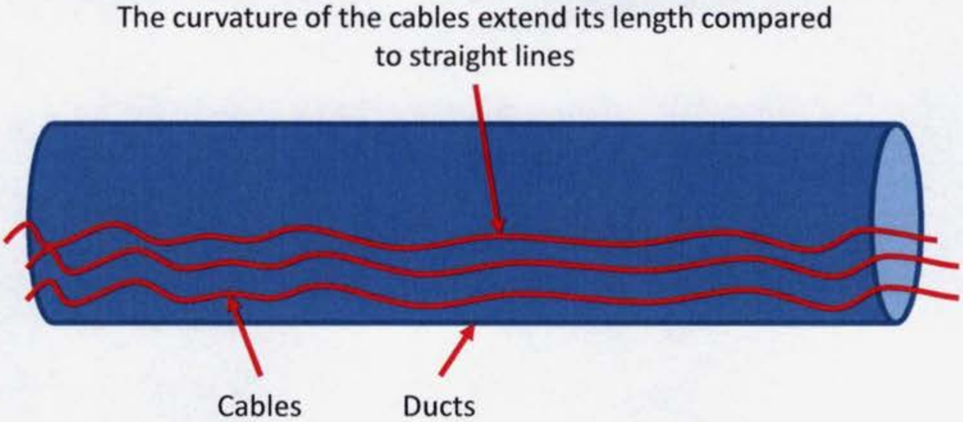
7.2.7 Missing parameters

There are many dimensioning rules that have not been taken into account by the ILR and its consultants leading to underestimate the network costs.

7.2.7.1 Curvature of the cables

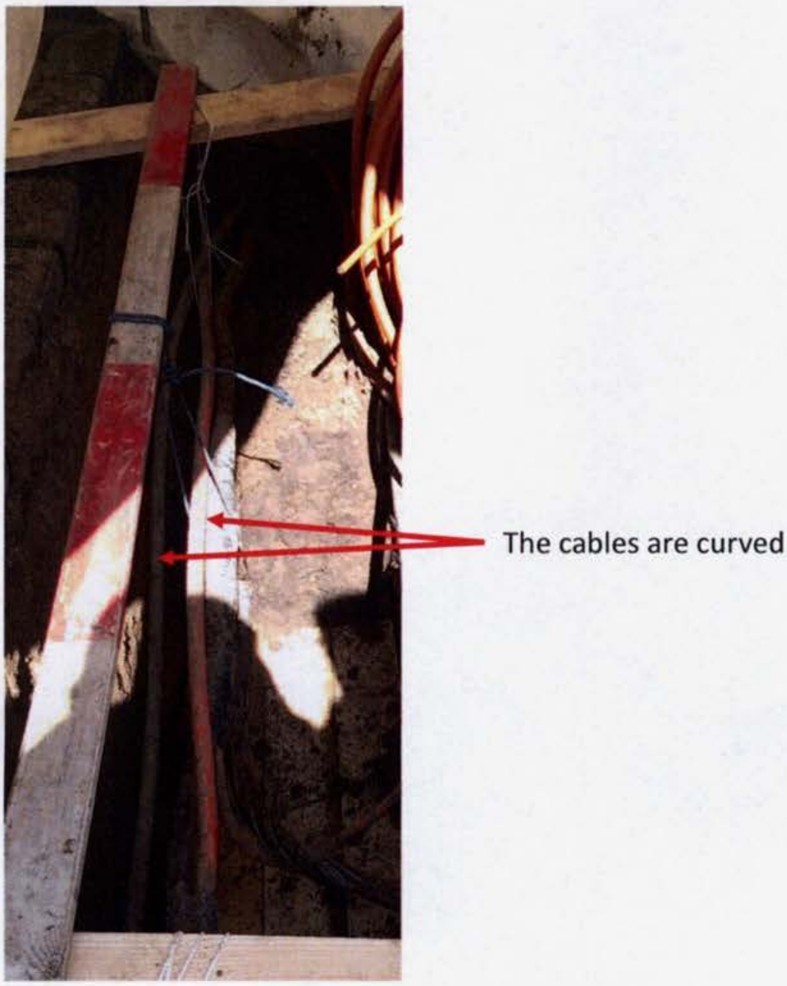
Due to the rigidity, the weight and the friction when rolling-out the cables, the length of the cables, that are rolled-out, is not the length of the road. The length has to be uplifted. This effect is particularly true for the largest cables.

Figure 8 – road crossing on a road with trenches on solely one side of the street



Source: EPT

Figure 9 – Open trench to observe the curvature of the cables



Source: EPT

The length of the cables should therefore be uplifted by 5% in order to take into account this effect.

The ILR should uplift by 5% all the copper and the fibre cables in order to take into account the curvature of the cables.

7.2.7.2 Extra-length for splitting fibre cables

Each time of fibre cables is split, an extra-length is required for several technical reasons:

- The splitting is not carried out by the technicians in the chambers or in the manholes. This is done due to the lack of space and light for security reasons.
- If a mistake is done, the extra-length allows to repair it at no cost (i.e. without redeploying a new cable);
- The extra-length allows relieving the splitter (especially the connections on the splitter) from any force when pulling the cables allowing decreasing the line faults.

Each time a splitter is installed, 15 additional meters are required on each cable:

The ILR should add 15 meters to each cable for each splitter installed.

7.2.7.3 Extra-length due to wasted cables (end of drums)

Only drums of cables can be bought and not a specific length. These cable drums hold standard length, typically 500 meters for copper cables up to 400 pairs and 280 meters for larger cables. From a cost point of view it is more efficient to waste, say 10-20-50 meters on a drum, instead of transporting it to a site where that particular cable length is needed. Due to these circumstances a level of 10 % of waste length should be taken into account.

The ILR should uplift the total length of cables required by 10%.

7.2.7.4 Extra-length for splicing (work of the technicians not carried out in manholes or chambers)

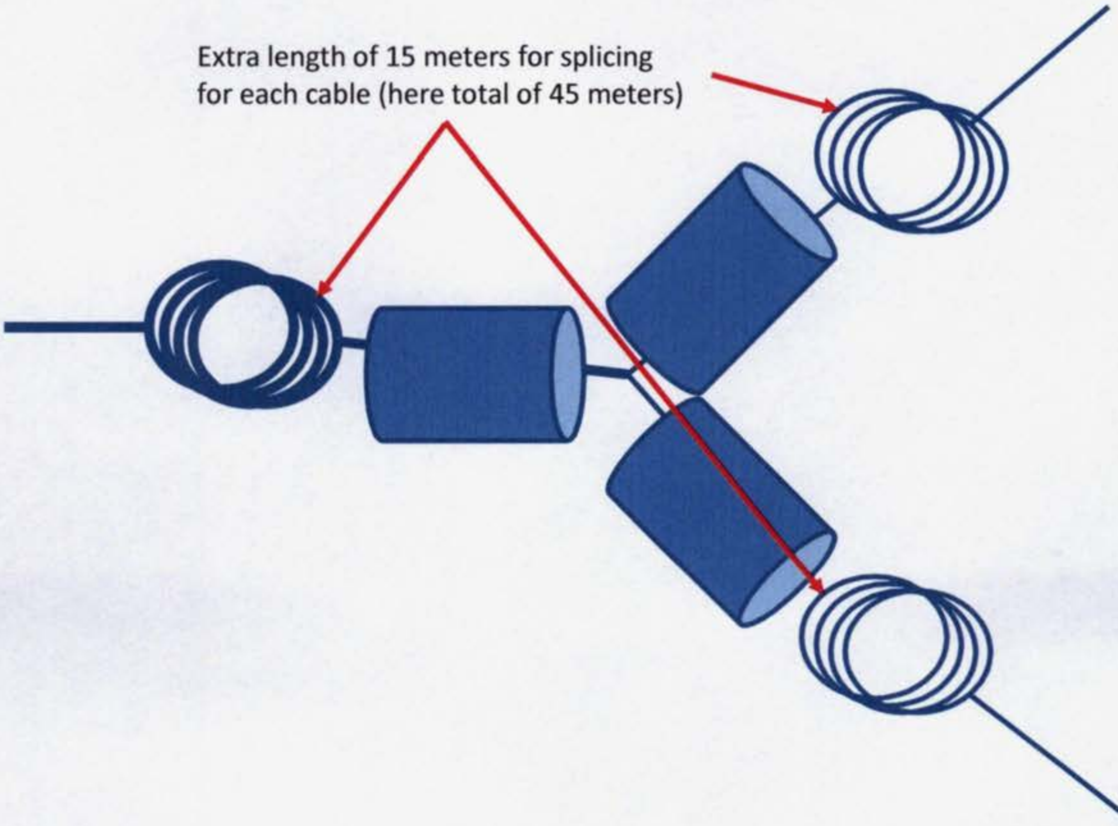
Each time of fibre cables is spliced, an extra-length is required for the same reasons as for splitting (this is called rigging the cable in joints).

Figure 10 – Extra-length for splicing

Source: EPT

Each time a splitter is installed, [redacted] additional meters are required on each cables:

Figure 11 – Extra-length for splicing



Source: EPT

The ILR should add [redacted] meters to each cable for each joint installed as shown in the previous figure.

7.2.7.5 Length of the final drop

No data and analysis has been provided by the ILR and their consultants on how the final drop length should be computed.

The final drop is an important part of the access network cost and should therefore be modelled with a great accuracy in order not to underestimate the costs.

The ILR should provide the parameters used for dimensioning the final drop in order for EPT to be able to comment on them.

8 Passive network dimensioning

Contrary to ILR consultants' statement:

"the model appears to reflect operating conditions in Luxembourg"

the results of the modelling shows a significant discrepancy between the model outputs and EPT data. Furthermore, the results are insufficient to allow any proper comparison as:

- Many data are missing;
- Data are aggregated to such a high level that most comparisons are irrelevant.

8.1 Comparison with the data provided

The first point of the comparison provided is that the EPT data are not properly reflected in this table.

Figure 12 – Comparison of the results

Asset	EPT according to ILR consultants	BU-LRIC estimate
Trenches (km)	[redacted]	4973
Number of poles	[redacted]	0
Length of copper cables (km-pairs)	[redacted]	0.9 million
Distribution points	[redacted]	1258
MDF+POP	[redacted]	106 POP
Buildings	[redacted]	163000

Source: EPT

It is obvious that the model has divided by at least 2 the length of the copper cables while at the same time the number of buildings is increasing by 11%. No justification is proposed by ILR while it seems clear that modelling errors or wrong modelling choices have led to such difference.

8.2 Missing elements

Many assets are missing in the cross-check table provided by the ILR:

- Length of the duct network;
- Number of joints for copper cables;
- Number of NTU;
- Number of chambers; for each chamber types used (details about chambers are missing)
- Number of street cabinet;

- Number of splitters;
- Number of street cabinet for splitters;
- Length of the fibre cables;
- Number of joints for fibre cables;
- Length of the micro-ducts.

Given the significant number of assets missing from the cross-check table, analysing the model results is complex.

For copper cables, it is imperative to provide

- The length of the cables measured as km-pair (data provided by ILR consultants);
- The length of the cables measured as km (data not provided by ILR consultants);

For fibre cables, it is imperative to provide

- The length of the cables measured as km-fibres (data not provided by ILR consultants);
- The length of the cables measured as km (data not provided by ILR consultants);
- The discrepancy observed in the length of the copper pairs between EPT figures and BU LRIC outputs tends to prove that the BU LRIC model is over-efficient.

The ILR should provide the results and corresponding cross-checks for all the network assets.

8.3 Data aggregated

The cross-check table provided by ILR consultants is too aggregated. As a consequence, it is complex to perform the required cross-checks.

The results of the copper cable modelling show a significant discrepancy between the model outputs and EPT inventory. These have not been investigated in depth by the ILR and its consultants.

The ILR consultants should provide the following data for the copper network:

- Total length for each type of trench (road-crossing, trench with superstructure, trench without superstructure, concrete…) and per geotype (urban, rural…)
- Length of the trench network for final drop
- Length of the trench network between the distribution point and the street cabinet
- Length of the trench network between the street cabinet and the MDF
- Total length (km-pairs and km) of copper cables
- Length (km-pairs and km) of copper cables for final drop

- Length (km-pairs and km) of copper cables between the distribution point and the street cabinet
- Length (km-pairs and km) of copper cables between the street cabinet and the MDF
- Total length of the core cable network
- Length of the core cable network between the street cabinets with active equipment and the MDF
- Length of the rest of the core cable network
- Total length of the core trench network
- Length of the core trench network between the street cabinets with active equipment and the MDF
- Length of the rest of the core trench network
- Length of the trench network share between access and core
- Total length of the core duct network
- Length of the core duct network between the street cabinets with active equipment and the MDF
- Length of the rest of the core duct network
- Length of the duct network share between access and core
- Total length of the core micro-duct network
- Length of the core micro-duct network between the street cabinets with active equipment and the MDF
- Length of the rest of the core micro-duct network

The ILR consultants should provide the exact same type of disaggregated data for the fibre network.

Given the significant discrepancy between the model outputs and EPT network, ILR consultants should also provide the whole dimensioning results at the road level for several representative roads in order for EPT to be able to cross-check the engineering rules used in the model.

The ILR should provide disaggregated data in order to perform cross-checks. The ILR should also provide the results of the modelling of the network for several representative roads in order to be able to fully understand the dimensioning rules used by the model.

8.4 Data per MDF and per POP

The ILR consultants are providing only the data at the national level. They should provide the data at the MDF level for the copper network and at the POP level for the fibre network.

The ILR should provide at the MDF level for the copper network and at the POP level for the fibre network.

9 Trench sharing

ILR consultants state in the section related to trench sharing:

> *"The table below sets out the percentage of trenches shared and the proportion of costs that would be incurred by an efficient network operator today"*

And then they add:

> *"[The proportion] is based(...)on historic levels of trench sharing."*

The ILR should not use historic levels of trench sharing to compute today's cost, ILR should use today's trench sharing.

Figure 13 – Comparison between historic levels and today's level of trench sharing

Asset	Historic levels	Level from 2010
No sharing	10%	[redacted]
Two thirds of trench used by modelled operator	60%	[redacted]
Half of trench used by modelled operator	20%	[redacted]
One third of trench used by modelled operator	10%	[redacted]

Source: EPT

Even the most efficient network operator could not reach the level of sharing stated by the ILR consultants.

ILR uses historic sharing levels. However those levels were estimated for the deployment of hybrid cables in the past when extensions were executed only in coordination with other utility operators and municipalities (road renewments). These sharing levels cannot be used for the deployment of a new network where specific regions have to be covered and where coverage targets have been defined.

The ILR should update the discount applied to trench costs to [redacted]% in order to reflect today's level of trench sharing and not the levels in the eighties. ILR values cannot be achieved today and therefore would lead to substantial cost under-recovery.

10 Core network hierarchy and number of nodes

Following the scorched node approach, the model should include all nodes part of EPT core network and all links part of the transmission network.

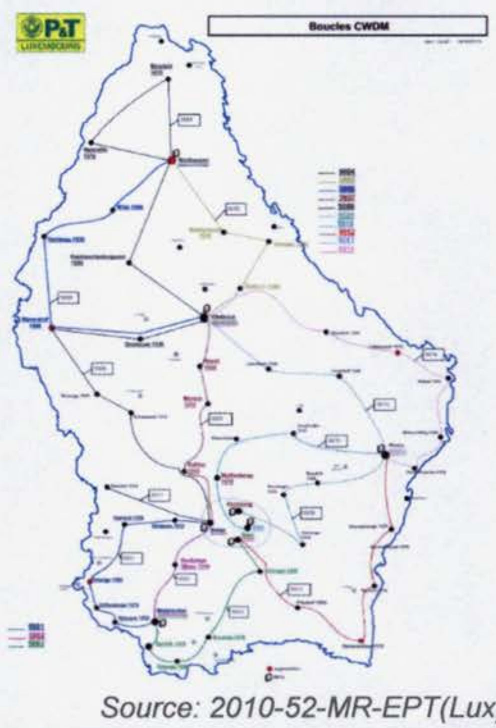
EPT network includes loops that seem not to have been modelled.

According to the documentation, the core sites are connected on a spanning tree topology:

"The model then calculates how the core network is routed (see Section 5.5). This is done in two stages. First, by building an efficient spanning tree that connects all of the nodes in the network (i.e. connecting all PoP sites using the shortest route to the nearest aggregation node site). And second, ***a spanning tree is also used to connect all core sites to a single core site*** *in Luxembourg."* (§5.2)

EPT's backbone transmission network is based on a ring technology for the TDM technology (SDH-rings) as well as for the modern DWDM/IP-MPLS (see Figure 14).

Figure 14 – P&T's IP-MPLS transmission network (DWDM network)



Source: 2010-52-MR-EPT(Lux)-Specifications vILR.ppt

Following the scorched approach, the core network should be based on a ring topology and should include all the nodes part of EPT network.

11 Equipment costs and dimensioning rules

11.1 Main cost categories

The table 18 of the document, many costs are missing and should therefore be updated:

Figure 15 – Updated main equipment cost categories (non-exhaustive)

LLU	Bitstream	Call termination
Trenching	MSAN equipment	Media Gateways (PSTN GW, PLMN GW, International GW, ...)
Jointing chambers	NMS	MSAN equipment
Copper cable	Core trenching	VOIP servers
Fibre cable	Core cables	Softswitches
ODF	Core joints	Switches
MDF	Core ducts	Routers
Joints	Core microducts	Transmission between routers and switches
Street cabinet	The whole LLU	Licences
NTU (network termination unit)		The whole LLU
Ducts		NMS
Micro-ducts		The whole core network
Splitters		
Chambers of splitting		
Terminal joints		

Source: EPT

It should be noted that these cost categories include only capex but no opex as more categories should be added.

The ILR should update the list and provide a complete list of the cost categories. Providing the full list of cost categories is important in order to be sure no costs are forgotten and would allow EPT to perform cross-checks.

11.2 Trench costs

The ILR consultants are using the following unit costs for trenches:

Figure 16 – Trench unit cost used by ILR in its model

Geotype	Unit cost (€/m)
Rural	40
Suburban	55
Urban	80
Urban high cable density	120

Source: EPT

It has to be noted that:

- The geotypes have not been defined in the document;
- Many costs have been forgotten leading to underestimate the unit cost of trenches not allowing EPT to recover its costs.

ILR should specify which trench types are modelled and provide the depth and width of the trenches described in the table. EPT's unit costs are in each case significantly higher than the unit costs indicated in the ILR table. EPT unit costs reflect the reality of the marked prices for civil works in Luxembourg as they have been calculated as mean trench costs of the last projects.

The types of trenches and digging rules in Luxembourg are defined in the encroachment permits (permission de voirie) developed by the Ministry of Public works (Ministère des Travaux Publics) and municipalities.

ILR seems to be using the trench costs specified by an operator in the input collection, as "operator data" has been quoted as source. However the costs of the trenches differ strongly from the costs specified by EPT. Therefore EPT insists in getting further details about the used trench costs:

- What type of trench is considered (specifications as trench depth, width, profile type)?
- Evidence of the costs (real projects in Luxembourg)

Furthermore, the ILR model doesn't seem to make the distinction between different types of trenches. However, even if EPT understands that a model requires a certain number of simplifications; different trench types have to be considered. Therefore EPT has specified different types of trenches in the input data request which differ in the following categories:

- Trenches with and without superstructure
- Trenches build along the street/sidewalk and trenches build to connect buildings and trenches crossing the road (different trench depth and width)
- concrete trenches (high cable density)

11.2.1 Definition of the geotypes

The use of geotype has not been defined in this document. The geotype impact is highly material as the unit costs of trenches vary from simple to triple In order to define geotypes, explicit criteria should be clearly defined based on population and geomarketing data. These criteria should then be explained.

The geotype "urban high cable density" name is misleading as it could suggest that this geotype has been used to increase the cost in urban parts with a high cable density although the objective of the geotypes is not to define the size of the trenches but to set the different unit costs depending on the location of the trench. Following the best practices observed in any cost model published in Europe, this geotype should be called "Dense urban". The increase of the unit cost reflects that it is much more expensive to dig in central parts of cities than in less dense areas. The impact of the trench size is assessed in the following section. It is obvious, although not taken into account by ILR consultants, that whatever is the geotype, an increasing size of a trench leads to an increasing unit cost of the trenches. Finally, he cable density does not define the geotype but the trench type (concrete trenches in case of high cable density).

11.2.2 Missing costs when assessing the trench unit costs

The unit costs used by the ILR underestimate the cost of the trench network. The oversimplification of the cost structure of digging a trench has led the consultants of the ILR to forget several cost elements:

- Different unit costs are needed depending on where the trench is located:
  - A trench to cross a road is more expensive than a trench along a side walk;
  - Specific trenches are needed for the final drop;
- It is evident that the cost of a trench depends on its size: the larger a trench is, the more expensive it is. The more cables are needed, the more ducts need to be rolled-out in the trench and the larger the trench will be. As explained in the previous section, the geotype "urban high cable density" does not play this role. Its name ads to confusion that needs to be addressed by ILR consultants.
- The digging cost of a trench does not represent the whole cost of building a trench. Planning, designing, registering in the inventory system and geodesy work lead to costs that need to be added to the cost of the trenches.
- When building a trench, water is needed and needs to be accounted for in the trench unit cost.
- For most trenches, a concrete structure is required to protect it.

- When digging a trench, often extra-care work should be carried out due to e.g. archaeological findings. (E.g. the work near the ILR building has been nearly stopped due archaeological findings leading to extra cost).

11.2.3 Update of the trench costs

Given the costs categories that have not been accounted for by ILR consultants, the trench unit costs need to be updated in order for the EPT to recover its costs.

The ILR should use the following unit costs:

Figure 17 – Trench unit cost that should be used by the ILR

Type of trench	Description	Cost of digging (in €/m) for 2013	Opex due to planning, designing, registering, geodesy (computed as a mark-up on capex in %)	Water contribution (in €/m)	Mark-up on capex for extra-care work
12 ducts concrete trench	For all except final drop when up to 12 ducts are required.	[redacted]	8%	1.32	6%
24 ducts concrete trench	For all except final drop when up to 24 ducts are required.	[redacted]	8%	1.32	6%
6 ducts concrete trench	For all except final drop when up to 6 ducts are required.	[redacted]	8%	1.32	6%
Road Crossing trench	For crossing road	[redacted]	8%	1.32	6%
Final drop without superstructure	For final drop	[redacted]	8%	1.32	6%
Final drop with superstructure	For final drop	[redacted]	8%	1.32	6%

Source: EPT

Final Drop Trench depends on situation (Final Drop to the house), not necessary defined by geotype. After deploying the final drop, an efficient operator in Luxembourg has to restore the access to the building; in case the trench requires to open the superstructure (concrete, pavement, ..) the original situation has to be rebuilt by the operator.

It is clear from this table compared to the unit prices used by ILR that no operator building a network in Luxembourg would be able to recover its costs with such unit prices that are not available in Luxembourg.

In order to take into account the impact of the density, the ILR should apply to these unit costs, the following mark-up:

Figure 18 – Mark-up on trench unit costs

Geotype	Mark-up
Rural	1
Suburban	1.3
Urban	1.4

Source: EPT

The EPT does not use the "dense urban" geotype (or the "urban high cable geotype") but estimates the corresponding mark-up should be 1.6.

The ILR should update the trench unit costs in order to allow an efficient operator to recover its costs. The trench unit costs should be updated with the value provided by the EPT and should include all the relevant costs. EPT believes that no other operator in Luxembourg could achieve lower level of unit costs than its own costs. Therefore, not considering EPT costs will prevent any operator from investing in networks.

As shown already at this stage, the opex have been underestimated as they have set to [redacted]% of the GRC. In this case, the opex have been divided by 4. As explained in section §13.1, the opex calculation should be completely updated in order not to forget any cost and to allow an efficient operator to recover its costs.

11.3 Jointing chambers

11.3.1 Jointing chambers

The unit cost set in the table 20 of the document published by ILR underestimates the cost of the chambers.

Figure 19 –Unit cost of jointing chambers used by ILR

Geotype	€ per unit	Installation cost (as a mark-up on capex)
Rural	[redacted]	[redacted]
Suburban	[redacted]	[redacted]
Urban	[redacted]	[redacted]

Source: EPT

It should first noted that the unit cost for the chambers in the suburban geotype has been underestimated as a 1.2 mark-up has been applied instead of a mark-up of 1.3

It is then noted that the ILR does not use the cost and types of EPT chambers. The ILR should therefore update its model with the following data:

Figure 20 – Updated unit cost of jointing chambers

chambres	Rural	Dense	Very Dense
Chambre d'épissures 1,8 x 3,9 x 2,0 m'	[redacted]	[redacted]	[redacted]
Chambre d'épissures 1,8 x 6,1 x 2,0 m'	[redacted]	[redacted]	[redacted]
Regard construite 1,4 x 0,7 x 1,0 m'	[redacted]	[redacted]	[redacted]
Regard préfabriquées 1,20 x 0,42 x 0,80 m'	[redacted]	[redacted]	[redacted]

Source: EPT

These costs do not include maintenance.

The ILR should update the chambers unit costs in order to allow an efficient operator to recover its costs. The ILR should use all the different types of chambers provided by the EPT.

11.3.1 Other assets

11.3.1.1 Jointing equipment for copper and fibre cables

The cost of the jointing chambers does not include the cost of the jointing equipment. The jointing equipment has to be dimensioned separately and then it should be cost. Not including its cost when assessing the network costs would not allow the EPT to recover its costs.

The jointing equipment should be selected according to the cable that is spliced. The jointing equipment is different for copper cables and for fibre cables.

Figure 21 – Unit cost of copper jointing equipment

Number of pairs	Updated costs
6	[redacted]
10	[redacted]
20	[redacted]
50	[redacted]
100	[redacted]
200	[redacted]
300	[redacted]
400	[redacted]
500	[redacted]
600	[redacted]
1000	[redacted]
1200	[redacted]
1800	[redacted]
2000	[redacted]

Source: EPT

Figure 22 – Unit cost of fibre jointing equipment

Number of fibres	Updated costs
4	(N/A)
12	[redacted]
24	[redacted]
60	[redacted]
96	[redacted]
144	[redacted]

Source: EPT

The ILR should include all relevant costs when assessing the network costs, i.e. the ILR should include the cost of the jointing equipment listed above.

11.3.1.2 Splitters

As ILR models GPON technology, the splitters cost should be part of the network cost. The ILR did not mention any cost related to this asset but ILR should include them in its model.

ILR should use the following unit costs:

Figure 23 – Unit cost of splitters

Splitting ratio	Unit cost (€/unit)
1:16	[redacted]

Source: EPT

A splitter with a splitting ratio of 1:16 is used for 16 fibres. If a fibre cable with 32 fibres needs to be split with a splitting ratio of 1:16, then 2 splitters are required.

The ILR should include all relevant costs when assessing the network costs, i.e. the ILR should include the cost of the splitters equipment listed above.

11.4 Copper cables

The unit costs of copper cables are in line with EPT unit costs. However it should be noted that this list is highly confidential. The ILR should have slightly changed the different values in order to maintain the confidentiality.

The ILR should include the cost of ducts as copper (and fibre) cables are installed in ducts. Not including the costs of ducts would not allow EPT to recover its costs.

The ILR should include the following unit costs:

Figure 24 – Unit cost of ducts

Inside diameter (mm)	Outside diameter (mm)	Unit cost (€/m)	Installation cost (€/m)
97	125	[redacted]	[redacted]
40	50	[redacted]	[redacted]

Source: EPT

The ILR should include the cost of ducts as fibre cables are installed in micro-ducts before being installed in ducts.

11.5 Fibre cables

The exact same issues as for copper cables apply to the fibre cables:

- The unit costs of the fibre cables are highly confidential and ILR should have altered the unit costs;

- The same dimensioning rules apply: when more than 144 fibres are needed, then only multiple of the largest fibre cables are rolled-out;
- Cost of ducts should be included.

It has to be noted that each fibre cable is deployed in a micro-duct before being installed in a duct.

The ILR did not include any cost for micro-ducts. The ILR should therefore include the following unit costs in its model in order to allow EPT recovering its costs:

Figure 25 – Unit cost of micro-ducts

Inside diameter (mm)	Outside diameter (mm)	Unit cost (€/m)	Installation cost (€/m)
20	33	[redacted]	[redacted]
15	14	[redacted]	[redacted]

Source: EPT

In order to select, the appropriate micro-ducts, the diameter of the cable should be compared to the inside diameter of the micro-ducts.

In order to assess how many micro-ducts can be installed in one duct, the same rules described in section §7.2.4 apply and the outside diameter should be used.

The ILR should include the cost of micro-ducts as fibre cables are installed in micro-ducts before being installed in ducts.

11.6 ODF

It should be noted that some opex should be included due to:

- Maintenance (mark-up of 5% applied on the capex)
- The floor cost: an ODF with around 2000 'ports' uses approximately 240 square meters.

11.7 MDF

It should be noted that some opex should be included due to:

- Maintenance (mark-up of 6% applied on the capex)
- The floor cost: an MDF with around 10000 'ports' uses approximately 400 square meters.

11.8 Other assets part of the access network

The ILR has disregarded several asset categories that are part of the access network. EPT has already listed in the previous sections many assets for which unit costs have not been provided by ULR. All these assets should be dimensioned and their cost should be included in the network total cost.

11.8.1 Copper joint for final drop

The ILR should include for the copper network a joint for the final drop. Their costs are:

- 50.79€ per household;
- 76.78€ per joint

E.g.: if a final drop is used in a building to connect three households, then the cost of this joint is 50.79€ * 3 + 76.78€ = 229.15€

The ILR should include the full cost of the copper joint for final drop in order to allow an efficient operator in Luxembourg to recover its costs.

11.8.2 LV

As the ILR is following the scorched node approach, the network the ILR is modelling should include street cabinets (this is the frontier between the E-Side and the D-Side). EPT names them LV (these are not distribution points which are the frontier between the D-Side and the final drop).

The cost of the street cabinet should be included in the network cost in order to allow an efficient operator to recover its costs.

Figure 26 – Street cabinet (LV) unit cost

Description	Comments	Unit cost (in €/unit)
LV: Installation and fixation	Installation Costs	[redacted]
LV: Jumper installation	Installation Costs	[redacted]
LV: LSA+ Block for 100 pairs copper cable	Material Costs	[redacted]
LV:Search + preparation	Installation Costs	[redacted]
LV: Shelf with socle	Material Costs	[redacted]
LV: Terminal jointing for 100 pairs copper cable - LSA+ block	Installation Costs	[redacted]

Source: EPT

The ILR should include the full cost of the street cabinet in order to allow EPT to recover its costs.

11.8.3 NTP

The ILR should include the cost for the NTP also called NTU (network termination unit or network termination point).

Not including the NTP would not allow EPT to recover its costs.

The unit cost of the NTP is:

Figure 27 – NTP unit cost

Fibre NTP	Unit cost (in €/unit)
FO-T 4 fo (maison unifamiliale)	[redacted]
TCS-12 fo (maison multifamiliale jusqu'à 4 unités)	[redacted]
TCS-24 fo (maison multifamiliale jusqu'à 12 unités)	[redacted]

Copper NTP	Unit cost (in €/unit)
maison unifamiliale	[redacted]
résidence 4 logements	[redacted]
résidence 12 logements	[redacted]

Source: EPT

The ILR should include the full cost of the NTP in order to allow an efficient operator to recover its costs.

11.9 MSAN equipment

The ILR should change the name of the equipment and set it to generic name as the assets used in EPT network are highly confidential. "7330 ISAM" indicates to all parties that EPT is using Alcatel MSAN 7330 as ISAM is a named used by Alcatel.

The footprint of a rack has been under-estimated. The footprint of the rack is approximately 1.5 square meters for 45 shelves. Among these 45 shelves, some are not used:

- The five lowest shelves (the ones near the ground) as it is not convenient for the technicians to work and a lot of dust is located on these shelves.
- Many shelves are left unused in order to let the air circulate to cool the equipment.
- This leads to approximately 35 shelves (or rack unit, R.U.) been usable per rack.

Regarding the footprint of the rack, additional space is required around the rack in order to let the technicians work around the different equipment. This space is estimated to be [redacted]%. Therefore the ILR should update the rack footprint to 1.8 square meters.

The MSAN are never used at full capacity. The ILR should use an 80% utilisation rate for the modules and 70% for the uplinks.

EPT holds spare MSAN equipment that uplift by 5% the total number of MSAN required. As any other operator, EPT holds spare equipment due to churn and to face breakdown

The cost of space should be a yearly cost instead of one-off cost and should be corrected in order to allow EPT to recover its costs.

It should be noted that for each site, there are additional costs due to:

- Power supply unit
- Backup site power
- Air conditioning unit
- Security system
- Site preparation
- Site maintenance
- Security guard

These costs are not included in the cost of power, cost of space or cost of cooling. The ILR should therefore include them in order to allow an efficient operator to recover its costs. The unit costs of these elements are the following:

Figure 28 – Costs associated to each site

Element	Description	Unit cost
Power supply unit	CAPEX	[redacted]
Backup site power	CAPEX	[redacted]
Air conditioning unit	CAPEX	[redacted]
Security system	CAPEX	[redacted]
Site preparation	OPEX	[redacted]
Site maintenance	OPEX	[redacted]
Security guard	OPEX	[redacted]

Source: EPT

The space required for the power supply unit, the backup site power, the air-conditioning unit and the security system should also be accounted for.

The power consumption of the air conditioning unit and of the security system should also be accounted for.

The air-conditioning requirement of the power supply unit and of the backup site power should also be accounted for.

The ILR should update the name of the asset and use generic name as the type of asset used by EPT in its network is highly confidential.

In order to allow the EPT to recover its cost, the ILR should update the following points:

The footprint of a rack is 1.8 square meters and this includes approximately 35 rack units usable.

The modules have an 80% utilisation rate and the uplink ports a 70% utilisation rate.

EPT holds spare equipment that accounts for [redacted]% of the total MSAN required and that should be included by EPT.

The rental cost has been underestimated.

The costs associated to each site have to be included by the ILR.

11.10 NMS

The GRC of the NMS used by ILR consultants is underestimating the costs of EPT network management system. As the benchmark is not provided, it is impossible for EPT to check the scope of the network management system benchmark. The ILR should use the following values:

Figure 29 – Network management system

Scope	Opex	Depreciated capex
NMS for xDSL	[redacted]	[redacted]
NMS for copper	[redacted]	[redacted]
NMS for IP	[redacted]	[redacted]
NMS for fibre	[redacted]	[redacted]
NMS for switches	[redacted]	[redacted]
NMS for operational support	[redacted]	[redacted]
IT	[redacted]	[redacted]
NMS for technical order handling	[redacted]	[redacted]
NMS for work force	[redacted]	[redacted]

TOTAL	[redacted]	[redacted]

Source: EPT

The ILR has underestimated the cost of the network management system not allowing EPT to recover its costs.

11.11 MGW

There are several types of gateways and all should be included in the model:

- The PSTN GW for interconnection with PSTN services (PSTN is the legacy voice service)
- The PLMN GW for interconnection with mobile services
- The international GW for interconnection with international.

All these assets should be dimensioned using engineering rules and then their cost should be computed and added to the network total cost.

These gateways are highly important for the modelling as they are dimensioned based on the voice traffic, based on the busy hour call attempts, based on the number of subscribers.

The ILR should provide detailed dimensioning rules regarding these three types of gateway in order for the EPT to assess their accuracy.

The cost of these assets is based on:

- The hardware;
- The licences.

The unit cost proposed by the ILR for the gateway represents in average the cost of the hardware of the gateways. The ILR should therefore add the cost of the licences in order to allow EPT to recover its costs.

Figure 30 – Licence costs of the gateway

Gateway	Driver	Unit cost (€/per driver)
PSTN	For each 100 BH Erlangs	[redacted]
PLMN	For each 100 BH Erlangs	[redacted]

Source: EPT

The ILR should include the costs of all GW in the network in order to allow EPT to recover its costs and especially the cost of its licences.

11.12 Other core network assets

The ILR should include all relevant assets when assessing the network cost. The model should therefore include at least the following assets:

- Intelligent network;
- IMS (IMS core, SBC edge, SBC distribution, SBC core);
- Routers and switches.

The ILR should provide clear dimensioning rules for each of these assets.

The ILR should state exactly what the scope of the access network is and what the scope of the core network is. Defining with precision the scope of both networks would allow to make sure all network assets are included and that no cost are left aside allowing EPT to recover its costs.

The ILR should include the costs of all assets used in the network in order to allow EPT to recover all its costs. EPT should therefore include the intelligent network, the different IMS, the routers and switches.

12 Asset lives and price trends

The space should be computed as a yearly cost and not as a CAPEX being depreciated. Furthermore the asset life associated to space is overestimated. It should be reduced to 40 years.

The price trend of the space cost should be set to 2%.

Many asset lives are missing in the table presented by the ILR. It should therefore be completed with the full list of assets (e.g. joints, chambers, splitters...)

The ILR should compute the cost of space as a yearly cost instead of capex.

The ILR should update the price trend of space from 2.5% to 2%.

The ILR should provide the data for all assets.

13 Other costs

13.1 OPEX

The opex for the core assets has been set to 4% by ILR consultants based on the data provided during the data request. This value has been set at the lowest end range of the estimate provided by ILR consultants although:

- Wages in Luxembourg are higher than in any other country in Europe which should lead to higher opex;
- Bargaining power of the EPT is lower than most European operators due to its size leading to higher opex.

It is further noticed that no top-down reconciliation has been carried out by ILR consultants in order to make sure that the EPT could recover its costs with the current value of the mark-up and that modelled opex are in line with opex incurred by an operator in Luxembourg.

The opex are even more underestimated as the unit costs selected by ILR consultants are underestimating EPT network costs.

The ILR should furthermore use a different mark-up for the different asset and provide each of them.

The ILR consultants have described the scope of the opex as including the maintenance, the supplier annual support and other costs for transmission and data network assets. In order to allow EPT to cross-check the values used by the ILR consultants, the opex should be split into the different categories as identified by ILR consultants and for each a precise description should be provided. In addition to the opex identified in section §11.9 (site preparation, site maintenance, and security), the ILR should add the following opex:

- Air-conditioning maintenance;
- Power production maintenance.

The opex for the access network has been set according to an international benchmark. It should be noted that as for all other benchmarks, no benchmark has been provided. It is also said that this benchmark has been adjusted for differences in labour costs. The EPT recognises the importance of adjusting any benchmark for differences in labour costs between the Luxembourg and other countries and emphasizes that ILR consultants should adjust any benchmark likewise. The adjustment methodology applied by ILR consultant should be fully documented.

As for the core network assets, the opex should be cross-checked against EPT opex in order to make sure the EPT is recovering its costs.

For the access network, top-down calculations are showing that in 2010, the opex per subscriber and per month is [redacted]€. This value should be uplifted by the wage inflation (2% per annum) in order to have an actual figure.

The ILR should include all relevant opex in the model. The mark-ups used by the ILR should be defined for each asset of the network and should be split according to each category of opex identified instead of using a global mark-up.

Given the significant disadvantages faced by EPT due to specificities of Luxembourg, it is highly unlikely that EPT opex are at the lowest end range of the estimates computed by ILR consultants. It is, on the contrary, highly expected that the opex incurred by the EPT are the highest end range in Europe.

The ILR should perform cross-checks among which top-down reconciliations, in order to make sure the EPT is recovering its costs.

The opex incurred by the EPT in 2010 for the access network is [redacted]€. The 2.12€ proposed by ILR consultants is therefore underestimating the opex occurred by EPT and does not allow EPT to recover its costs.

13.2 Power and air conditioning costs

The power and air conditioning costs should be computed based on:

- The power consumption of each network asset;
- The air-conditioning requirement due to each network asset;
- The cost of electricity in Luxembourg.

The total power consumption computed by the model should be provided. The total air-conditioning requirement (in W per m²) should also be provided. These data would allow the EPT to cross-check the results computed by the ILR.

As explained in section §11.9, power consumption and air-conditioning of the sites should be included in order for the EPT to recover its costs.

The cost of space (or of floor) should also be computed as an opex. The ILR should provide the total space required computed by the model and the total yearly cost associated.

The power and air-conditioning costs should be split in two categories. The results for each should be provided. The model should rely on the power consumption and the air-conditioning requirement of each network asset including the sites.

The space of floor should also be computed as a yearly cost and should be provided to the EPT.

13.3 Wholesale specific costs

EPT agrees that the wholesale specific costs should be accounted for. However it should be applied to:

- All products
- Included in the pure LRIC computation.

Not including wholesale specific costs in the pure LRIC computation is not in line with the EC decisions and is not in line with best practices observed in all other countries in Europe. It should be further noted that this approach is itself in contradiction with the approach followed by the ILR on the mobile termination rate pricing.

The ILR should apply the wholesale specific costs to all products.

The ILR should include the wholesale specific costs in the pure LRIC calculation in line with the recommendations of the European Commission, with European NRA best practices and with ILR current approach for computing the mobile termination rate.

13.4 Common costs

ILR consultants are correct when including common costs. It should be noted that the costs incurred by EPT according to ILR consultants are at the lowest end of ILR consultants' benchmark although it is expected that the costs are higher in Luxembourg due to:

- Lower economies of scale;
- Higher wages;
- Lower bargaining power.

ILR consultants should therefore update the value used for common costs in order to allow EPT to recover its costs.

The ILR should update the mark-up used for common costs as it is expected that it should be higher than in other European countries due to significant disadvantages faced by EPT compared to its European competitors.

13.5 Cost of working capital

The activity of an electronic communications operator requires or generates cash for everyday operations: this amount of cash is defined as "working capital". It consists in the net balance of operating uses and sources of funds, which can be either positive or negative[3]. On a day-to-day basis, there can be a delay between the day a cost is incurred and the moment the revenues aimed at recovering this cost are generated. As an example, there will always be a delay between the day an additional DSLAM is acquired, and the day the operator will earn extra revenues deriving from the extra traffic using this DSLAM.

The working capital can generate revenues (through interests) when positive. But it can also generate financial costs for the operator when negative. These revenues and financial costs should be taken into account in cost models. The cost of the working capital is equal to the capital employed multiplied by WACC.

When making network investments, an operator generally begins earning revenues from its asset several months after the investment is completed (the generated cash can then be used to reimburse shareholders and banks). This period which goes from the payment of an asset to its first operating use generates working capital and is sometimes referred as "time to build".

Figure 31 – Cost of working capital

Source: TERA Consultants

For network CAPEX, working capital is therefore linked to the "time to build" period that exists between network investment payment and the beginning of network revenue. This can be done easily by multiplying each annuity by $(1+ \text{WACC})^{\text{time to build (in years)}}$.

The average "time to build" is in average 12 months.

The ILR should include the cost of working capital in its model in order to allow the EPT to recover its costs.

In order to include the cost of capital, the ILR should update its depreciation formula by multiplying each annuity by $(1+\text{WACC})^{\text{time to build}}$ with a time to build of 12 months.

[3] Formally, net working capital is equal to current assets (cash and cash equivalent, accounts receivable, inventories and short term investment) minus current liabilities (accounts payable and the current portion of long term loans).

14 Sensitivity analysis

ILR consultants have run a sensitivity analysis on the number of PoP. This analysis shows that the scorched node approach has not been implemented as the number of node of the network should be EPT's number of node.

A smaller number of nodes do not necessarily lead to fewer transmission routes and fewer pieces of equipment.

The number of pieces of equipment is driven by the number of lines and by the traffic therefore having less nodes would lead to having less building but with more pieces of equipment in each.

The length of the transmission routes would depend on which nodes have been removed and where the nodes are located. As this is not documented, the EPT cannot cross-check the analysis carried out by ILR consultants.

The ILR consultants should use EPT nodes following the scorched node approach.

15 NGA Risk premium and WACC analysis

To calculate the NGA risk premium, ILR uses 3 benchmark values but does not take into account the French value which is at 4.6%[4]. This was calculated using real option calculations. ILR's benchmark selection leads to lower the NGA risk premium.

The ILR is considering a real WACC of 9.11%. It is obvious that in the tilted annuity formula used by ILR, the input of the formula is not a real WACC but a nominal WACC. Using the real WACC in this formula would be a significant misunderstanding. As a consequence, EPT would appreciate ILR to clarify that a nominal WAC will be used.

In addition to that, the NGA risk premium should be included for FTTC and FTTH networks.

EPT would appreciate if ILR could make it clear how the real WACC and the NGA risk premium are implemented in the model since model documentation does not enable to understand it.

4 http://www.arcep.fr/index.php?id=8571&tx_gsactualite_pi1[uid]=1332&tx_gsactualite_pi1[annee]=&tx_gsactualite_pi1[theme]=&tx_gsactualite_pi1[motscle]=&tx_gsactualite_pi1[backID]=26&cHash=4acc538941
This decision gives the sum of risk premium + wacc at that time (15%) from which a 4.6% risk premium can be deducted

Institut Luxembourgeois de Régulation
Attention de Monsieur le Directeur
Paul SCHUH

17, rue du Fossé
L-2922 Luxembourg

Bertrange, le 3 janvier 2013

Par courrier simple et par mail : costmodel@ilr.lu

Objet: Demande d'avis relative au projet d'élaboration d'un modèle de coûts fixe NGA-NGN.

Monsieur le Directeur,

Par la présente, nous nous référons à la demande d'avis relative au projet d'élaboration d'un modèle de coûts fixe NGA-NGN.

Tout d'abord, Tango remercie l'ILR pour cette consultation et se limitera à ce stade à ne commenter que la méthodologie que votre institut souhaite appliquer pour l'élaboration dudit modèle de coût et non les données d'entrée, ni les paramétrages.

Rappel du contexte d'élaboration du modèle.

L'ILR a choisi, suivant marché négocié du 11 septembre 2012, de charger le consultant Frontier Economics de développer un modèle de coûts fixe NGA-NGN. Une première présentation aux acteurs du marché a été faite par l'ILR et par le consultant, le 28 novembre 2012. Il s'agissait d'exposer aux opérateurs concernés un aperçu du processus de modélisation et de son calendrier comprenant « model specification – Septembre 2012 », « data collection – mid January 2013», « Model development – December 2012 – May 2013 », « public consultation – mid May to June 2013 », « Revision and finalisation of model and documentation – June to end August 2013 ».

Les parties prenantes ont été invitées à remplir un questionnaire pour le 18 janvier 2013, reportée au 8 Février 2013 l'ILR ayant fait parvenir par mail du 15 janvier 2013 certaines clarifications au sujet des questions soulevées quant au questionnaire pour la collecte des données et l'ILR relevant que « *certains opérateurs nous font parvenir des questionnaires incomplets ou ne répondent pas à notre demande* ».

A la lecture des documents dont le présent avis est sollicité, nous apprenons encore que :

- l'ILR a organisé une réunion séparée avec l'EPT visant à sérier les questions suivantes : leur stratégie réseau, leur choix de technologie, l'environnement d'exploitation spécifique au Luxembourg, la disponibilité et la pertinence des données à utiliser dans le modèle ;
- l'ILR aurait demandé des éclaircissements aux parties prenantes sur les renseignements fournis en vue d'assurer leur interprétation et leur bonne utilisation.

De la transparence de la méthodologie.

Déjà, lors la réunion de présentation du 28 novembre 2012, les représentants de Tango avaient fait observer :

- qu'il était impossible de se prononcer sur les principes de modélisation et de l'approche proposée alors qu' il s'agissait d'une brève description et que l'élaboration d'un tel modèle nécessite à tout le moins, des tests « en nature » - même sur un modèle « hypothétique » - et d'offrir ainsi aux opérateurs la possibilité d'effectuer des simulations ;
- que le modèle présenté par le consultant et les hypothèses choisies ne semblaient pas à discuter ;
- que des questions essentielles restaient en suspens ou sans réponse à savoir qu'il était dans le contexte donné, difficile voire impossible de fournir de « bons » éléments et données d'entrée nécessaire à l'élaboration du modèle. Ces questions subsistent à l'heure actuelle : « « *comment savoir que les opérateurs fournissent les bons éléments au modèle ?* », « *comment s'assurer d'une bonne compréhension des données à fournir ?* », « *quels sont les garde-fous choisis pour être sûrs que les opérateurs alternatifs puissent survivre au modèle proposé ?* » etc.

La présente consultation publique porte exclusivement sur la méthodologie du modèle. Nous n'avons donc pour l'heure aucune visibilité sur la structure du modèle mais surtout il nous est difficile d'apprécier la prise en compte des contributions et savoir s'il y aura ou non des simulations et tests éventuels pour le calibrage du modèle final. Il est encore regrettable que nous ne sachions pas clairement si une prochaine consultation est prévue par la suite et à quel stade et si parmi les étapes principales prévisionnelles du projet de modélisation, des tests « en situation » sont programmés.
Cette méthodologie prive au final les opérateurs de toute la transparence requise. Ceci est d'autant plus regrettable que les impacts peuvent se révéler in fine énormes, sans qu'au stade actuel, on ne puisse avoir la moindre idée du résultat.
Nous maintenons donc nos observations suite à la réunion du 28 novembre 2012, qui font partie intégrante de la présente.

Quant aux données d'entrée.

Sur base des documents soumis à la consultation, le modèle de coût et sa méthodologie semblent avoir été construits sur base :

- des données quantitatives transmises par les opérateurs fixes consultés (suivant questionnaire remis le 8 février 2013) ;
- d'une réunion bilatérale avec EPT ;
- des données fournies par l'ILR ;
- des hypothèses du cabinet de consultant dans l'élaboration de ce type de modèle ;
- de benchmarks internationaux.

Il s'avère qu'aucun questionnaire qualitatif n'a été soumis aux opérateurs (mais uniquement quantitatif) et ce, bien que via l'OPAL notamment, cet oubli a été à maintes fois souligné et dénoncé. Il ressort également que les opérateurs alternatifs dont Tango n'ont toujours pas été invité à présenter leurs observations lors de réunions bilatérales et n'ont de ce fait, pas eu la chance de recevoir des informations complémentaires et particulières sur le modèle pour optimiser leur compréhension et favoriser leur familiarisation.
Ceci est d'autant plus regrettable que lors de la communication de sa réponse au questionnaire du 8 février 2013, Tango avait souligné ses réserves quant aux données fournies, sinon quant à la bonne compréhension des éléments du questionnaire tel que cela ressort de son mail à l'ILR et dont copie en annexe.

Il convient dès lors de réaffirmer ici l'impératif pour l'Autorité de mener un véritable travail préparatoire à l'élaboration du modèle final et ce, en concertation étroite avec tous les concernés, opérateur dominant comme les opérateurs alternatifs, à l'instar des autres processus conduit dans d'autres pays et leur expérience, ce qui ne semble pas avoir été pris en compte pour la construction du présent modèle.

Quant à l'apport d'expérience d'autres pays : l'exemple de la France et la Belgique.

Dans le présent processus de modélisation, il est à déplorer que l'on n'ait pas intégré les observations des précédends et/ou des travaux en cours dans d'autres pays européens. L'exemple de la Belgique et de la France démontre que la période d'élaboration du modèle a débuté depuis plus longtemps (2011 pour la Belgique et la France) et qu'elle découle d'un long processus de compréhension mais aussi de concertation (pas encore terminée pour la Belgique et en cours de réadaptation avec l'implémentation de nouvelles briques fonctionnelles et de nouvelles données d'entrée et de paramétrage du modèle pour la France en 2013).

Qui plus est, les opérateurs d'autres pays ont pu effectuer les simulations nécessaires à la compréhension des données d'entrée et ainsi bénéficier d'un indispensable accès au modèle (sans que les données d'entrée confidentielles ne soient un obstacle) pour favoriser in fine des résultats tangibles.

Ainsi, pour l'exemple belge, l'IBPT a chargé le consultant Analysys Mason de développer un modèle de coûts en 2011. L'autorité belge a proposé en 2012 à une 1ère consultation une version préliminaire du modèle, version qui existait en trois exemplaires distincts à savoir :

- l'IBPT avait seule l'accès à la version préliminaire, car cette dernière contenait des informations confidentielles ;
- un second exemplaire de la version préliminaire a été fourni à Belgacom uniquement, pour contenir des informations confidentielles fournies par Belgacom ;
- dans le troisième exemplaire, était fourni aux acteurs du secteur, *les informations confidentielles de Belgacom avaient été supprimées et/ou remplacées par des données arrondies de même ordre de grandeur.*

Ce n'est que sur une première analyse des réactions reçues dans le cadre de cette consultation que la version préliminaire du modèle belge a été amendée et les travaux se poursuivent encore à l'heure actuelle.

Il faut en effet pour que les différents opérateurs soient en mesure de donner un avis sur le modèle pouvoir se rendre compte et donc faire des simulations !!!

Il s'avère que les pays cités ci-dessus ont pris à bon escient le parti de favoriser la voie participative et de discuter avec tous les opérateurs, de proposer les éléments de modélisation en tests, ce qui n'est pas le cas du Luxembourg.

Dans ces pays, le but affiché est également de privilégier un équilibre entre la simplicité du modèle d'une part et la justesse des résultats qu'il produit : Simplicité : élément encore plus crucial dans la taille d'un pays comme le Luxembourg ; Justesse des résultats : élément indispensable ; qu'attendre alors de ce point de vue, compte tenu des lacunes et interrogations précédentes (cf.infra), de l'analyse de sensibilité menée (cf. « Sensitivity analysis ») et des résultats du modèle aujourd'hui et de son adaptation future.

Pour être complet, nous voudrions encore préciser que nos collègues des départements régulatoires d'opérateurs nous ont sensibilisé sur le fait que les simulations représentent des jours/homme considérables, que quelle que soit la qualité du consultant ou même si le modèle choisi semble rôdé, il faut absolument et toujours le challenger : challenger aussi bien le consultant choisi comme le modèle lui-même. Le processus à envisager par la suite par l'ILR devra dès lors prendre en compte la variation des données et aux moyens et s'adapter par ailleurs aux ressources des opérateurs à ce faire.

Il convient enfin de s'interroger sur l'analyse des marchés 4 et 5 alors que dans le cadre de la recommandation de la Commission 2007/879/CE et celle du 20/09/2010 sur l'accès réglementé aux réseaux d'accès de nouvelle génération (NGA), il est indiqué que leur analyse « *devrait tenir compte des réseaux NGA et être exécutée de manière coordonnée et en temps voulu par les ARN. Les ARN devraient veiller à ce que les mesures correctrices imposées sur les marchés 4 et 5 soient cohérentes.* » De ce point de vue, nous restons dans la pure expectative.

Veuillez agréer, Monsieur le Directeur, Cher Monsieur SCHU, l'expression de nos salutations distinguées.

Pour Didier ROUMA emp.
Myriam BRUNEL
Directeur Legal et Régulatoire

Annexes :
- Mail de Tango du 8 février 2013

From: BRUNEL Myriam (TAN/MST)
Sent: 08 February 2013 6:12 PM
To: costmodel
Cc:
Subject: Modèle des coûts NGA-NGN

Messieurs

La présente pour vous communiquer le questionnaire relatif à l'étude des modèles de coûts NGA-NGN complété par TANGO.

Nous tenons à préciser que nonobstant les clarifications et /ou précisions complémentaires que votre Institut a bien voulu nous apporter notamment suivant courriel de l'ILR du 15 janvier 2013, nous avons perçu l'exercice comme très difficile parce qu'en totale inadéquation avec la « configuration » en matière de réseau fixe dans laquelle Tango se trouve pour offrir des services fixes à ses clients finaux.

Tango ne disposant pas d'une infrastructure fixe en tant que telle, ni de lignes en boucle locale dégroupée, il n'est pas sûr que les éléments repris dans le questionnaire puisse fidèlement refléter la situation de Tango et aider à l'étude menée

Ceci est d'autant plus regrettable que l'intérêt de cette étude qui vise à retenir un modèle fondé sur les coûts réels est essentiel.
Sachez que vu l'enjeu, nous sommes disposés lors d'une réunion avec votre institut et avec les consultants à compléter, voire préciser les éléments de ce questionnaire.

Il est également pour le moins surprenant que sauf erreur de notre part, les câblo-opérateurs plus au fait des coûts de pose de gaines, durée de vie, des câbles, de la fibre ne soient pas consultés. Ces derniers disposent de plus d' expérience sur le marché luxembourgeois que les opérateurs alternatifs qui eux, ne peuvent répliquer le réseau EPT (tel que précisé dans les rapports de l' ILR).

Nous profitons de la présente pour réitérer les observations faites lors de la présentation par un de nos représentants, Monsieur Laurent DESIDE, comme quoi – à côté des éléments quantitatifs du questionnaire - le choix qualitatif du modèle à retenir est primordial. Nous souhaiterions à cet égard aussi être consulté au préalable ou tout du moins, être informé de la méthode sélectionnée par le consultant FRONTIER pour pouvoir faire part de nos observations en temps utiles.

Nous restons à votre disposition pour tout renseignement complémentaire.

Veuillez croire, Messieurs en l'expression de nos salutations distinguées.

Myriam BRUNEL

Myriam Brunel
Legal & Regulatory Director

Tango
177, rue de Luxembourg
L - 8077 Bertrange
T +352 27 777 221
M +352 691 777 221
www.tango.lu