

# Final Model Document Wholesale Leased Lines, Duct Rental and Dark Fibre



Submitted comments regarding published “Draft Model Reference Paper Wholesale Leased Lines, Duct Rental and Dark Fibre” and AEC’s answers

Dear all,

Agency for electronic communications (AEC) on 23.07.2012 opened public hearing for Draft Model Reference Paper Wholesale Leased Lines, Duct Rental and Dark Fibre. Due date for submission of the views and comments about proposed subject of public hearing from the interested parties was 22.08.2012 on the operators request AEC have extended the due date for submission of the comments where Makedonski telekom, VIP operator and Neotel submitted their views on published document.

AEC is thanking to the interested parties for submitted comments on published document. Below are presented submitted comments and AEC answers.

**Agency for Electronic Communications  
Macedonia**

**Final Model Document  
Wholesale Leased Lines, Duct Rental  
and Dark Fibre**

**October 16, 2012**

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## 1. INTRODUCTION

### 1.1 Project communication structure

This document is a part of the formal communication within the AEC's bottom up modelling project for services Wholesale Lease Lines, Duct Rental and Dark Fibre.

As announced during the above mentioned project has four main communication stages:

- **Inception Report** – Report that contains information about the engagement, explains what will be modelled, what are basic assumptions, explains services and provides descriptions, and explains cost types and how the costs will be modelled.
- **Data request** – Series of documents used to gather the data from SMP operator.
- **Model reference paper** – Document that extends the Inception report, explains how the methodology described within the Inception report is integrated into the model, describes modelling process and presents modelling assumptions that were adopted during the modelling process. Model reference contains results presented in the public consultation processes.
- **Model results** – Report that containing results and outputs from the model.

Model and Model reference paper are based by Inception report so it is important to note that statements expressed within the Inception Report are valid for this document unless specified otherwise.

### 1.2 Workstreams

We have divided the engagement into the following three broad workstreams:

**Wholesale Leased Line Workstream** – This workstream models Wholesale Leased Lines (WLLs) structured in a different way than actual leased line services offered by MakTel.

**Duct Rental Workstream** – This workstream models Duct Rental whereby Other Licensed Operators (OLOs) pull their own cables through MakTel bores.

**Dark Fiber Workstream** – This workstream models dark fibre services as specified by the Agency.

**Neotel comment:**

Why is it limited only to "Ethernet". AEK should not impose what will be the technical equipment to be used by operators

**AEK answer:**

***"Ethernet segment"***

Term "Ethernet segment" refers to the aggregation part of the network (backhaul), and not platform specific. This was clarified with updated terminology used in Model reference paper.

These workstreams represent extensions of our previous engagement. As such, our previous computer model(s) is extended to include WLLs, Duct Rental and Dark Fibre wholesale services.

### 1.3 Project Challenges

As with our previous engagement, we once again point out that the results and accuracy of our modelling will depend entirely on information/data supplied by MakTel.

We recognise the challenge of the engagement due to the fact that Duct Rental and Dark Fibre services are new services on the market and there is no historical usage data or trends. This leads to the fact that service demands may not satisfy minimum quantities for achieving Economies of Scale (EoS). Taking into account that LRIC is based on EoS logic, **small input demand can highly influence model results.**

**MKT comment:**

Makedonski Telekom AD requires insight in the model, particularly in the area of the projection of volume of services, since it directly affects the results of the model. In this draft report is not specified projection of the demand of the service by which are received the results of the model.

**AEC answer:**

***Service demand projections***

Service definition and current demand does not provide sufficient basis for modelling of the demand due to the following challenges:

- WLLs are currently offered as point-to-point WLL or PPC. WLLs are not offered as separated trunk and terminating segments. It was taken into account that new service cannot be transformed to new service automatically due to different possibilities wholesale customers would have.
- WLLs have limited current demand and projections may provide significant gap.
- Duct is usually built for own purposes and not for rental services.
- Dark fibre is secondary service that can be offered only in case of unavailable duct for renting. Also it cannot be treated as NGA service.

Due to the challenges above, it was decided to move from demand calculation to supply projection. Therefore it was not modelled according to possible forecast, rather to what can be supplied on the market. The starting point is currently available capacity that is as portion value maintained in the future.

Following AEC Bylaw on the Access and Use of Specific Network Devices, MakTel issued Reference Offer (RO) for physical access to telecommunication infrastructure and other capacities. Reference Offer and Bylaw are basic documents for defining part of services modelled in this engagement. In terms of these documents, we define and model:

**Duct Rental** – Monthly fee for rent of ducts in Access Network (terminating-secondary segment feeder –primary segment and aggregation segment). Costs

are calculated on per kilometre per bore diameter basis, for 40mm, 32mm, 10/8.5 mm and 5/3.5 mm diameters.

**MKT comment:** What does “полнечки сегмент”? Is this a translation of "feeder segment"

**AEC answer:** It is due to a translation, correct word is “влезен сегмент”

**Dark fibre** – Monthly fee for rent of dark fibre in backhaul and feeder (primary) segments. **We stress out that dark fibre modelled within this project is not considered nor part of Next Generation Access (NGA).** Service specified here is offered as a substitute service in case there is no available bores for duct rental.

MakTel currently offers WLLs in the format (as described in currently available Reference Offer) of:

**Partial Private Circuit (PPC)** – service offered on wholesale level to offer connection from customer premises to PoI.

**Point to Point (P2P)** – service offered on wholesale level to offer connection between two locations.

Taking into account fact that MakTel is mostly offering WLLs on PPC basis, the Reference Offer does not separate WLLs into Terminating Segments and Trunk Segments.

**MKT comments:**

MKT act according to the current Rules for providing termination and / or trunk segments of leased lines and the current reference offer MKT is based on the same policy that is in force.

**AEC answer:**

AEK agree with the conclusion.

It is the view of AEK that WLLs are modelled in line with AEK’s view on future service structure. In particular, WLLs are separated into Terminating Segments and Trunk Segments in line with European Commission terminology and according to best practices. Separation faced the challenge structuring the service according to their availability on the market and expectation for the future.

In addition a new interconnection service is identified: Interconnection Circuit for Wholesale Leased Lines (ICWLL). This Interconnection Circuit is to be used to transfer the traffic from a WLL/PPC from a MakTel PoP to an OLO’s own premises.

## 1.4 Terminology

In order to eliminate any doubts or inconsistencies within this report and the model we have adopted naming policies that precisely identify either part of the service discussed, either the part of the network where particular service is implemented.

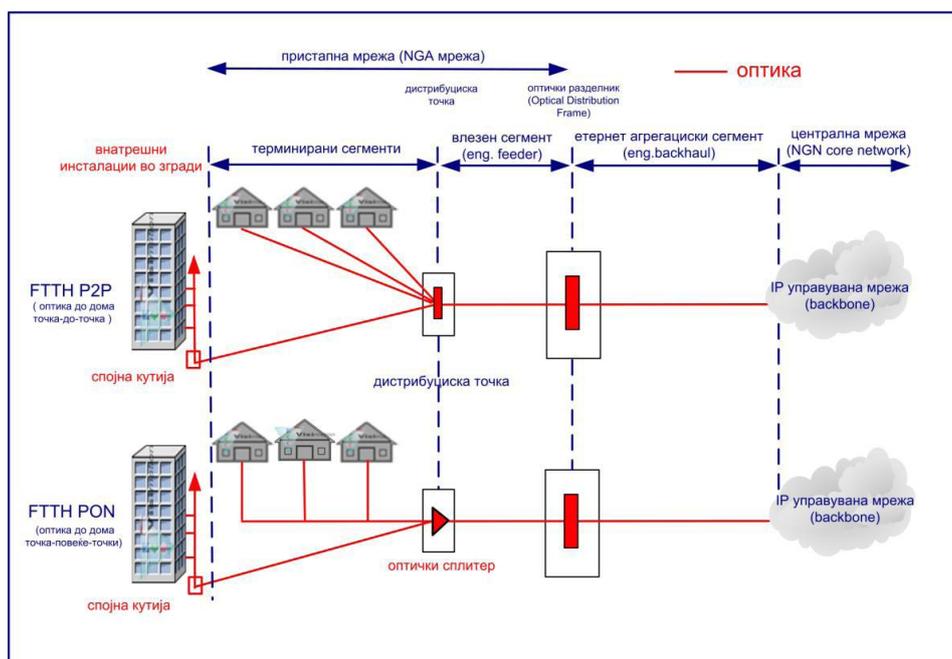
Access and aggregation network recognizes three main parts of the network that follow the principles described in bylaw on the access and use of specific network devices<sup>1</sup>:

**Terminating segment ( secondary segment )** – Part of the access network from end customer to distribution point.

**Feeder segment ( primary segment )** – Part of the access network from distribution point to distribution frame (DF)

**Backhaul segment** – Part of the network utilized for aggregation between distribution frame (DF) and core network.

The structure of network segments is visible on the picture below that is taken from the bylaw on the access and use of specific network devices document.



**MKT comment:**

We want to highlight that this topology does not match the current topology of the reference offer for access. According to the current network topology of the MKT, channels have primary and secondary network, and it is described in the reference offer for access

**AEC answer:**

**Difference in terminology for networks segments**

Terminology of the network must recognise two independent layers: (i) infrastructure (network) level and (ii) service level. Infrastructure layer has three distinctive elements: (1) backhaul, (2) feeder and (3) terminating segment. Definitions used by Makedonski Telekom are in direct alignment with provided structure where Primary network is equal to Feeder and Secondary network is equal to terminating segment.

<sup>1</sup> No. 02-1334/1, 7 March 2011

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In addition to these three terms, we will use additional term when specifying the service of wholesale leased lines as follows:

**Local End** – network section between end user and distribution frame (terminating and feeder segment comprised in one section)

However, when referring to services modelled and provided over the network document uses terms that are commonly used. Terms used in describing each part of the service are specified in the chapters below.

## 1.5 Modelled services

This section describes services covered by the model. Detailed service description is available in following chapters.

The model supports LRIC calculation for following group of services: monthly fee for wholesale leased lines (separated into the *terminating* and *trunk* segments), monthly fees for duct rental, and monthly fees for dark fibre.

### **Wholesale Leased lines**

Currently offered service offered on the wholesale market is offered as single wholesale leased line, without separation into *terminating* and *trunk* segment. As specified in Inception report the model produces results for *terminating* and *trunk* monthly rental segments separately.

The separation to terminating and trunk segment is fully aligned with service elements specified in MakTel's referent offer where:

**Terminating segment** – segment of wholesale leased line from end user to POI

**Trunk segment** – segment of wholesale leased line between two POIs.

It must be noted that "terminating segment" used when referring to wholesale leased lines is different from "terminating segment" used when referring to segment of the network. Detailed specification of service segments is provided in section where modelled services are described further in the document.

Both terminating and trunk segment rental services are modelled according to length and bandwidth.

Model calculates the following bandwidths:

- 64 kbit/s
- 2 Mbit/s
- 34 Mbit/s
- 155 Mbit/s

Model takes into account the length factor of the wholesale leased line for both terminating and trunk segments as follows:

- **Terminating segment** is divided into the following sections (separated according to bandwidths):
  - Monthly rental for terminating segment up to 300m

- Monthly rental for terminating segment between 300m and 3 km in increments of 100m.

**MKT comment:**

MKT considers that the increment of 100 m is not necessary and only further complicates administration services as well as billing or payment of these services. Calculation of fees should be made simple enough to not cause new investments in Billing systems of the MKT and additional complication in collection. MKT proposes an increment of 1 km, in order to simplify the collection of these services.

**AЕК answer:**

Discrete segments are defined for modelling purpose to demonstrate the cost in discrete units. They allowed the calculation of the costs that are structured in the future referent offer.

AЕК does not agree with the requirements of increasing the discrete units. The main reason why AЕК has decided in going through cost calculation in discrete units is to eliminate that thee user is paying for a service that is not consumed. AЕК doesn't see any evidence that breakdown to smaller discrete units will increase the costs on incumbent operator side.

- Monthly rental for terminating segment between 3 km and 15 km of length in increments of 1 km
- **Trunk segment** part is expressed in following sections (separated according to bandwidths):
  - Monthly rental of trunk segment up to 50 km of length in increments of 1 km
  - Monthly rental of trunk segment between 50 km and 200 km of length in increments of 10 km

Lengths referred above when specifying the sections of Wholesale leased lines are based on optical length (not on cable length basis). That represents different approach from the one that is adopted in currently available wholesale referent offer. The algorithm for calculating optical distance is elaborated further down in the document.

**MKT comment:**

The investment in the network of MKT is not planned according to the air distance network. By applying this methodology MKT consider that are not covered all costs incurred for the construction of the network.

Whether in the calculation of these fees are included the cost of GIS systems required for the development of these products? How do you determine the length of each DLL without GIS system?

**AЕК answer:**

**Application of optical distance versus cable distance**

The approach that AЕК took for calculation of costs (from cable distance to optical distance) does not represent optimisation of costs, rather the adjustments in cost representation structure.

As indicated on the public consultations meeting, the curve factor was calculated based on the geographical data and reconstructed network. The method is based on 500 randomly selected geographical points positioned in the Republic Macedonia. They were connected as a web (every point was connected with other 499 points) and for each connection, the optical route as well as cable route was calculated. The optical route represents the air distance between them while the cable length is calculated as a length of the cable route that is required to connect the two points. Cable

route is based on the routes implemented in modelling SMPs cable network (access and core). Curve factor represents the average of all ratios between air distance and cable distance.

AEC sees two ways how this particular method can be used: (i) the air distance of the leased lines can be determined by applying external, free of charge, applications (such as Google earth) if the exact coordinates of the connecting points are known or (ii) if cable length is known, the distance is divided with curving factor which amounts to 1.49 (value is a result of the previously described method). AEC prefers the first option as more precise and transparent option.

Current referent offer for WLL rental does not specify interconnection link for leased lines. Definition and handling of interconnection between operators is described in detailed service description chapter within Inception Report. New interconnection service will be defined by AEC: Interconnection Circuit for Wholesale Leased Lines (ICWLL). This Interconnection Circuit is to be used to transfer the traffic from a WLL from a MakTel PoP to an OLO's own premises and due to its nature it will be treated as Leased Line terminating segment. ICWLL specific charges are not calculated with this model.

**MKT comment:**

MKT offers not only WLL service, it shall proceed according to the current rules on termination and / or trunk segments of leased lines and in accordance with this Regulation is defined this WLL service.

**AEC answer:**

Currently IC Ink is calculated as a in order to fully adopt the WLL service to the actual needs of the market, AEC decided that to include additional service for capacity interconnection of two networks, specifically to be used with WLL service. Although the interconnection link may be implemented in three distinctive options (as explained in Inception report and Model referent paper).

As stated before modelling of other charges and fees related to the service of wholesale leased lines rental are not subject to this project.

Often, a distinction is made between Traditional Interface Symmetric Broadband Origination (TISBO) RLLs and Alternative Interface Symmetric Broadband Origination (AISBO) RLLs.

TISBO RLLs provide symmetric capacity between a customer's premises. The capacity is symmetric because traffic can be carried at the same rate in both directions.

AISBO RLLs are defined by the following:

- o they have different (predominately Ethernet IEEE 802.3) interfaces;
- o they can be used to carry many different types of data; and
- o they can generally only be used over short distances without re-amplification, although this is not the case where such services are provided over WDM technology.

In contrast, TISBO RLLs have (i) a CCITT G.703 interface, (ii) can easily be used to carry voice or data, (iii) can be used over any distance, and (iv) are generally provided using SDH or PDH technologies.

**MKT comment:**

It should be considered that in the future SDH or PDH technology will be replaced, ie PSTN migration process and these technologies will migrate.

Somehow conclusion "According to AEK, WLL should be modeled according to the future structure of the service" will undergo changes in the future in terms of the underlying technology.

**AEC answer:**

In the future, when PDH and SDH will be replaced than the service leased lines will not be defined as it is defined in this document. As indicated in the previously released documentation, the scope of this model is WLL traditional interface services as defined in the referent offer. In future if Ethernet based technology is introduced it must be accompanied with change of the referent offer.

**We have reviewed MakTel's Wholesale Leased Line Reference Offer. Wholesale Leased Lines (WLLs) are only offered on a TISBO basis. Accordingly, we shall model WLLs on a TISBO basis only.**

***Duct Rental***

Duct rental monthly fees are structured according to tube size and length. The fees are expressed in per kilometre basis. The service includes the rent of particular tube within the duct for the length of one kilometre

Modelled duct rental services are as follows:

- Monthly duct rental for tube 40mm per 1km
- Monthly duct rental for tube 32mm per 1 km
- Monthly duct rental for tube 10/8.5 mm per 1 km
- Monthly duct rental for tube 5/3.5 mm per 1 km

Modelling of other charges and fees related to the service of wholesale duct rental are not subject to this project.

Costs are calculated for terminating (secondary segment), feeder (primary segment) and backhaul segments separately and structured according to the bode diameter.

***Dark fibre***

When modelling dark fibre rental service, it is taken into account that this service demand is not driven by NGA take-up. Since wholesale dark fibre rental service is a substitute service for wholesale duct rental (when duct capacities are not available), modelling process took into account that new capacities will not be introduced specifically for this service. It is assumed that demand will be within the boundaries of currently available infrastructure.

Following services are modelled:

- Dark fibre in feeder (primary) segment of the network
- Dark fibre in backhaul segment of the network

Dark fibre rental monthly fees are proposed on the market according to length. The fees are expressed in "per kilometre" basis. The service includes the rent of one kilometre of one fibre straw.

Modelling of other charges and fees related to the service of wholesale dark fibre monthly rental are not subject to this project.

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## 2. MODEL OVERVIEW

Previously developed model that calculated the costs for service of fixed network has been extended to calculate Wholesale Leased Lines costs, Duct rental costs and Dark fibre costs.

While the methodological approach was described in Inception Report, this chapter provides the overview of the model structure.

The model consists of five main parts as follows:

1. Data Input Module
2. Network Dimensioning Module
3. Cost Allocation Module
4. Cost Structure Module
5. Service Costing Module

**Data Input Module** contains input data acquired through data gathering process. The data is structured into main groups: Access network engineering, Core network engineering and Financial inputs. Beside network data, this module contains engineering rules and description of components that are modelled in later stages of the model.

**Network dimensioning module** creates network dimensioned according to engineering rules and input data provided within the Data Input Module.

### **MKT comment:**

We expect a more detailed description by the AEC for the network dimensioning rules, so that they are appropriate to comment. At this point we do not have enough information for network dimensioning and network in question is exactly the MKT, so we need insight into the model again.

### **AEK answer:**

#### **Modelling approach for network**

AEK took the approach that modelled network must comply with industry standards. Modelling approach ensured that all required redundancies are included.

**Cost allocation module** manages cost categories where costs are allocated to network components based on driver definition.

**Cost structure module** represents basis for cost calculation where all cost categories, cost drivers, network components and services are listed on one place.

**Service costing module** aggregates all relevant costs associated for particular service determined by routing factors

### **Modelling process**

Based on engineering input rules, morphology characteristics and relevant traffic figures (number of users, average traffic etc.) data model is first creating and optimizing physical network. Model distinguish and separately building access, switching and transmission network.

**MKT comment:**

What means optimizing the physical network? Does in the modeling of the transmission network is taken into account and the redundancy of the network which is necessary and already implemented in the network of MKT? Just as before, we require insight into the AEC models so we can adequately to prepare our comments.

**AEC answer:**

Modelling approach for network - AEC took the approach that modelled network must comply with industry standards. Modelling approach ensured that all required redundancies are included.

Access network is built and dimensioned taking into account main drivers: morphologies, number of subscribers, distribution density, busy hour traffic and grade of service.

Model is building hybrid network using combination of copper and fibre cable technology.

**MKT comment:**

There is lack of detailed information for the modeled hybrid network. Copper network is included in the fees of the MATERUO, and how is projected optical network? According to these data, we can determine how to use the output enabled by this model.

**AEC answer:****Co-existence of copper and fibre in the access**

The model used to model wholesale leased lines, dark fibre and duct rental represents the extension of already implemented model for fixed network services. The model includes modelling segment of copper access and fibre optic networks independently.

First step in building access network is stratifying main distribution frames in morphologies. After that model is calculating representative MDF/ODF with its characteristics and representative ODF/MDFs are located into territory using scorched node approach. Every MDF area is represented with equivalent hexagon. Model then calculate network structure for one segment of hexagon (hexagon has 6 segments). Curve factor is used to adjust straight lines calculated between points within hexagon.

**MKT comment:**

At the meeting between the AEC, MKT and Deloitte Zagreb, held on 02.12.2010 in KMC Zajcev Rid Deloitte said that it was used scorched earth approach to building a model for the access network, while for the rest of the network is used scorched node approach. MKT considers that the same approach was used again for modeling the access network, i.e scorched earth approach. Again we stress the need for a detailed insight into the prepared model, because we believe that they are not taken into account all expenses submitted by MKT during the modeling.

**AEC answer:****Application of scorched node methodology**

Model approach is based on scorched node. It is AEC's objective to identify the costs required from providing services in Republic of Macedonia. AEC used all existing точки на центри of exchanges, nodes and access points.

Spare capacity is driven by input parameters and it is accounted in building access network. Access network optimization is done based on cost effective principle and it is done different points:

- Number and type of cables used for primary, secondary and terminating segment

- Usage of underground or over ground technology
- Depth and width of trench needed for duct
- MDF configuration

Optimizations are based on linear programming.

One of main cost driver for access network is civil work to provide underground cabling technology. To reflect real cost of civil work user can define surface (3 types) and sub-surface (3 types) of terrain. Surface and sub-surface terrain is defined for every of 4 morphologies. Financial input follow definition of terrain types.

Switching network is represented with concentrator units and exchanges. Model position concentrator unit in same location (collocate) with exchange in exchange building. All other concentrator units are positioned remotely together with main distribution frames. Geographical scorched node approach is used for modelling number and positions of exchanges.

Main driver for dimensioning switching network components are: number of active lines, busy hour traffic, originating and terminating traffic on exchange and grade of service. Optimization of switching components on cost effective principle is done on:

- Remote concentrator unit - number of ports, line cards and racks
- Switching - number and capacity of switching blocks, line cards, CPUs, software and signalling units

Transmission network is built separately for following levels:

- RCU to LE route
- Local level of transmission rings and
- Core level of transmission.

**MKT comment:**

Just like the previous comments that the PDH / SDH technology will be replaced by the PSTN migration and the modeling will continue to be changed. This technology can not be maintained in the near future.

**AEK answer:**

In the future, when PDH and SDH will be replaced than the service leased lines will not be defined as it is defined in this document. As indicated in the previously released documentation, the scope of this model is WLL traditional interface services as defined in the referent offer. In future if Ethernet based technology is introduced it must be accompanied with change of the referent offer.

RCU to LE transmission is modelled for every RCU in two ways if RCU is closer to ring than RCU is connected to ring in other case RCU is directly connected to LE. Backup path is created between two nearest RCU to provide network resistance. Input parameter defines for which morphology backup path is needed. Model is utilizing electric transmission over copper cables if traffic on RCU - LE path is below certain volume (user defined input parameter) otherwise fibre optic technology is used. Same principle is used for utilization of TDM or WDM technology.

Local and core rings are created using position of RCUs, local and transit exchanges and finding optimal path for connection. Every RCU and exchange is positioned on map and rings are drawn in map following geographical characteristics of terrain and built objects. After positioning transmission routes model calculate traffic on every transmission network segment and optimize capacity and number of active equipment used for providing service. Optimization is done on cost effective

principles for: size and number of transmission equipment and tributary line card. Also model is calculating and using cost effective methodology for cabling solution (over ground or underground).

Fibre elasticity factor is used to adjust fibre flexibility challenge while user defined input parameter is the approach used to define ring protection mechanism (2f MSPring or 4fMSPring). In order not to doubling civil work costs trench is shared between transmission and access network in ratios defined by user and by every network segments. Also active transmission equipment is collocated in same building where it is possible with exchanges and RCUs.

Finishing building main network components model is calculating number, capacity and cost of other important network components (manholes, distribution boxes, poles, power equipment, regenerators et.). Those calculations are based on route length, shared route length and network segment traffic.

Engineering part of model calculate summary for every network segment relevant for cost allocation model. Before grouping cost into homogenous cost categories (HCC) CAPEX was annualised using asset life, tilt and weighted average cost of capital. OPEX costs are input parameters provided by incumbent.

Results of engineering model are two different network types: network for coverage and full network. Network for coverage represent minimal network cost for providing basic level of services for minimal number of service demand. Full network represent network able to provide full demand for all services.

Cost allocation model works on standard LRIC cost allocation mechanism as previously described in Inception Report. Costs calculated in engineering part of model are grouped into HCCs. Cost driver is used to allocate cost from HCCs to network components. Network for coverage cost are used to identify fixed cost and difference between full network and network for coverage represent values of variable cost. Common and joint costs and independent costs are determined defining dedicated matrix. Allocating cost from network components to services are done using routing factors and service demand.

Routing factors are consisted using incumbent input or by using service definition presented in inception report (for newly introduced services). Service demand is entered as it is now or minimal demand for services that not meet minimal demand required for model to run.

Cost allocation is done using:

- 158 homogenous cost categories
- 54 cost drivers
- 48 network components

**MKT comment:**

We demand more transparency - showing all the calculations of the model at closed debate between AEC and MKT.

**AEC answer:**

The model developed to determine the cost of the services WLL, DF and DR was developed in cooperation with the operators. AEC ensured meetings and workshops to discuss the provided materials (inception report, data collection, model referent paper and model results). Methodology was communicated to operators and models were developed using operator's data.

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### 3. MODELLING ASSUMPTIONS

This Section provides insight how the assumptions presented in Inception Report (and adopted during the modeling process) were implemented within the model.

#### 3.1 Service demand assumptions

Project team was faced with demand challenges as follows:

- Services Duct Rental and Dark Fiber were introduced recently and at the time of the model development there were no wholesale customers using or applying this service.
- Demand for Duct Rental and Dark Fiber is expected to increase with new bylaw that regulates the access network development.
- Dark Fiber is offered as a replacement services only in case there is no available duct space when Duct Rental is requested.
- Wholesale leased lines are mostly used by other operators as Partial Private Circuits and Point-to-Point wholesale leased lines
- Wholesale leased lines are currently offered as end-to-end service however due to the mature of usage it is assumed that current demand remain in separated leased lines to terminating and trunk segments

Although the modeling challenges were explained in the Inception Report, certain assumptions had to be taken into account. In order to overcome these challenges the team created demand based on following assumptions:

- Duct rental is offered on spare ducts only. There is no expectation that specific duct investment will be made by SMP operator to build additional duct specifically for duct rental service.
- Dark fiber is offered on available spare straws only. There is no expectation that specific fiber investment will be made by SMP operator to build additional fiber connections specifically for dark fiber service.

**MKT comment:**

MKT plans their networks under other bylaws such as the Regulation for technical, utilization and other conditions for certain types of electronic communications networks and electronic communications infrastructure, supporting infrastructure facilities and resources, and according to them is determined redundance of the cable channels in the future planning, if for the same are made appropriate claims from the alternative operators. If no such claims, MKT performs the planning according to own internal inputs.

**AEK answer:**

***Respecting the available bylaws and legal documents that define how the network is built***  
The model is based on the regional experience where similar bylaws are implemented. Bylaws define

the available capacity that must be made available to the other operators that would require this service. The model recognizes required additional capacities in duct network (additional 20%) that must be available.

- Wholesale leased line demand for terminating and trunk segments is in line with current demand for PCCs and point-to-point.

### 3.2 Aerial distance for wholesale leased lines

As specified in the Inception Report, costs for whole leased line terminating and trunk segments are structured to reflect actual distance covered, not the distance determined by the path of infrastructure (access network, network site positions and network routes).

Costs for wholesale leased lines terminating and trunk segments are transformed to aerial (optical) distances using the additional module within the model.

The transformation is based on curve factor.

Curve factor is calculated as geometrical average of all ratios between aerial distance and network path distance. Calculation process was following next steps:

1. Complete network routes calculated by model are positioned on map of Macedonian.
2. Sufficient number of random points all over Macedonian territory covering all MDF areas
3. Aerial distance ( $d_A$ ) of one to every other point is calculated based on geographical coordinates, for all points.
4. Network path ( $d_N$ ) was calculated as sum of direct path to nearest network terminating distribution point and shortest network path between two distribution points.
5. Simple ratio of aerial distance and network path ( $R = d_N/d_A$ ) is calculated for all pair of selected points.
6. Finally curve rate was calculated as geometrical mean of all ratios calculated for all point pairs.

Calculated curve factor is applied on cable length. The value of the calculated curve factor is 1.49. Because the prices calculated in the model are expressed with the air distance, one method for calculation of the air distance of the leased lines is to divide circuit distance of the leased line by curving factor.

**MKT comment:**

MKT considers that it should be specifically stated in this document as is the factor curve calculated according to the methodology? This is linked with the previous comments that the true costs of leased lines do not correspond to the air distance between two endpoints DLL, but depend on how the network is built.

**AEK answer:**

**Curve factor used to calculate the relative ratio between optical and cable length**

As indicated on the public consultations meeting, the curve factor was calculated based on the geographical data and reconstructed network. The method is based on 500 randomly selected geographical points positioned in the Republic Macedonia. They were connected as a web (every point was connected with other 499 points) and for each connection, the optical route as well as cable route was calculated. The optical route represents the air distance between them while the cable length is calculated as a length of the cable route that is required to connect the two points. Cable

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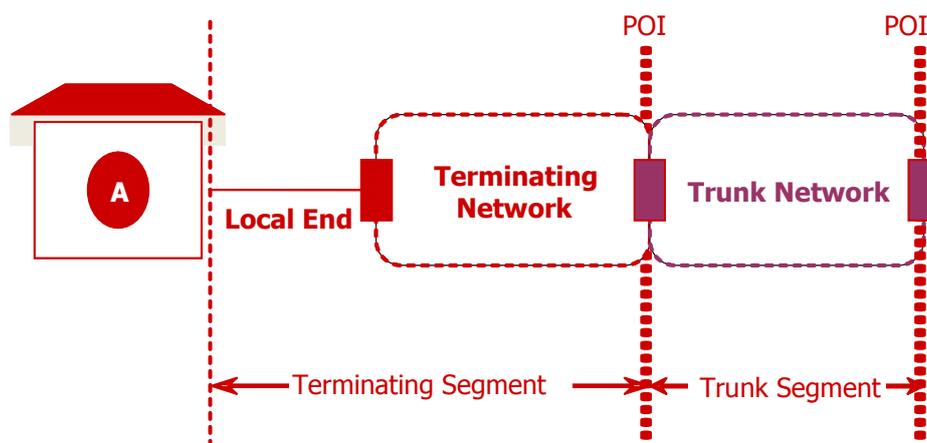
route is based on the routes implemented in modelled SMPs cable network (access and core). Curve factor represents the average of all ratios between air distance and cable distance. The approach that AEC took for calculation of costs (from cable distance to optical distance) does not represent optimisation of costs, rather the adjustments in cost representation structure.

## 4. SERVICES MODELLED

### 4.1 Wholesale leased lines

Although Inception Report provided the description of the services modeled, we would like once again to point out how the services are modeled within the model.

First we would like to present the definition of wholesale leased line (WLL) terminating and trunk segments.



The Agency's objective in modeling WLLs is to (re)define WLLs using the terminology Terminating Segment and Trunk Segment as defined above. In particular:

**Terminating Segment** represents the part of the WLL that covers Local End on the network (from end user to the distribution frame, or to be more precise, terminating and feeder segment of the access network) and Terminating Network (part of the transmission and cable network from distribution frame to nearest point of presence within incumbent operator network). The reason for including Terminating network in wholesale leased line terminating segment is that incumbent's point of presence is not positioned on all MDF's. In order to provide connectivity, the distance between MDF and POI must be bridged.

**Trunk Segment** represents the part of the WLL that covers Trunk Network (transmission and cable network used that connects two points of POIs within incumbent's network).

This approach is in line with referent offer for wholesale leased lines currently available where both WLL segment types are recognized and described. However the WLL service is not offered as combination of two independent segment types, but only as one direct circuit (either as P2P, either as PPC). Therefore technical specification of the service also does not recognize two independent WLL segment types.

In order to follow the principle of separated WLL segment types that can be offered on the market independently (as required by the AEC), certain assumptions were integrated when modeling WLL

terminating and trunk segments. In transition from point to point leased line (as it is currently offered) to new services of separately offered terminating and trunk segments, it is expected that the technical underlying solution will change. Therefore, this change was required to be adopted in order to structure independent services.

Assumptions are as follows:

- Due to definition of service, existing PoPs are positioned within trunk segment
- In order to offer independent terminating segment, incumbent operator would need to ensure POI for all terminating segments as well and therefore have additional cost that must be taken into the consideration

**MKT comment:**

In the process of submitting data to the AEC by MKT were not requested costs for the additional modifications in the network for the positioning network elements different from the current topology. MKT has provided to the AEC the costs only for existing technical solutions.

This subsection provides the calculation of additional cost! MKT needs to know what this extra expense is.

**AEK answer:**

**Additional cost elements required for establishment of independent WLL terminating segment service**

AEC decided that existing WLL service that is offered as (i) point-to-point wholesale leased line and (ii) PPC, must be structured to support realistic trunk and terminating segment WLL service. In order to do so, we were required to adjust the service and create realistic service that will be offered on the market. Current specification (Existing Reference Offer) of the WLL service does not support independent terminating segment because its termination is exclusively predefined to terminate on the port of the trunk segment aggregation device. In order to be terminated at the PoP, terminating segment would terminate on additional separate device that is used (i) to provide transparent interface according to the specification of the service, (ii) to separate termination of the WLL from other traffic and enable independent connection with alternative operator and (iii) to provide bandwidth control of the service. Attributable costs related to those devices were introduced to enable realistic service of WLL terminating segments.

Network components that are included in leased lines segments from modeling point of view are as follows:

- **Terminating segment**
  - Local end including
    - network termination equipment
    - end line access cabling (including ducting and trenching)
    - distribution frame
  - Cabling from distribution frame to PoP (Point of Presence) of LL trunk network located at local/core Ring
  - Active devices located from the end customer up to the PoP (Point of Presence) of LL trunk network located at local/core ring
  - Active equipment used for transfer of traffic from terminating segment on the PoP (Point of Presence) of LL trunk network
- **Trunk segment**
  - Starting MUX (including line card)
  - Core network cabling (including ducting and trenching) between two PoP (Point of Presence) of LL trunk network
  - Core network active equipment between two PoP (Point of Presence) of LL trunk network

- Ending MUX (including line card)

LRIC builds theoretical model, **number of leased lines by capacity and morphology is a user input parameter**, but distribution of leased lines over ODFA within morphology will be uniform.

**MKT comment:**

What means an equal distribution of leased lines through ODFA. Is it a cost optimization of the network or shortening? We are looking for insight into these costs for network modeling.

**AEK answer:**

**Distribution of WLLs over the ODFA**

WLL data was acquired as In order to define required transmission capacity within the network, WLLs had to be allocated to particular ODFA. Since AEC was not provided with geographical distribution of WLLs, allocation to particular distribution area had to be done in the uniform way.

Due to current Macedonian situation model will be developed according to locations of PoP (Point of Presence) of LL trunk network of MAKTEL published reference offer for Leased Lines:

Kumanovo 11-ti Oktomvri  
 Štip - Kuzman Josifovski – Pitu  
 Kočani - Maršal Tito  
 Strumica - Maršal Tito  
 Veles - Blagoj Gorev  
 Tetovo - Ilindenska  
 Gostivar - Ilindenska  
 Kičevo - Maršal Tito  
 Ohrid - Makedonski prosvetiteli  
 Bitola - Ruzveltova  
 Prilep - Goče Petrov  
 Skopje - Orce Nikolov  
 Skopje - N. Lisiče Vidoe Smileski  
 Skopje - Karpoš Nikola Rusinski  
 Skopje - Čair Kemal Sejfula

Above mentioned represents cost structure and modelling view. Within the model the cost structure will be transformed to meet AEK's future vision of price structure that is in accordance with best practices. As we mentioned only monthly capacity rental charges will be calculated within this engagement. While previous chapter demonstrated the modelling view on providing the service, this chapter provides price structure. End model results (cost of service) will be structured, calculated and expressed using following principle:

- Terminating segment
  - up to 300 meters,
  - from 300 meters up to 3 kilometers with increment of 100 meters,
  - >(greater than) 3 kilometers with increment of 1 km.

**MKT comment:**

According to the list of PoP-ROMs states above, are likely to occur terminating segments longer than 15 km. This should be taken into account and for these segments should anticipate compensation. This can be further described in the Contract for terminating and trunk segments of leased lines with alternative operators. MKT proposes to simplify the billing model, because it is too complex. Example:

step from 100m to rise to 500 meters, also for step of 1 km we propose to exclude or to add some more length between 3 and 15 km.

**AEK answer:**

***Maximum length of the terminating segment***

Although specified that maximum terminating segment can be 15kms, AEK agrees with the conclusion that in reality terminating segment may be longer in length. Since modelled termination segment included capacity related costs and length related costs, the length can be expanded without implication on the model. In those cases AEC concluded that the same algorithm will be applied as in shorter WLL terminating segments. Final result of the model changed accordingly.

The main purpose of this project is to make a breakdown of the leased line services and the user is not obliged to pay for a service that will not use. AEC made adjustments instead of up to 15 km defined a service "greater than 3 km"

- Trunk segment
  - up to 50 kilometers with increment of 1 km,
  - from 50 up to 200 kilometers with increment of 10 km.

**MKT comment:**

In line with previous comments, this model will cause major problems in the collection of services, as for the operator who is providing wholesale leased lines and for the operator to use.

We propose to simplify the billing model, because it is too complex. Example: To exclude all the steps, and add some length between the prescribed limits in the previous listing.

**AEK answer:**

Discrete segments are defined for modelling purpose to demonstrate the cost in discrete units. They allowed the calculation of the costs that are structured in the future referent offer.

AEC does not agree with the requirements of increasing the discrete units. The main reason why AEC has decided in going through cost calculation in discrete units is to eliminate that the user is paying for a service that is not consumed. AEC doesn't see any evidence that breakdown to smaller discrete units will increase the costs on incumbent operator side.

Trunk segment does not include terminating segment.

Main result will be provided in physical length. However since AEK's view on future service structure is to calculate in optical visibility distance between two points, the results will be transformed again to meet that requirement.

Final model result will provide service costs for terminating and trunk segment expressed in distance of LL as optical visibility distance between two points (starting and ending part) of the LL segment. Actual (cable) distance between point will be calculated using actual routing factors and curve factor.

Due to new service structure alternative operators will be able to lease different bandwidths through the network (e.g. multiple 2Mbit/s terminating segments and one single 34 Mbit/s). If this is the case multiplexing of these lines on transfer point from terminating to trunk segment is solely responsibility of the operator leasing the lines.

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## 4.2 Dark fibre

Output of the modelling exercise is the results of dark fibre for backhaul and feeder (primary) segments. We stress out again that **dark fibre modelled within this project is not part of Next Generation Access (NGA).**

When modelling dark fibre rental service, it is taken into account that this service demand is not driven by NGA take-up. Since wholesale dark fibre rental service is a substitute service for wholesale duct rental (when all duct capacities are not available), modelling process will take into account its own specific demand.

Monthly fee for dark fibre will be modelled to include following costs:

- Backhaul network segment – one piece of fibre cable, splicing, bores, ducting, trenching and overhead cost excluding active equipment;
- Feeder network segment – one piece of fibre cable, splicing, bores, ducting, trenching, ODF and overhead cost;

## 4.3 Duct rental

In modelling Access Network Duct Rental costs per kilometre there are two possible technically feasible options. Under the first option, space exists within existing fibre optic cable bores for additional cables to be pulled through. Under the second option, Telekom Macedonia's fibre optic cables are carried in separate bores than those of the interconnecting operator. In reality this is more likely to be the case for legal reasons. Pulling cables through bores that already contain cables may result in damage and possible interruption to services (potential principal and third party damages).

In reality both options result in the same costs. As already discussed, the main cost of the Access Network is determined very much by subscriber density (that is the size of cables) and the length of cables and not whether cables share bores or not.

Bylaw on the access and use of specific network devices regulate duct rental offering as service that allows usage of existing spare duct capacity. That implies that only "tube in tube" can be rented as duct rental service and that only small diameter tubes (40mm, 32mm, 10/8.5 mm and 5/3.5 mm) are used to fill the large diameter tubes (e.g. 110mm) can be rented.

Ducts (and costs related to duct) are different in core network from access network. Since focus is on access network ducting, only access network ducts will be modelled. Additionally, costs will be calculated for terminating (secondary), feeder (primary) and aggregation sub-segments of Access network (as defined in Bylaw). If results for these sub-segments will be similar, one blended cost will be calculated.

The results will be related only to access duct (it cannot be applied for core network due to different duct structure).

Like with cables, spare bores are also laid during network building, so number of spare bore will be user input into the model.

It is common that big diameter tube is filled with small diameter tubes following certain rules. Since number of possible combinations can be high and that it depends on various external factors, rules for filling 110 mm diameter tube by network segments will be user input parameter.

Clearly the cost of Duct per metre does not depend on cables, since the interconnecting operator is supplying its own cables. However, the cost of Duct (perkilometer) depends on the number of bores laid in each trench. In turn, the number of bores laid in each trench depends on the number of cables to be pulled. Thus model will optimize number and diameter of bores needed to build network infrastructure in every of three segments. Also based on number and type of bores, model will optimize trench dimension needed for laying calculated number of bores. Model trenching principals is described in our previous report.

After all main network components that directly influence Duct rental costs are: trenching, duct installation and overhead costs.

## 5. MODEL RESULTS

### 5.1 Introduction

In preparing results, we have relied upon a number of third party reports (AEC subscriber/traffic spreadsheets, operator supplied network/cost data, etc). We have not undertaken any form of investigation, verification, audit or other work in relation to such information. In particular, the scope of our work has not included validating subscriber, traffic, tariffs (revenues) and cost assumptions contained in third party source documents. Accordingly we express no view on the reasonableness of said third party source documents.

**MKT comment:**

We believe that with this introduction the developer of this LRIC Bottom Up model wants to hedge against the responsibility of the accuracy of the data used as input data in the model and by that recognizes that the revision of this model by the independent auditor is more than needed. MKT considers that due to the obligation of all SMP operators should have revised LRIC Top Down model for the preparation of the accounting statements, reciprocal and AEC would have to have the same obligation to revise the model that governs almost the all wholesale services on the Macedonian telecommunication market. The audit conducted by an independent auditor would mean the verification of the accuracy of the model.

**AEC answer:****Audit of the AEC's model**

The model developed to determine the cost of the services WLL, DF and DR was developed in cooperation with the operators. AEC ensured meetings and workshops to discuss the provided materials (inception report, data collection, model referent paper and model results). Methodology was communicated to operators and models were developed using operator's data. Electronic communication act refers to the models developed by the operators which are developed independently by the operators and without public process or participation of the AEC. The audit of the model is the toll that enables AEC to ensure verification of the methodology and results.

## 5.2 Wholesale leased lines

Costs defined in the table below correspond to the structure and definition of the WLL product agreed with AEC and in detail described in Inception Report and in previous chapters of this document.

Since new product structure takes into account physical distance between, users and SMP operator are require to calculate the sum of costs. The relation of cost according related to distance is presented below in the separate table and graphs for each bandwidth

Total product cost is calculated from results as follows:

Since the monthly costs for rent of wholesale leased lines is both circuit and length related this is taken into consideration when calculating the final price for both terminating and trunk segments of the leased lines. In this view, the model determines circuit related costs and length related increment costs (per meter or kilometre of length) for the border lengths (300m, 3km and 15 km for terminating segment, which is 50 km and 200 km for trunk segment).

If the actual length of leased line exceeds the border lengths than the pertaining cost should be determined by taking into consideration both circuit and the length related costs of the next border length.

Total cost of terminating segment is calculated by adding the circuit related cost and by multiplying the length of the line by the determined length increment for the same border length.

***Total cost = border length circuit related cost + length of leased line\* incremental cost of the same border length related cost***

For example, if the length of terminating segment is 2,5 km, than the costs are calculated as follows:

- The length of the leased line exceeds the minimum of 300 m, but it is below the next border level of 3 km. Therefore, the relevant boarder length is 3 km.
- Costs of 2,5 km is therefore the circuit related costs of 3 km increased by the 2500 m times the increment cost per 100 m of the 3 km length related cost.

$$\text{Total cost} = 3 \text{ km circuit related cost} + 2,5 \text{ km} * \text{incremental cost for 3 km}$$

Furthermore, if the actual leased line length is above 3 km, than the next border length is > (grater than) of 3 km. The stated means that the cost for length of above 3 km should be the total of circuit related cost of > (grater than) 3 km and increment cost for length related > (grater than) of 3 km. For example, if the actual leased line is 5 km in length, than the total cost is as follows:

$$\text{Total cost} = > \text{ (grater than) } 3 \text{ km circuit related cost} + 5 \text{ km} * \text{incremental cost for } > \text{ (grater than) } 3 \text{ km}$$

Finally, when it comes to the trunk segment of the leased lines, the minimum border length is set at 50 km. This means that when calculating the trunk segment costs of all leased lines below 50 km in length, both circuit and length related costs of 50 km will be the starting point. Again, the total cost is calculated using the formula stated under point.

For example, if the trunk segment is of 10 km length, its related cost will be calculated as stated below:

*Total cost = 50 km circuit related cost + 10 km \* increment cost for 50 km*

For all trunk leased line segment above 50 km, the border line of 200 km will be the relevant point for calculating both circuit and length related costs.

The results for air distance LL are as follows:

<b>Service</b>	<b>MKD</b>
<i>64 kbit lease line terminating segment - 300 m</i>	2.583
<i>64 kbit lease line terminating segment – up to 3 km</i>	2.539
<i>64 kbit lease line terminating segment - up to 3 km increment 100 m</i>	11
<i>64 kbit lease line terminating segment - &gt;(grater than) 3 km</i>	2.546
<i>64 kbit lease line terminating segment &gt;( grater than) 3 km increment 1 km</i>	91
<i>64 kbit lease line trunk segment - 50 km</i>	1.515
<i>64 kbit lease line trunk segment - 50 km increment 1 km</i>	4
<i>64 kbit lease line trunk segment - 200 km</i>	3.031
<i>64 kbit lease line trunk segment - 200 km increment 10 km</i>	10
<i>2 Mbit lease line terminating segment - 300 m</i>	10.015
<i>2 Mbit lease line terminating segment – up to 3 km</i>	9.930
<i>2 Mbit lease line terminating segment – up to 3 km increment 100 m</i>	22
<i>2 Mbit lease line terminating segment - &gt;( grater than) 3 km</i>	10.175
<i>2 Mbit lease line terminating segment - &gt;( grater than) 3km increment 1 km</i>	154
<i>2 Mbit lease line trunk segment - 50 km</i>	6.982
<i>2 Mbit lease line trunk segment - 50 km increment 1 km</i>	9
<i>2 Mbit lease line trunk segment - 200 km</i>	12.301
<i>2 Mbit lease line trunk segment - 200 km increment 10 km</i>	24
<i>34 Mbit lease line terminating segment - 300 m</i>	32.236
<i>34 Mbit lease line terminating segment - up to 3 km</i>	30.785
<i>34 Mbit lease line terminating segment - up to 3 km increment 100 m</i>	373
<i>34 Mbit lease line terminating segment - &gt;( grater than) 3 km</i>	56.277
<i>34 Mbit lease line terminating segment - &gt;(grater than) 3 km increment 1 km</i>	427
<i>34 Mbit lease line trunk segment - 50 km</i>	52.401
<i>34 Mbit lease line trunk segment - 50 km increment 1 km</i>	85
<i>34 Mbit lease line trunk segment - 200 km</i>	84.224
<i>34 Mbit lease line trunk segment - 200 km increment 10 km</i>	332
<i>155 Mbit lease line terminating segment - 300 m</i>	51.389
<i>155 Mbit lease line terminating segment – up to 3 km</i>	49.938
<i>155 Mbit lease line terminating segment – up to 3 km increment 100 m</i>	373
<i>155 Mbit lease line terminating segment - &gt; (grater than) 3 km</i>	66.297
<i>155 Mbit lease line terminating segment - &gt;( grater than) 3 km increment 1 km</i>	534

<i>155 Mbit lease line trunk segment - 50 km</i>	97.180
<i>155 Mbit lease line trunk segment - 50 km increment 1 km</i>	256
<i>155 Mbit lease line trunk segment - 200 km</i>	192.650
<i>155 Mbit lease line trunk segment - 200 km increment 10 km</i>	995

**MKT comment:**

This complex model will cause problems in determining the Collection (Billing systems) and it will be a problem for the operator who provides the service and operators that use the service.

MKT proposes to simplify the billing model, because it is too complex. Example: step from 100m to rise to 500 meters, also for step of 1 km propose to exclude or to add some more length between 3 and 15 km.

**AEK answer:**

Discrete segments are defined for modelling purpose to demonstrate the cost in discrete units. They allowed the calculation of the costs that are structured in the future referent offer.

AEC does not agree with the requirements of increasing the discrete units. The main reason why AEC has decided in going through cost calculation in discrete units is to eliminate that the user is paying for a service that is not consumed. AEC doesn't see any evidence that breakdown to smaller discrete units will increase the costs on incumbent operator side.

### 5.3 Duct rental

According to the presented modelling methodology in Inception report and within Model reference paper the model results for duct rental are as follows:

Service	MKD
<i>Monthly duct rental 5/3,5 (per km) – terminating (secondary segment )</i>	1.836,30
<i>Monthly duct rental 5/3,5 (per km) – feeder (primary segment)</i>	1.259,44
<i>Monthly duct rental 10/8,5 (per km) – feeder (primary segment)</i>	1.799,20
<i>Monthly duct rental 32 mm (per km) – feeder (primary segment)</i>	3.838,30
<i>Monthly duct rental 40 mm (per km) – feeder (primary segment)</i>	4.797,87
<i>Monthly duct rental 5/3,5 (per km) - backhaul</i>	1.540,55
<i>Monthly duct rental 10/8,5 (per km) - backhaul</i>	2.200,79
<i>Monthly duct rental 32 mm (per km) - backhaul</i>	4.695,02

**MKT comment:**

MKT considers that should be set a minimum length of sold channel. For example, if an alternative operator requires only 20 m channel MKT in the reference offer should have a limitation that will sell at least a 1 km (or 500 m).

**AEK answer:**

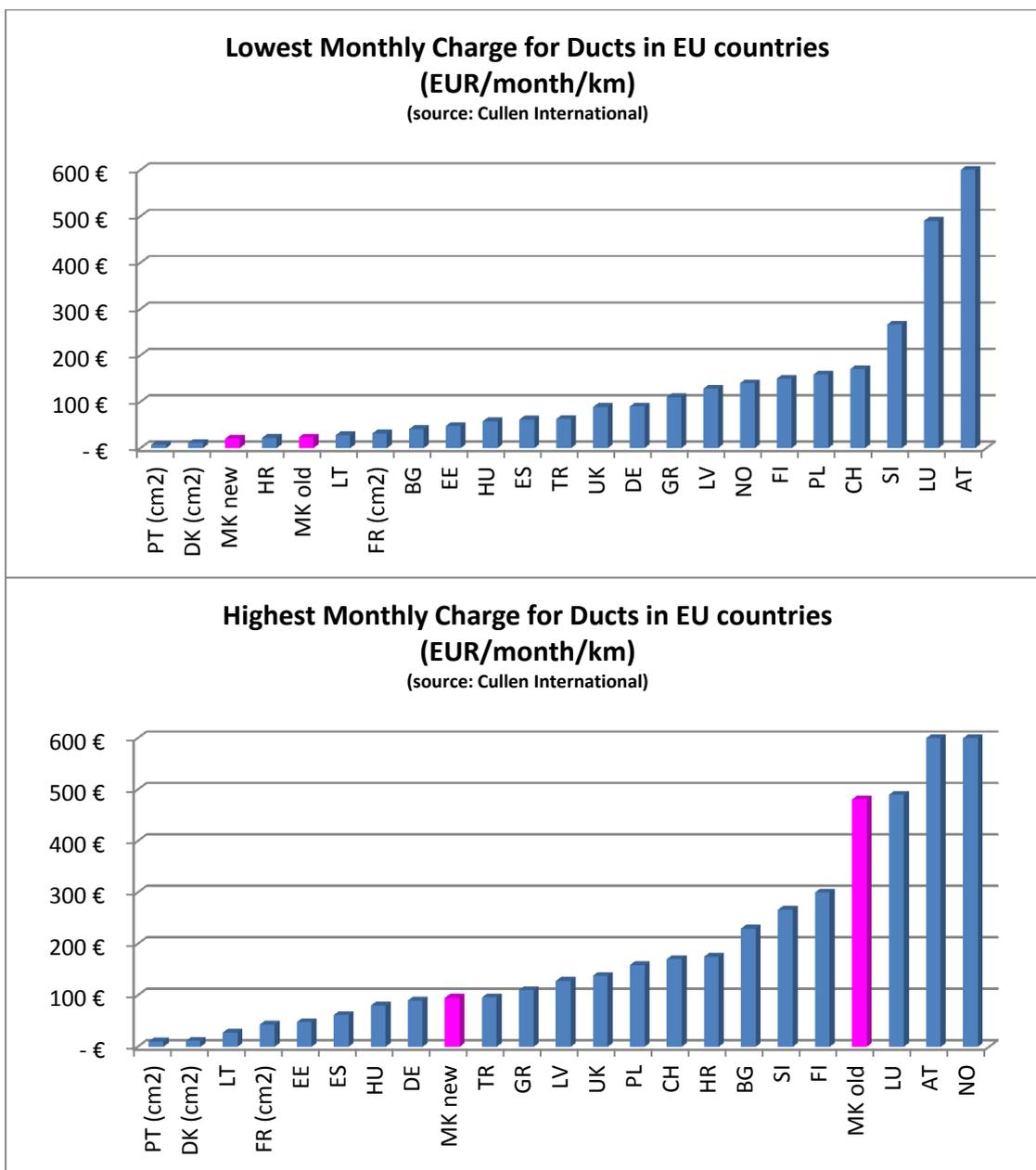
Prices are calculated per km.

**MKT comment:**

MKT considers that the monthly rental fees for cable channel is very low compared to other European countries, as can be seen from the images below. Because of this, once again we emphasize that we need insight into the model and the cost that it uses.

**AEK answer:**

The results were calculated based on provided operator’s information, not using benchmark methodology. The results represent the costs that reflect the actual costs to provide the service.



## 5.4 Dark fibre

**We stress out that dark fibre modelled within this project is not considered nor part of Next Generation Access (NGA).** Service specified here is offered as a substitute service in case there is no available bores for duct rental.

According to the presented modelling methodology in Inception report and within Model reference paper the model results for one piece dark fibre cable rental are as follows:

Service	MKD
<i>Dark fibre feeder ( primary segment) per Km</i>	5.049,71
<i>Dark fibre backhaul per Km</i>	939,73

**MKT comment:**

We believe that all the above defined charges for wholesale services of MKT should be fee for the agreement with an alternative operator for at least a year, because it is very illogical to sign a contract for an indefinite period for this type of services. The supply of these services requires a lot of time and other resources as well as investment by the MKT, to be an agreement signed for an indefinite period and may be terminated only after a few months.

**AEK answer:**

The prices of the modeled services are modeled by using the data submitted by the operator requested during the developing of the model. Taking into account financial data for the cost input parameters, amortization, depreciation and WACC the model calculates price for the services on motly basis, regardless of the duration of the signing of the contract .

**VIP operator comments:**

**Leased Lines**

*Comments:*

VIP operator greets the undertaken steps by Agency for introducing a separate regulation for the prices for the terminating segments of leased lines and for the trunk segments of leased lines, as opposed to the wholesale service currently offered by the SMP operator which provides an identical price as the case when they are provided together or separately. By this way, the unit price which would be valid separately for a terminating and for a trunk segment would be in any case lower than the current price which is valid for both segments together.

As in previous occasions we have pointed out, this practice has long been established in almost all European countries, where are allocated two separate wholesale markets and the same is in accordance with the last paragraph of the Recommendation of the European Commission C (2005) 951/1 - Part2:

“(5) On 11 February 2003, the Commission adopted a recommendation on relevant product and service markets defining the relevant markets within the electronic communications sector that NRAs must analyse under the provisions of Article 15 of the framework Directive.

The list includes wholesale terminating segments of leased lines and wholesale trunk segments of leased lines.

(6) The supply of leased lines part circuits is included in the market of wholesale terminating segments of leased lines and for sufficient line lengths also in the market for wholesale trunk segments of leased lines referred to in the Recommendation of the Commission of 11 February 2003. It is a matter for the NRA to decide what constitutes a terminating segment depending on the network topology specific to their national market.”

VIP operator as one of the major users of leased lines from the SMP operator provided on its wholesale offer, believes that is more than unnecessary to pay an additional cost for trunk and terminating segments together, when in our case the actual need is limited exclusively for terminating segments of leased lines. For these reasons, VIP operator emphasizes that the definition of separate prices for the two modeled services largely reflect the real situation of the market, enabling operators who use or lease these services from MKT have costs at a reasonable level in line with the real needs. Analogous to the fact that the prices that are offered in the draft reference model are significantly lower than the existing set prices in Wholesale MKT offer applicable to both segments together, these defined prices would greatly ease the operating costs of operators which in some cases are require to use only one of the two offered services, in circumstances where the replication of such infrastructure by the other alternative operators is significantly harder viable and causes additional costs especially in circumstances when it is evident the need for increased capacity among their own network elements, the result of growth subscriber base and realized traffic.

### **Section 1.5. modeled services**

Agency initially, explaining the way for defined services, subject to the regulation of this document, among other things, within the description set out in section 1.5 states that:

“The current reference offer for WLL rental does not determine the interconnection link for leased lines. The definition and handling of the interconnection between operators is described in detail in the initial report. New interconnection service will be defined by the AEC: Interconnection Circuit for Wholesale Leased Lines (ICWLL). This interconnection circuit will be used to transmit the traffic from WLL to PoP MakTel to OLO, and because of its nature, will be treated as terminating segments of leased lines. ICWLL fees are not calculated in this model. ”

**VIP operator asks** what is the reason to define the so-called ICWLL separately and outside the draft Referent document?

VIP operator is of the view that ICWLL should be an integral part of this document and should be covered under the proposed principle of future payment under defined and modeled prices for terminating segments of leased lines. Moreover, VIP operator indicates that it is necessary to distinguish this type of interconnection, respectively term interconnection that is used in this case, form the term "Interconnection" as defined in Article 4 point 23 of the ZEK.

### **Item 4.1. Wholesale leased lines**

In further analysis of the published draft Reference document, in accordance with current factual situation and the way in which VIP operator uses wholesale offers of MKT, for VIP operator as the

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essentially arose the question of how the set modeled prices would be implemented in the case of leased lines with one endpoint in the region of the capital, Skopje.

Namely, as stated under point 4.1, there are provided more locations PoP (point of presence - Point of Presence) for leased line of transmission network, according to the reference offer of MKT for leased lines, so when it comes to locations of MKT in Skopje, **VIP operator requires** clarification what is the reason the price that MKT would calculate to operator in addition to the fee for terminating segment, to include compensation for the trunk segment of leased line when the operator requires from MKT offer for relation that is on very small distance?

If the payment methodology would be based on this principle, the final cost would result in an amount which will be higher than MKT currently charged amount. This is primarily explain in next paragraf in point 4.1, according to which all lengths above 2 km would have to be included and the trunk segment:

"The true leased line service is offered by capacity and distance and the SMP operator can provide such data, and the model will assume that:

- leased lines up to 2 km will use the access network in one ODFA,
- leased lines up to 5 km will use the access network and transmission network between the ODF to the local exchange
- leased lines up to 15 km will use the access network and transmission network between the ODF to the local exchange and local portable rings,
- leased lines up to 50 km will use the access network and transmission network between the ODF to the local exchange and local portable rings. "

How is exposed this definition implies that for all terminating lines over 2 km in the calculation of the monthly fee would be included and trunk segment besides terminating. Because the trunk segment has the lowest limit of 50 kilometers, the new price calculated on the basis of the proposed modeled prices, would certainly result in a higher price than the current which is currently charged from MKT. In this case, given calculation for terminating segments for crossing distances of 3 km and 15 km becomes irrelevant, respectively for the example listed above, it implies that in addition to the compensation provided for terminating segment, for quite small distances would be included and compensation for trunk segments .

Additionally, **VIP operator** propose to Agency to make a clarification weather the proposed method of defining the prices based on these reference distances, implies that there can be no terminating leased line which is over 15 miles in length, that such leased lines in themselves will always contain and trunk segment.

As an example you can take the route in the region of Skopje with endpoint located in N.Lisice, which is necessary to connect to our central PoP on Bul. "Orce Nikolov" bb or leased line length of 7.5 kilometers. For VIP operator in this case remains unclear why it would not be used only terminating segment between these two points, versus projected in the draft reference document to use the terminating segment between our location in N.Lisice to PoP of MKT "Skopje N. Lisice Vidoe Smileski "and for connection to our central PoP on Bul." Orce Nikolov "bb will be used trunk segment. This is primarily for reasons then calculations show that the operator is obliged to pay a higher fee because in the price will be include and compensation for the trunk segment of leased line, and that the Agency has defined for lengths up to 50 kilometers as the smallest initial reference distance of which defined trunk segments of leased line prices.

Calculation of rental ranging from 2 Mbit:

**Total cost = marginal costs for circuit + leased line length \* cost for increasing of border length**

|

Case 1:

Total cost = 15 km expense circuit + 7.5km \* cost for increasing 15km =  
= 10.175 + 7.5 \* 154 = 11.330 MKD (cost for the terminating segment)

Case 2:

Cost for the terminating segment = 15 km expense circuit + 7.5km \* cost increasing 15km =  
10.175 + 7.5 \* 154 = 11.330 MKD

Cost for the trunk segment = 50 km expense circuit + 7.5km \* cost increasing 50km = 6.982 +  
7.5 \* 9 = 7,049.5 MKD

Total cost: Cost of the terminating segment + Cost of the Trunk segment = 11.330 MKD MKD  
+ 7,049.5 = 18,379.5 MKD

From this example, it can be seen that in the second case the result of the model, the prices which the operator should pay for a distance of only 7.5 km are more than 60% higher if the price including added fees for trunk segment of leased line.

On the basis of the above it, **VIP operator proposes** to Agency to revise i.e to supplement the published model in the proposed direction by VIP operator, guided primarily by the real situation and the setup of the network of MKT, with this model specifically for the region Skopje, where there are multiple points of presence of MKT that are close to each other would only covered fees which are specified to use the access network (terminating segment).

**VIP operator** also propose to Agency within the defined distances to establish new reference threshold of the trunk segment which would be ranging from 25 km in length, with an increase of 1 kilometer, by that it would give more detailed and more appropriate approach to regulation of these fees, or proposed changes of VIP by this section are as follows:

- Terminating segment

- o to 300 meters

- o 300 meters to 3 kilometers with an increase of 100 meters,

- o from 3 km to 15 km with an increase of 1 km.

- Trunk segment

- o from 25 km with an increase of 1 km,

- o to 50 km with an increase of 1 km,

- o from 50 to 200 km with an increase of 10 km.

Overall, VIP operator for the modeled prices which are proposed in section 5.2 considers that the same in all other cases except those referred to in the text above, allow payment of real and lower fees in relation to the currently defined MKT wholesale prices. These fees are acceptable and reflect the correct situation at the national level, when is necessary to perform MKT connecting points of

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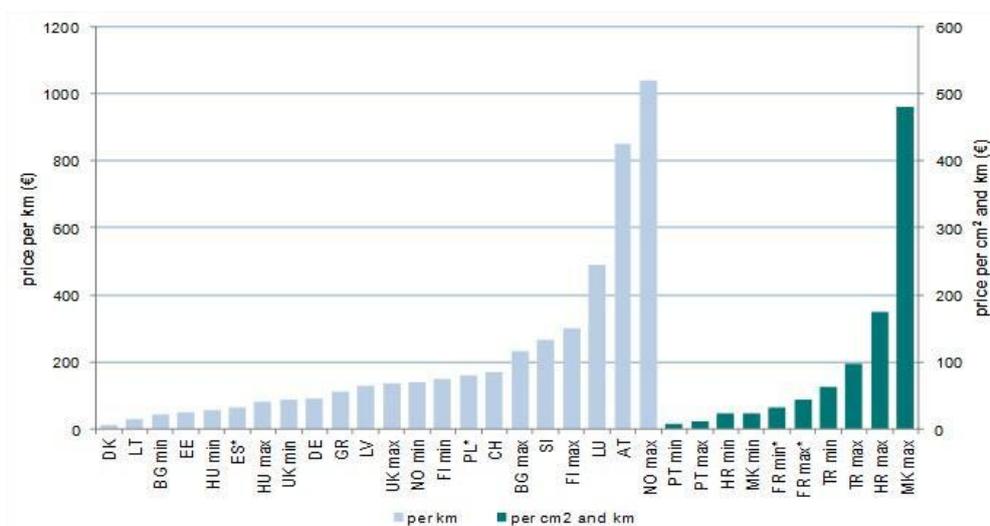
presence outside of Skopje. Based on the analysis and calculations by VIP operator, in accordance with the actual needs and costs being settled until now on a monthly basis with MKT derives the conclusion that these fees are more cost-efficient for longer distances, because the resulting compensation is significantly lower compared to that now pay for the same to the MKT. In terms of smaller distances, these prices are roughly the same with current.

Additionally, by a comparative analysis of the data available at Cullen International, we concluded that in all European countries there is a clear division, separate market for terminating and market for trunk segments. Even in these countries, the regulation of these markets and pricing operator with significant power is symptomatic and depends on many factors, primarily from restitute of network of operator with significant market power, the construction of networks of other alternative operators, etc. which entail different models of computation of these prices. Generally, in all European countries, there are separate defined price structures within that prices for terminating segments are significantly higher in terms of price for trunk segments, as is the case in of the Reference Model offered by Agency. However arise that this model is necessary to adequately remodels for small distances, as well as locations in the vicinity of Skopje in order to enable real reduction in current prices, which is the Agency's initial idea with the proposed model.

### **Renting of ducts**

#### *Comments:*

In addition to the published draft Reference document is done an analysis also for the rental of service ducts. Overall, the regulation of these prices in the EU is moving in two directions, and in some countries prices are regulated based on the length of the cable channel, or perform billing based on cable diameter expressed in millimeters and length in kilometers. However comparison with prices that are built and based on the second principle, showed that the existing MKT fees charged for this service are among one of the highest in terms of category prices are calculated according to the diameter of the pipe (in cm<sup>2</sup>) and length rented channel expressed in kilometers. The regulated access charges that MTC has stated in its reference offer for access, specifically for the monthly rental of cabling infrastructure for 40mm pipe after 1km, has made a comparative analysis based on published data from Cullen International as of the month June 2012 are quite high by an amount approximately equal to 500EUR. Cullen International's calculations according to which was obtained this review are made in order to get a unified view for different methods of calculation of these fees in different European countries.



It is obvious that the regulation proposed for the modeling of these prices within the Draft reference document or the results of the model, which leads to their reduction is more than necessary, so the level of these prices to be brought close to the fees applicable in the EU.

Additionally, we believe that with this way alternative operators would allow access to the cable infrastructure of the SMP operator under favorable conditions and fees which would roughly correspond to the actual costs, with shared use of this infrastructure, among other things, would also indirectly affect the creation better placed to establish appropriate optical infrastructure.

### Dark fiber rental

#### *Comments:*

By the way of determination the prices for dark fiber, where it is stated that they refer to the reference length of 1 kilometer, at first comes the question for the principle on which would be based cost that actually need to be paid in case the length of dark fiber segment is different from the integer times of the specified reference length. We believe **that it is necessary** to determine whether the charges for this service in case the length is for example

1.5 mile entail costs for the new start kilometer or costs shall be calculated as the product of the total listed real dark fiber segment length?

Further on the defined prices, VIP operator is on the view that the price is established for dark fiber feeder segment is illogical significantly higher than the stated price for the backhaul segment, we think that the regulation of the same should be in order to ensure proportionality and balance with prices previously published for cable channels, primarily because the offered capacity and further because of the way it was organized this service, which is used when there is no possibility to rent the cable channels. In other words, through a cable channel can be implemented more dark fibre terminating and / or feeder segments that price is an indication that it is illogical for a single dark fiber feeder segment is several times higher than the cost of renting a cable channel.

For these reasons, **we suggest** that the established model for recovery dark fibre appropriately be revised in accordance with the model set for duct rental.

Further VIP emphasizes that the implementation in practice always is made of two optical fibers to allow two-way transmission, thus causing considerable expense to account service operator for which actual costs for the establishment, maintenance and construction are far lower if we take into account the overall cost required for implementation of two optical fibers, compared with the implementation of a single fiber. The justification of this argument is aimed at providing greater economic efficiency and cost optimization, which is the ultimate brainchild of this model published by the Agency. Because of all this, **we propose** to perform additional pricing that will address two fibers as feeder and backhaul segment appropriately, that they would be slightly higher than the prices for single fiber.

Furthermore, given the chosen methodology and infrastructure network and the corresponding network segments as the basis for pricing of renting dark fiber, which is shown earlier under section 1.4 of the draft reference document, **VIP propose** to Agency to explain why despite prices that are defined for dark fibre feeder and backhaul segment is not included and terminating segment fibre feeder as a necessary part of the service?

VIP operator stressed that the model should include regulation for the price of terminating segment of dark fiber, in order to allow connectivity from one endpoint to another, and thus to preserve principle respectively the concept that with service dark fibre not provide service fiber itself but only infrastructure, which is not the case with the proposed draft reference model because under it to reach the end point will have to rent the infrastructure to service it (a leased line capacity).

In other words, according to the manner in which this service is initially presented in the draft reference model, we believe that it is incomplete and that is necessary to ensure technical promote and implementation between individual endpoints, based on the existing infrastructure with complement the model with terminating segment dark fibre. For these reasons **we suggest** replenishment of the model in this direction, with the included prices for terminating segments of dark fiber, thus further analysis would be carried out and appropriate review of existing model collection of dark fibre.

#### **AEK answers:**

##### ***Modelling of WLL interconnection link***

In order to fully adopt the WLL service to the actual needs of the market, AEC decided that to include additional service for capacity interconnection of two networks, specifically to be used with WLL service. Although the interconnection link may be implemented in three distinctive options (as explained in Inception report and Model referent paper). New service can be structured within the WLL referent offer and this will be decided in process of WLL referent offer change.

##### ***Distinction between trunk and terminating segment***

By definition of the WLL trunk segment given by AEC, it enables the establishment of transparent transmission capacity between two PoPs. If WLL is established without routing through one PoP to be delivered to other PoP, trunk segment costs are not associated. Although specified that maximum terminating segment can be 15kms, in reality terminating segment may be longer in length. Since modelled termination segment included capacity related costs and length related costs, the length

can be expanded without implication on the model. In those cases AEC concluded that the same algorithm will be applied as in shorter WLL terminating segments. AEC recognizes that transformation from existing WLL service structure to new one will require additional care because (i) the WLLs would potentially require different routing and (ii) new service is different from existing service provided. AEC recognises that some challenges may be on the way but considering the benefit new service structure would provide, they are not considered to prevent implementation. Each case that could lead to potential dispute will be handled on individual basis through existing regulatory processes.

#### ***Duct rental prices***

The results were calculated based on provided operator's information, not using benchmark methodology. The results represent the costs that reflect the actual costs to provide the service.

#### ***Dark fibre rental***

As stressed out in the documents published during this process, it is not the intention of AEC to perform NGA access regulation, rather to determine the costs for dark fibre service. As described, the dark fibre rental is a service that is offered only in case when there is no available duct in place. Therefore the service has specific demand characteristics and is not offered as primary solution. It is the view of AEC that operators do not require dark fibre positioned between distribution point and end customer, to connect e.g. the base stations. The results were calculated based on provided operator's information, not using benchmark methodology. The results represent the costs that reflect the actual costs to provide the service.

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Our Ref. \_\_\_\_\_  
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