Final Report for OPTA

(public version)

The business case for sub-loop unbundling in the Netherlands

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Annex A: Definition of MDF and MCL areas

0 Executive summary

This report summarises the findings of Analysys's investigation of the business case for providers using sub-loop unbundling (SLU) and/or wholesale broadband access (WBA) following the implementation of KPN's All-IP network and VDSL. It should be noted that much of our analysis is based on the assumption that providers have already deployed local-loop unbundling (LLU) and borne the associated start-up costs.

Whilst it has sometimes been necessary within the time constraints of the work, and based on the data available, to rely on estimated values in the course of our analysis, we have identified a number of conclusions about which we have a high level of confidence.

- Based on the current interconnect and wholesale offers from KPN, we have calculated that the use of SLU by an alternative provider is not economically viable as an alternative to continuing to use LLU, except under certain conditions. We estimate that a business case for SLU with similar economic viability to that of continuing use of LLU for 60% of the population would require both:
  - a market share greater than 55% of all broadband lines (including cable) in areas served
  - our highest estimate for incremental revenue (which assumes an increase in ARPU across all broadband users of EUR10 per month by 2016).

- For an alternative provider with a 10% market share of all broadband lines in areas served, we estimate that it may be economically viable to deploy SLU to around 1000 of the largest street cabinets in the dense urban areas, provided that:
  - the interconnect and wholesale tariffs from KPN for SLU line rental, co-location and links to the street cabinets are reduced significantly (we have tested 50%)

  - an increase in ARPU of around EUR9 per user per month can be achieved for the entire period (which we consider reasonable if business customers are targeted).

- The strong local economies of scale effects that are evident in deployment at the street cabinet level mean that even if such significant cuts of 50% in KPN's interconnect and wholesale tariffs were to be realised, the use of SLU would still not be economically viable as an alternative to LLU to reach the mass market, unless we assume for example:
  - a market share of 25%, together with our medium estimate for ARPU increase
  - a market share of 16%, together with our highest estimate for ARPU increase.

- The current offer from KPN for WBA is also unlikely to be economically viable as an alternative to continuing to use LLU to reach the mass market regardless of the market share, even with the highest estimate for ARPU increase.

- Should OPTA wish to influence the prices offered by KPN to make the SLU option more viable, the prices which affect the viability of an alternative operator's business plan the most are those for the line rental, SDF co-location and SDF–MDF link. Furthermore, our assessment of the cost of building a competitive network to provide backhaul to street cabinets indicates that unless very substantial revenue streams can be generated from services other than SLU backhaul, then it will not be possible for a third party to provide such backhaul at prices at the same level as, or below, the current offer from KPN.

- On the basis of our modelling, KPN's own estimate of costs of EUR1.5 billion to deploy its All-IP network does not appear unreasonable.

1 Introduction

1.1 Objectives of the study

Analysys has conducted a study on behalf of OPTA to investigate the business case for providers using sub-loop unbundling (SLU) and/or wholesale broadband access (WBA) following the implementation of KPN's All-IP network.

This report presents the methodology used in our study and our key findings. It includes:

- a review of the different options available to service providers
- an assessment of the business case for these providers under a number of different scenarios
- a high-level evaluation of the costs to KPN.

The report also includes an annex which provides more detailed information about MDF and MCL areas.

1.2 Market context

At March 2006, DSL accounted for just under 60% of broadband lines in the Netherlands, cable accounted for just over 39%, and fibre to the building (FTTB) accounted for around 1%. This is illustrated in Exhibit 1.1, below.

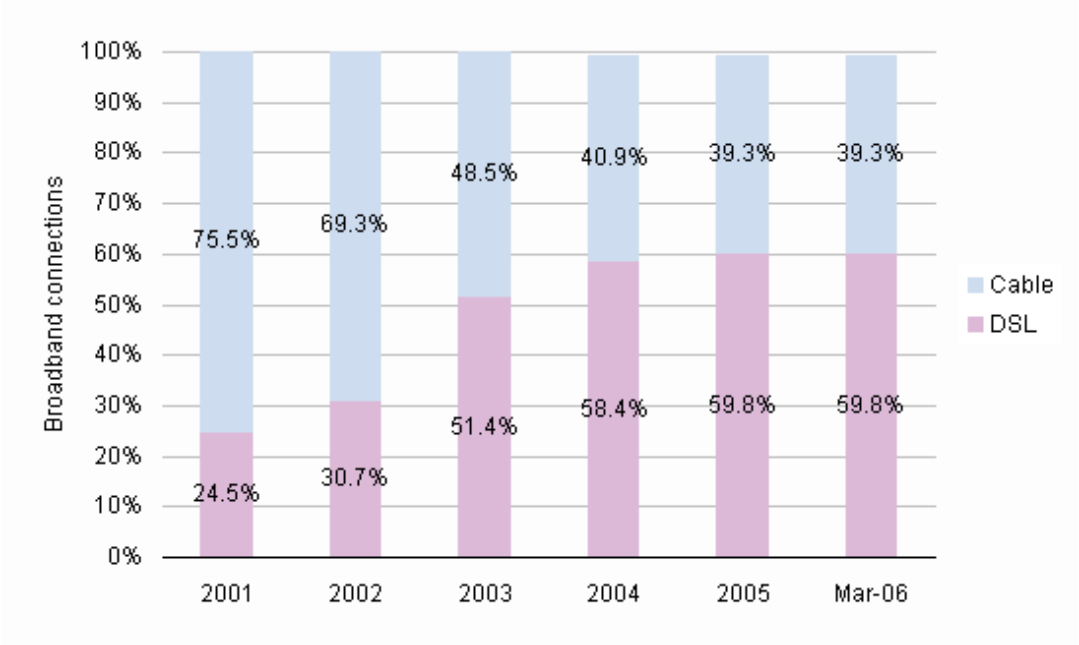

Exhibit 1.1: *DSL and cable-modem share of broadband connections in the Netherlands, 2001–March 2006 [Source: Analysys Research, 2006]*

Within the DSL market, KPN holds an approximate 80% market share since its acquisition of Tiscali. The three main alternative providers are BBned, which focuses on serving business customers and has a DSL market share of about 8%, Tele2/Versatel, which has a DSL market share of about 8%, and Orange/Wanadoo, which has a DSL market share of about 4%.[1] Currently, all these operators predominantly rely on LLU at the MDF to deliver service, and can each reach 50–70% of the population by this means.

1.3 KPN's All-IP network

KPN is currently in the process of implementing its next-generation network (NGN): All-IP. KPN's proposed network topology for All-IP is very different to its existing network.

1 All figures as of March 2006 (source: Analysys Research).

As part of this implementation, KPN is intending to dismantle the vast majority of its local exchanges and the main distribution frames (MDFs) contained within them. This is in comparison to other planned NGNs, such as BT's 21CN, which will keep its local exchanges. Between 130 and 200 of KPN's MDF locations will remain as 'metro core locations'; however, the main distribution frames will be removed in these instances. There are currently around 28 000 street cabinets, which we expect will decrease slightly as the All-IP network is deployed. There are currently also lines directly connected to each MDF, and we assume that many of these may be converted into street cabinets in future. The part of the local loop between the street cabinets (cable distribution boxes) and the metro core locations will be switched over to fibre. Exhibit 1.2, below, illustrates the changes to KPN's local loop following the implementation of All-IP.

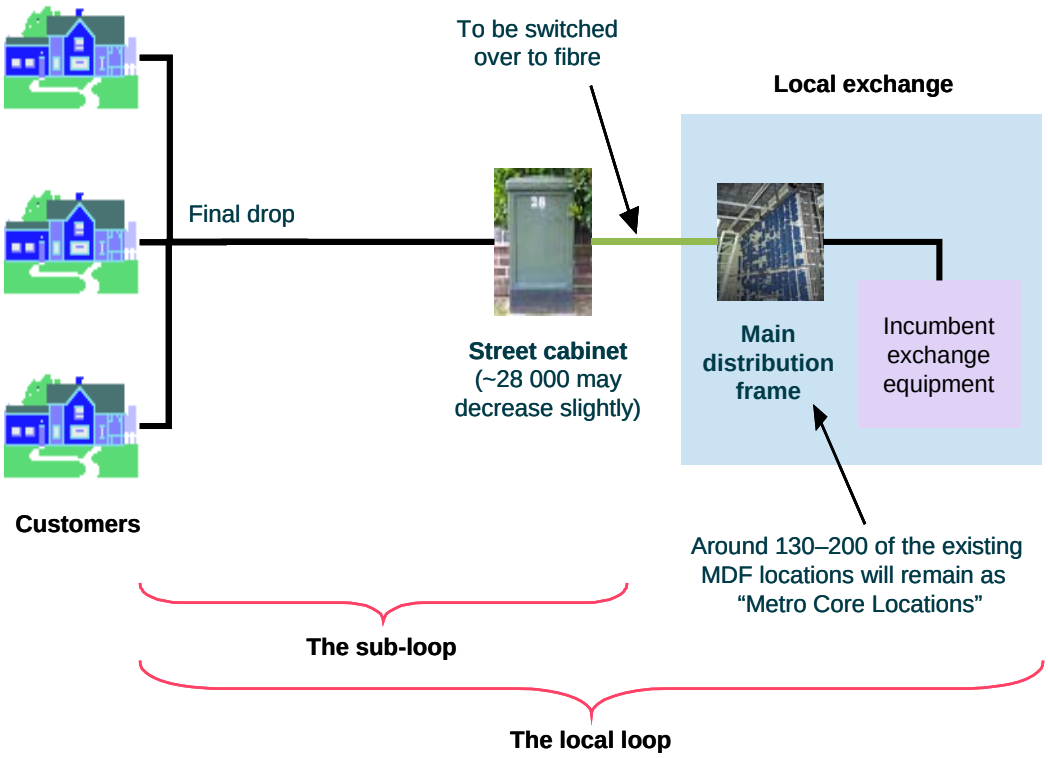

***Exhibit 1.2**: Impact on KPN's local loop following switch to All-IP [Source: Analysys]*

KPN has significant market power (SMP) in the relevant market for metallic paths, and OPTA has imposed a remedy which obliges KPN to offer unbundled access at the MDF level (local loop unbundling – LLU) and sub-loop levels (sub-loop unbundling – SLU).

However, DSL providers are currently only purchasing access at the MDF level. One result of KPN's move to All-IP is that it will be unable to continue offering its MDF access service.

Going forward, if there is no MDF access, alternative network operators would have no option other than to build their business on SLU and WBA.

2 Service delivery options for alternative providers

2.1 Introduction

We have considered a number of service delivery options for alternative providers, with respect to:

- services offered
- geographies covered
- use of SLU and WBA
- co-location options
- backhaul options.

Each of these is discussed in turn below.

2.2 Services offered

The services that an alternative provider chooses to offer will have an impact on the equipment that is deployed and the revenues that can be gained from customers. Using local loop unbundling and ADSL2+ it is feasible to provide voice services and broadband services of up to 25Mbit/s, although the speed of service that can be delivered varies according to the length of copper loop as illustrated in Exhibit 2.1, below. The longer the copper loop, the lower the data rates that can be delivered.

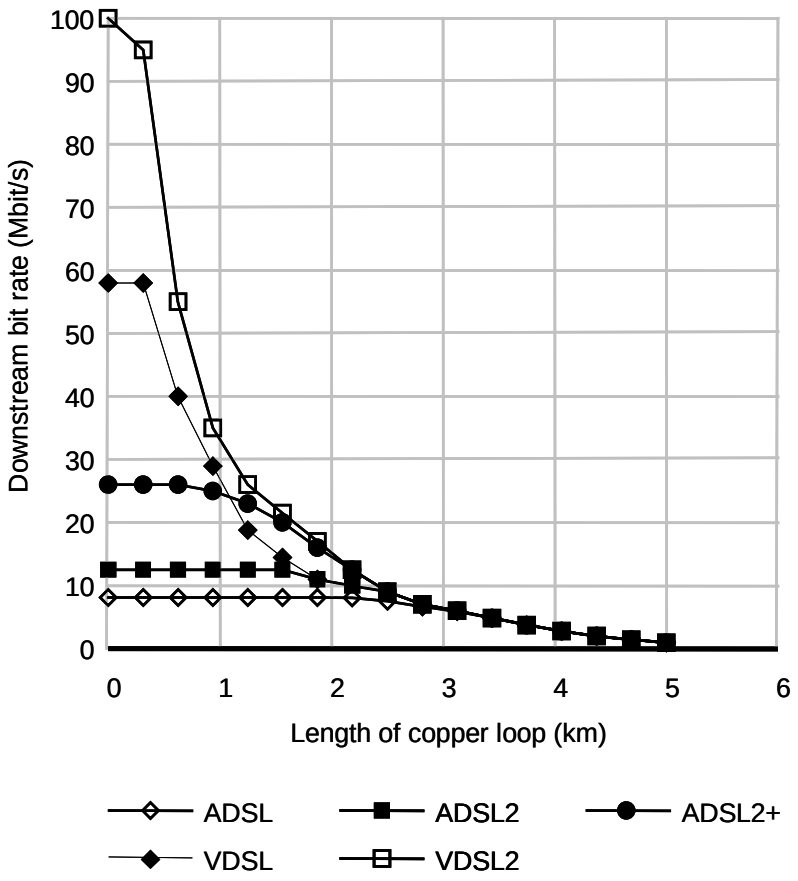

Exhibit 2.1:
Variations in xDSL data rates in Mbit/s versus line length [Source: Analysys Research, 2006]

The deployment of KPN's All-IP network and VDSL at the street cabinet will significantly reduce the length of copper loop required to reach customers and enable higher bandwidths of 50Mbit/s and above to be offered to many customers. This is likely to be attractive to business customers and will also assist providers to offer IPTV and video streaming services to the mass market.

Currently, the majority of alternative providers offer both voice and DSL services. It may already be possible to offer a triple-play service combining voice, broadband and TV services using ADSL2 technology, but once VDSL is available, this will increase the ease with which TV services may be offered. This opportunity to improve services to the mass market when VDSL becomes available is however limited by the widespread use of cable and satellite TV.

For business users, we do not expect demand for TV services, but the higher speed broadband services possible with VDSL are likely to prove attractive.

2.3 Geographies covered

Currently, alternative operators use LLU to deliver service to the majority of their broadband customers, and are typically able to reach 50–70% of the population by this means.

If alternative providers choose to rely on SLU, some of them consider that it may be feasible to 'cherry pick' individual street cabinets, but others think that this is unlikely to be practical since there is little variation in the number of lines per street cabinet.[2] The feasibility may, therefore, depend on whether the mass market or business customers are being targeted, since business lines may be more concentrated at particular street cabinets (i.e. those in business parks and town centres). The feasibility is also likely to depend on cheap backhaul being available to individual street cabinets.

2.4 Use of SLU and WBA

Currently, alternative providers rely almost exclusively on LLU rather than buying an end-to-end wholesale service from KPN. However, the impact of local economies of scale is more significant for SLU and it may be more economically attractive to use WBA rather than SLU outside of the most densely populated urban areas. Some possible strategies that alternative providers might choose include:

- WBA everywhere
- SLU in dense urban areas and no service offered elsewhere
- SLU in dense urban areas and WBA elsewhere
- SLU in large contiguous geographic blocks centred around urban areas and WBA elsewhere
- SLU only to large street cabinets and WBA elsewhere.

The options regarding how SLU is provided are discussed more fully below. For WBA, we have based the option on KPN's current proposal, which is structured as a per-line monthly

[2] Nearly 80% of cabinets have between 50 and 500 lines.

rental charge that varies slightly according to bandwidth required, plus a small one-off charge.

2.5 Co-location options if using SLU

The options for co-location at the street cabinet distribution frame (SDF) set out by KPN in its recent Reference Offer are as follows:

- build a second cabinet adjacent to KPN's
- co-locate with KPN's street cabinet.

2.5.1 Build a second cabinet

Alternative providers have the option of building their own street cabinet alongside KPN's cabinet to accommodate their equipment; it may also be possible for two or more alternative providers to share a second cabinet between them. We estimate that the cost of constructing such a cabinet would be around EUR10 000, but alternative providers may also face difficulties in acquiring planning permission with local councils that may prevent this option in some cases.

2.5.2 Co-locate with KPN's street cabinet

According to the current offer, the price that KPN will charge to co-locate at the street cabinet depends on

- the size of cabinet (type A, B or C) or whether it is an in-building cabinet (type D)
- the number of alternative providers wishing to co-locate at a particular cabinet.

The price charged is based on a standard space and does not depend on the volume of space required by an alternative provider. Therefore, it may be relevant to consider the impact of a co-location charge based on a per-rack price.

The prices for co-locating at A, B and C cabinets are all quite similar, and rely on an installation rate higher than our estimate of the cost of building a second cabinet. It may therefore also be relevant to consider in the model the impact of lower co-location prices more generally.

2.6 Backhaul options if using SLU

Alternative providers using LLU currently require backhaul from the MDF site to the core network. If they migrate to SLU following the deployment of KPN's All-IP network then they will need to extend this backhaul to the SDF site.

2.6.1 MDF–core network links

Currently, the use of leased backhaul from a third party to provide the link from an MDF to an alternative operator's core network is widespread. For the purposes of our analysis, it is therefore assumed that MDF – core network links rely on the lease of dark fibre from a third-party provider.

2.6.2 SDF–MDF links

Although it is not necessary for the backhaul from the SDF to pass through the current MDF, for ease of modelling we have considered the street cabinets in clusters based on the MDF to which they are currently attached. KPN's current proposed offer for links to the SDF is also based on delivering a link to the old MDF site.

We have considered three options for alternative providers to link the SDF to the MDF site:

- own build
- lease dark fibre from a third-party provider
- lease dark fibre from KPN.

We have considered the third option, to lease dark fibre from KPN, on the basis of the current proposal from KPN. This offers a point-to-point connection between each SDF and the old MDF site based on a fixed fee plus a per-metre charge. The price is the same regardless of the number of street cabinets to which the alternative provider wishes to connect, whereas we expect that the cost per street cabinet would be significantly lower for the other two options if more street cabinets are served.

3 Model methodology

In order to assess the business case for SLU and WBA, we have developed a cashflow model which calculates the incremental costs and revenues of these approaches compared to continuing to use an LLU solution. In this section, we describe the methodology adopted in our modelling.

3.1 Model overview

We have developed a cashflow model that considers the incremental costs and revenues faced by an alternative provider over a ten-year period, assuming that it invests in either SLU or WBA rather than continuing to use an existing LLU solution that it has already invested in.

The diagram below illustrates the calculation flow used in the model.

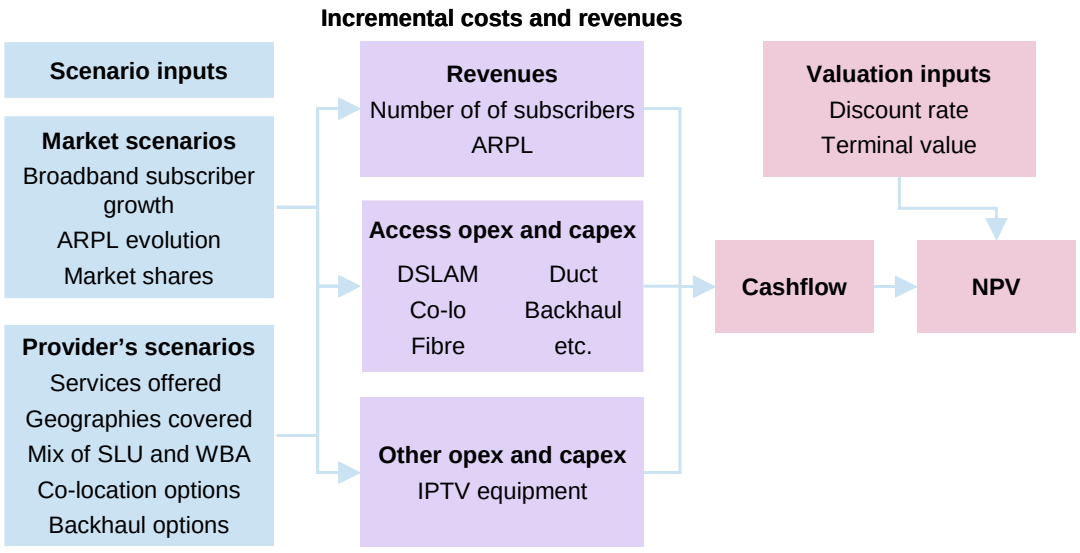

Exhibit 3.1: *Overview of model methodology [Source: Analysys]*

The model contains a number of inputs which can be modified by the user to test specific scenarios. We list below the major inputs that can be changed:

Market scenarios

- Total Dutch broadband subscribers: three options are available, based on low, medium and high forecasts for the number of broadband subscribers in the Netherlands over the next ten years.

- Average revenue per line (ARPL) increase in the future compared to current levels: three options are available (High, Medium, Zero).

- Market shares: the user can enter the market share in 2007 and 2016 for the areas which the alternative operator is serving. The model assumes a linear interpolation between these two dates.

Provider's scenarios

- Services offered: the three options considered for the alternative provider are broadband Internet, voice and broadband Internet, and IPTV, voice and broadband Internet.

- Geographies covered: the user can select which areas and which street cabinets are served by SLU, and if not whether WBA will be used instead or whether no service will be offered.

- Co-location options: the user can select whether the alternative provider builds its own cabinets or rents space from KPN. In the case of the former, it is also possible to vary the number of other operators sharing the cost of building new cabinets; in the latter case, it is possible to vary the number of other operators co-locating with KPN.

- Backhaul options: three options are available, either 'Build own' in which the alternative provider builds a complete network, 'Rent from third party' in which

transport from the cabinet to the core network is purchased from a third party, or 'Rent from KPN' in which dark fibre SDF–MDF backhaul is purchased from KPN and MDF–MCL backhaul purchased from a third party.

Network design algorithms are used to calculate the number of assets required in the network based on these scenarios. Total costs are calculated by multiplying unit costs together with the number of each asset required.

Incremental revenue in each year is calculated by multiplying the average number of subscribers that year by the incremental ARPL in that same year.

In addition to calculating the in-year incremental cashflows over the ten-year period, the model also calculates a net present value (NPV) on the basis of a discount rate equivalent to KPN's current regulated weighted average cost of capital (WACC) (9.21% nominal). It also includes a terminal value which is calculated based on a simple multiplier of the final year cashflows and, for assets with a short lifetime such as DSLAMs and other electronics, an annualised replacement cost.

Results are presented either as the total cashflows included in the model, or as the incremental costs and revenues relative to LLU.

3.2 Data sources

As part of our study, we interviewed KPN, BBned, Versatel, Orange and Eurofiber in order to gain information to support our analysis. In addition, we relied on a number of other data sources:

- KPN's Reference Offer
- data from OPTA concerning the distribution of lines at street cabinets and MDFs
- third-party demand forecasts
- economic data from EIU
- Analysys's internal estimates for technical parameters and unit costs.

3.3 Approach to modelling geographic coverage

We have categorised MDFs into 15 different geotypes in order to evaluate the impact of cherry-picking only the most densely populated exchanges. Separately, we have categorised MCL regions according to five geotypes in order to evaluate the impact of deploying infrastructure to whole MCL areas. These are much larger than individual MDF areas and therefore of necessity require deployment to a mixture of densely populated and less densely populated areas. However, there are certain economies of build that can be achieved by deploying to larger contiguous areas.

The size of typical MCL and MDF areas is illustrated in Exhibit 3.2, below. Annex A discusses how we determined the MCL and MDF areas.

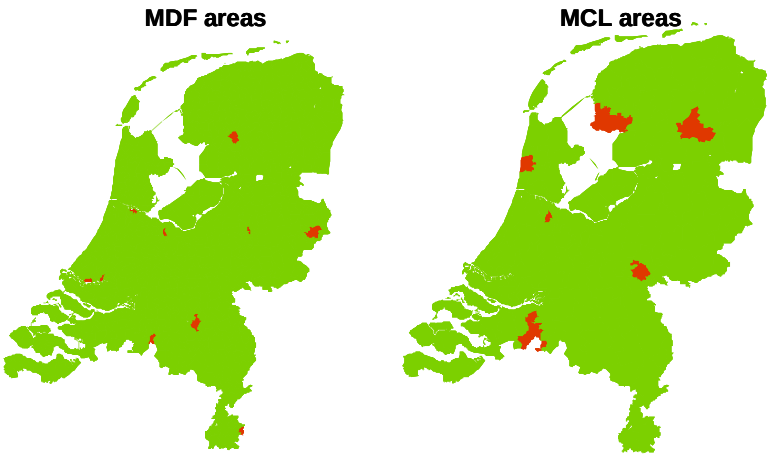

Exhibit 3.2:
Illustration of individual MDF and MCL areas
[Source: Analysys]

The proportion of lines within each geotype is illustrated below:

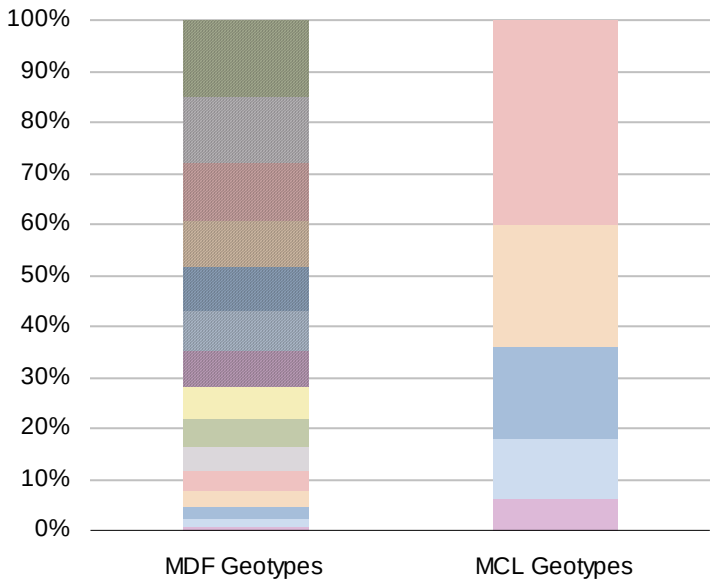

Exhibit 3.3: *Percentage of total lines in each geotype [Source: Analysys]*

Within each area we have also considered the number of street cabinets of A, B, C and D classification (D are in-building cabinets). We assume that any changes KPN may make to the number of street cabinets in future will not affect the relative mix of these cabinets.

The model is flexible enough to take into account, within an MCL area, a strategy that serves either large only (category C) street cabinets, large and medium (category C and B) street cabinets or all street cabinets. This allows us to test the impact of a scenario in which an alternative provider opts to build out only to the largest street cabinets.

3.4 Demand

We have developed three separate forecasts to predict total broadband numbers in the Netherlands over the ten-year period, based on data from three different third-party reports. In the base case scenario, we use the Medium forecast. These forecasts are illustrated below:

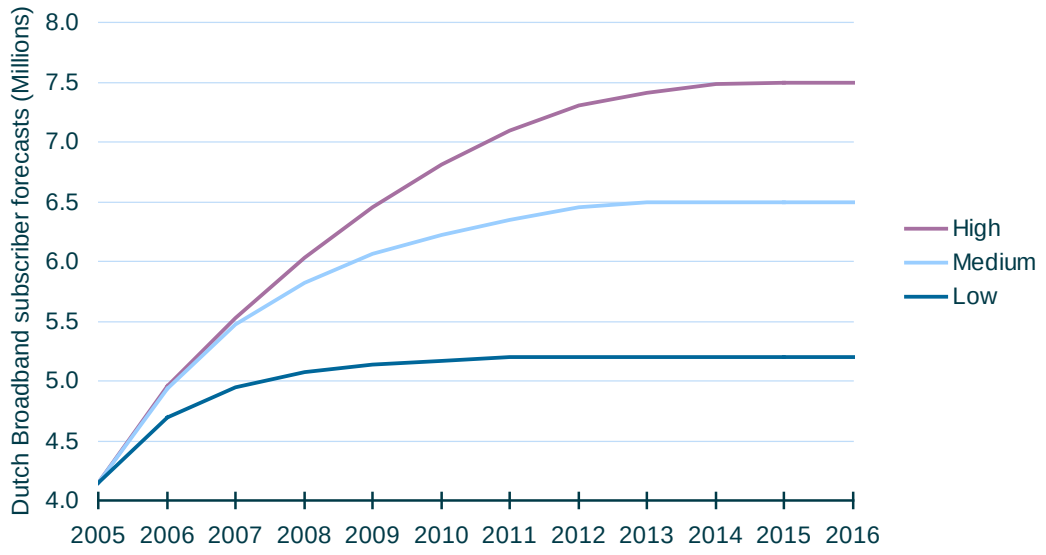

Exhibit 3.4: *Dutch broadband forecasts [Source: Analysys Research, JP Morgan, Informa]*

In addition, the EIU predicts that the population of the Netherlands will increase by an average of 0.5% per annum over the period which we are modelling. We have therefore assumed that the total number of lines and cabinets will increase by 0.5% each year.

In our base case, we have assumed that the modelled operator has a 10% market share in the areas in which it is rolling out. As the operator is only rolling out to roughly 60% of the country, the market share over the whole country is approximately 6%. This market share is based on a fraction of total broadband subscribers and accounts for a market share being taken also by operators using cable or FTTH.

3.5 Network costs

In this section, we discuss the network costs associated with each of the service delivery options. For all options we have excluded the cost of the core network. However, in each case, the access costs are based on the assumption that the core network extends to around 150 points of presence, which allows us to make a like-for-like comparison between the different service delivery options. Such a core network is equivalent to having a point of

presence at each of the proposed MCL, and is a similarly extensive network to that which would be required to offer WBA using 'local' access.

3.5.1 LLU

The network architecture modelled for LLU is illustrated below. It includes rental of local loops from KPN, co-location space and associated services, equipment installed at the MDF site and backhaul to the core network.

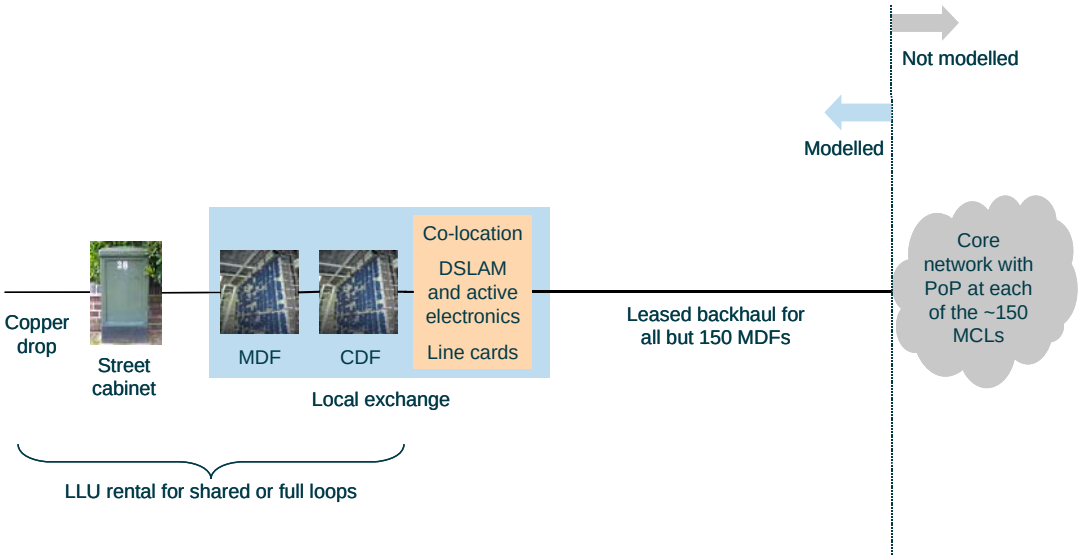

Exhibit 3.5: *Network architecture modelled for LLU [Source: Analysys]*

- Current full and shared LLU set-up, line rental, and disconnection charges from the KPN co-location offer 2004 have been placed in the model. The charges are reduced at the appropriate rate over the next two years and then assumed to remain constant in nominal terms.

- We have made use of Analysys's estimates for the cost of DSLAMs and line cards and predict a reduction in cost of 2% each year. The annual maintenance of these electronics is estimated to be 15% of the initial capex.

- MDF co-location recurring and non-recurring charges stated in the KPN co-location offer 2004 are applied in the model. These charges are not assumed to reduce over time.

- Data given to us by operators has been used to estimate the cost of transport from the MDF to the core network of a typical alternative operator. This includes a non recurring charge per MDF and a monthly rental per MDF. Neither charge is assumed to change over time.

3.5.2 WBA

The network architecture modelled for WBA is illustrated below. It includes only line rental from KPN and incremental equipment that may be needed in the core network to offer video services.

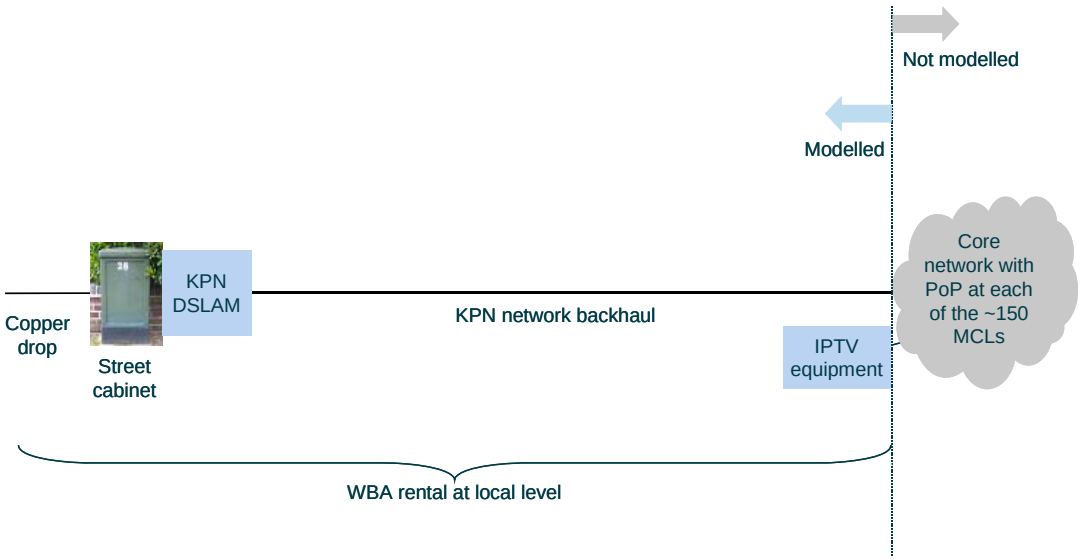

Exhibit 3.6: *Network architecture modelled for WBA [Source: Analysys]*

The source of WBA line rental and disconnection prices is the Tariff Wholesale Broadband Access Reference Offer made by KPN on 21 November 2006. The line rental includes:

- a network access tariff (shared or full)
- an access speed tariff (Ethernet 8–20Mbits/s is used in the model)
- transport tariff (local, medium is used in the model).

The source for incremental core network costs needed to provide IPTV was Analysys Research.

3.5.3 SLU at the MDF level

We have modelled two possible network architectures for the deployment of SLU on an MDF-by-MDF area basis, depending on whether the SDF–MDF links are built by the alternative provider or a third party; or are leased from KPN.

SLU at the MDF level using new build for SDF–MDF links

If there is a new build for SDF–MDF links, either by the alternative provider or by a wholesaler on its behalf, then we assume the network architecture illustrated below. It includes rental of sub-loops from KPN, either co-location space and associated services or self-build of a street cabinet, equipment installed at the SDF site, a ring between the street cabinets, and backhaul to the core network. It also includes incremental equipment that may be needed in the core network to offer video services.

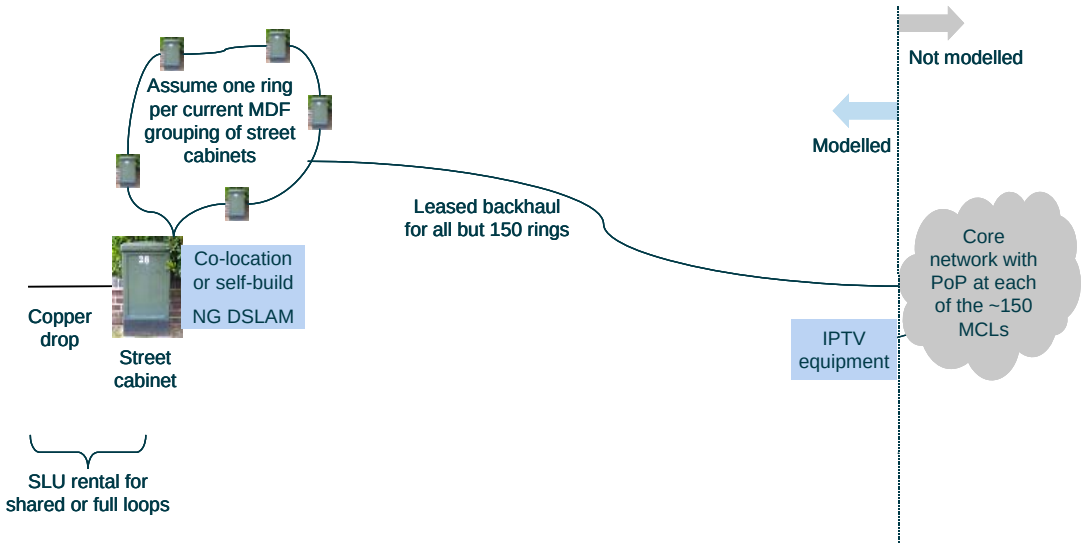

Exhibit 3.7: *Network architecture modelled for SLU at MDF using new build for SDF–MDF links [Source: Analysys]*

When the operator is building its own SDF–MDF link, we have assumed prices of EUR50 per metre, which is in line with OPTA's estimates. The cost of buying fibre and reusing existing duct are Analysys's estimates. We have assumed that these prices do not change over time and that yearly maintenance costs represent 2% of initial capex.

The cost of transport from the MDF to the core network of the operator is calculated in the same way as for LLU.

Charges for SLU line rental and co-location have been taken from the KPN document 'SDF Access services – tariff schedule'. We have assumed that the line rental prices decrease at the same rate as LLU line rental prices.

SDF equipment such as NGDSLAMs and battery support prices and price trends are Analysys's estimates.

The costs of building cabinets has come from many sources, including interviews with the alternative operators and Analysys's estimates. The cost of building and maintaining cabinets does not change over time.

The source for incremental core network costs needed to provide IPTV is the same as for WBA i.e. Analysys Research.

SLU at the MDF level using KPN for SDF–MDF links

If the alternative provider relies on KPN for the SDF–MDF links, then we assume a similar network architecture, as illustrated below. However, rather than the use of a ring between the street cabinets, the model assumes purchase of point-to point links from each SDF to the old MDF site purchased from KPN. Again, it includes incremental equipment that may be needed in the core network to offer video services.

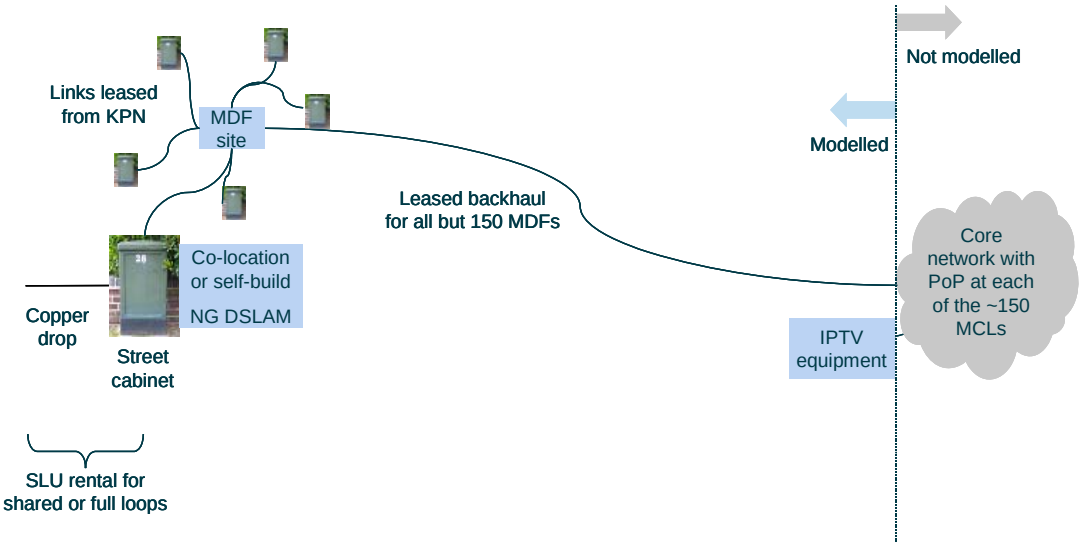

Exhibit 3.8: *Network architecture modelled for SLU at MDF using KPN for SDF–MDF links [Source: Analysys]*

When renting the SDF–MDF link from KPN, we have used prices stated in the KPN document 'SDF Backhaul Dark Fiber List prices'. We have assumed that these prices do not change over time.

All other unit costs are the same as in 'SLU at the MDF level using new build for SDF–MDF links' (see above).

3.5.4 SLU at the MCL level

We have also modelled two possible network architectures for the deployment of SLU on an MCL-by-MCL area basis, again depending on whether the SDF–MDF links are built by the alternative provider or a third party, or are leased from KPN.

SLU at the MCL level using new build for SDF–MDF links

If there is a new build for SDF–MDF links, either by the alternative provider or by a wholesaler on its behalf, then we assume a similar network architecture as for MDF level deployment. However, since adjacent MDF areas within the MCL area are all covered then we assume that rather than continue to lease backhaul separately from each MDF area, it will be more efficient to link the individual rings together.

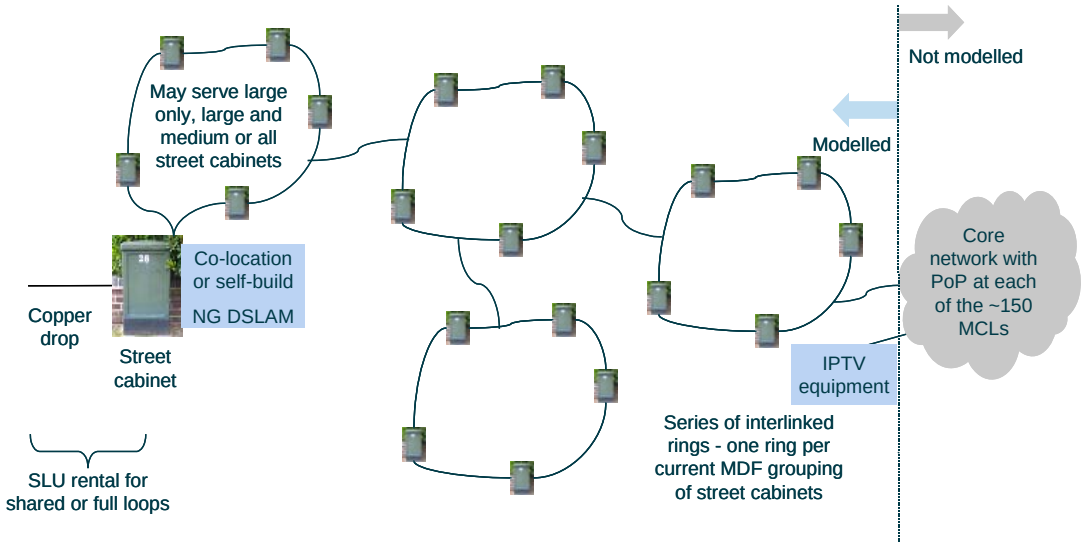

Exhibit 3.9: *Network architecture modelled for SLU at MCL using new build for SDF–MDF links [Source: Analysys]*

The length of ring is calculated using a mathematical algorithm driven by the number of cabinets and area of each geotype. Each ring created has a small link which connects the ring to the core network, negating the need to rent an MDF–MCL link. The length of this link is calculated based on the cabinet density with each particular geotype. The ring

circumference and link length are added together to find the total distance that needs to be built.

We have again relied on a EUR50 per metre price for digging and installing duct.

All other unit costs are the same as in 'SLU at the MDF level using new build for SDF–MDF links' (see above).

SLU at the MCL level using KPN for SDF–MDF links

If the alternative provider relies on KPN for the SDF–MDF links, then we assume a similar network architecture, as illustrated below. Rather than using a ring between the street cabinets, it assumes purchase of point-to point links from each SDF to the old MDF site purchased from KPN. This means that it is necessary to lease backhaul separately from each MDF area to the core network.

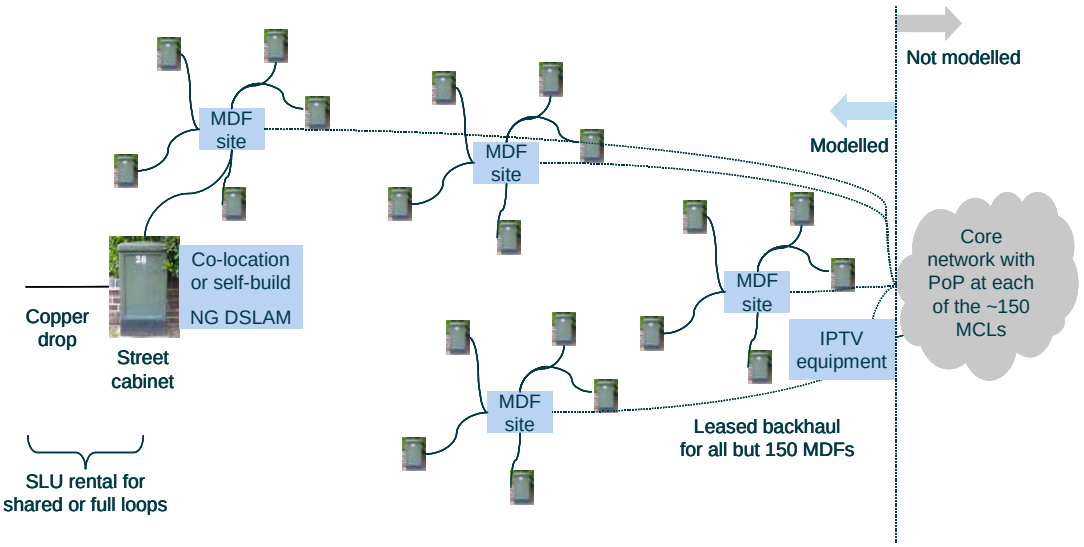

Exhibit 3.10: *Network architecture modelled for SLU at MDF using KPN for SDF–MDF links [Source: Analysys]*

The unit costs for 'SLU at the MDF level using KPN for SDF–MDF links' are the same as for 'SLU at the MDF level using KPN for SDF–MDF links'.

3.5.5 Summary

The table below summarises the network costs that are included for each of the options discussed above, and also indicates how these are categorised within the model.

Category	*LLU*	*WBA*	*SLU (MDF level)*	*SLU (MCL level)*
Line rental (incl. connection and disconnection)	LLU line rental	WBA line rental	SLU line rental	SLU line rental
SDF equipment	-	-	Equipment installed at the street cabinet	Equipment installed at the street cabinet
SDF–MDF link	-	-	Ring linking street cabinets or KPN backhaul to MDF	Ring linking street cabinets or KPN backhaul to MDF
MDF equipment	Equipment installed at the MDF	-	-	-
Co-location	Co-location at the MDF	-	Co-location at the SDF (including possible self-build)	Co-location at the SDF (including possible self-build)
MDF–MCL link	Link from MDF to core network	-	Link from each MDF area	Links between each ring or link from each MDF area if buying KPN backhaul
Core network	-	Incremental video equipment	Incremental video equipment	Incremental video equipment

Exhibit 3.11: *Summary of network costs modelled [Source: Analysys]*

3.6 Revenues

The model considers only incremental revenues generated by new services, in addition to those that would be gained from offering services using LLU. They arise from increased broadband speeds and from the possibility of offering IPTV services.

The amount of incremental revenues that might be generated is highly debatable and we have therefore developed three alternative forecasts as illustrated below. In the base case,

we use the medium forecast, which assumes an average increase in monthly ARPL of EUR5 in nominal terms by 2015.

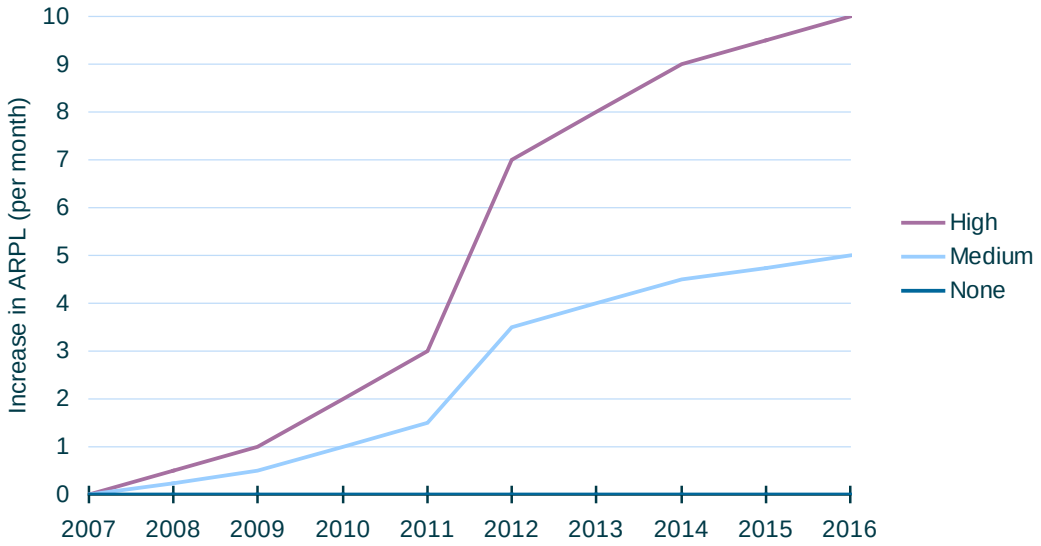

Exhibit 3.12: *Different estimates for increases in ARPL in the Netherlands [Source: Analysys's estimate]*

4 Results from the model

4.1 The business case for alternative providers

4.1.1 Introduction

We have evaluated a number of different business cases for alternative providers to use SLU or WBA. For each case we present costs and revenues compared to a situation in which operators are already providing local loop access and have already invested in the up-front costs associated with this.

We first present a high-level assessment for the relative cost of serving customers in different parts of the Netherlands under a number of different assumptions. We then go on to present results for a series of possible strategies that an alternative provider might follow:

- wide-scale deployment of services to the mass market
- targeted use of SLU in densely populated areas to serve the mass market
- targeted use of SLU for the largest street cabinets to serve the mass market
- targeted use of SLU to serve selected business customers.

In each case, we assume that coverage is around 60%, equivalent to a current typical roll-out of LLU.

4.1.2 High-level assessment

Base case

For the base case scenario, we have selected the following inputs:

- the modelled operator is planning to offer IPTV, voice and broadband services
- both the total Dutch broadband subscribers and ARPL increase over present levels have been set to 'Medium'
- the total number of street cabinets in the Netherlands decreases from 28 000 to 24 000 as the All-IP network is rolled out
- a 10% share of the broadband market in the areas of the Netherlands where the operator is rolling out its services.
- SDF–MDF link is rented from KPN
- the modelled operator is co-located with KPN at each cabinet.

The chart below shows, for the base case, how total costs vary depending on which strategy an operator adopts. The modelled costs for LLU are included for comparison.

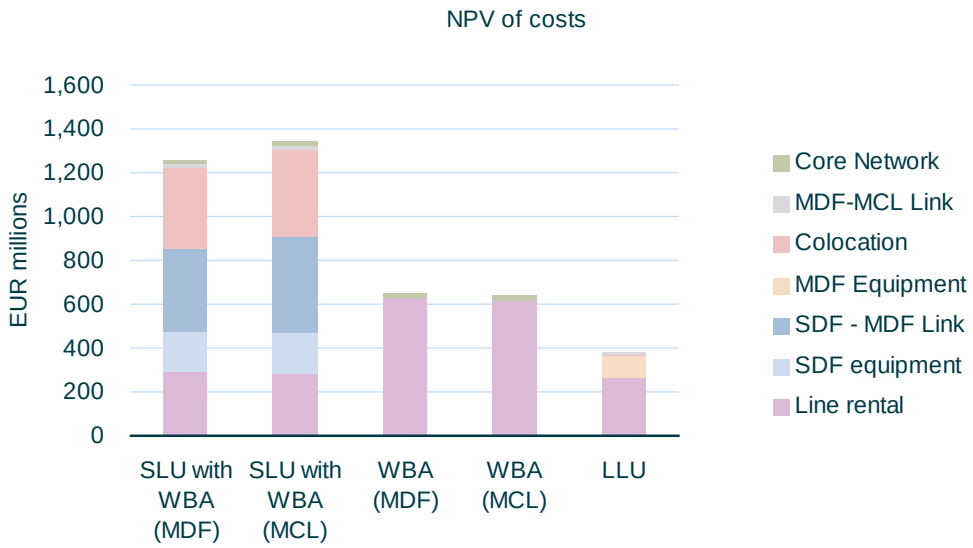

Exhibit 4.1: *NPV cost stacks for different scenarios using inputs from the defined base case, when 60% of the lines with the highest density are covered [Source: Analysys]*

The total costs are broken down into different categories:

- core network – this includes only incremental costs needed in the core network to enable the operator to offer IPTV services
- MDF–MCL link – this includes charges relating to leased backhaul, purchased from a third party, which connects the MDF to a MCL at which the operator is assumed to have a point of presence (PoP)
- co-location – this includes both recurring and non-recurring charges for co-location at the MDF level for LLU and the SDF level for SLU. The cost of building your own cabinets is also included in this section
- MDF equipment – this includes the cost of DSLAMs and line cards for LLU
- SDF–MDF link – this includes charges for transport between the street cabinet and MDF site
- SDF equipment – this includes the cost of NGDSLAMs and line cards installed in the cabinets for SLU
- line rental – this includes disconnection, connection and line rental charges for LLU, SLU and WBA.

It can be seen that LLU is a significantly cheaper option than either WBA or SLU. However, it should be noted that the LLU costs represent only the ongoing costs of leasing and maintaining services, since we assume that the network is already deployed. WBA is, in turn, significantly cheaper than SLU, suggesting that it will not be economically viable to deploy SLU as extensively as LLU is currently deployed.

We have also considered how the cost per subscriber varies across the different geotypes. Exhibit 4.2 below indicates the average annual cost per subscriber for each service delivery option by geotype, with the geotypes ordered by line density. It should be noted that line density does not necessarily equate to lowest cost, therefore the lines shown on the chart for some service delivery options move up and down as density changes.

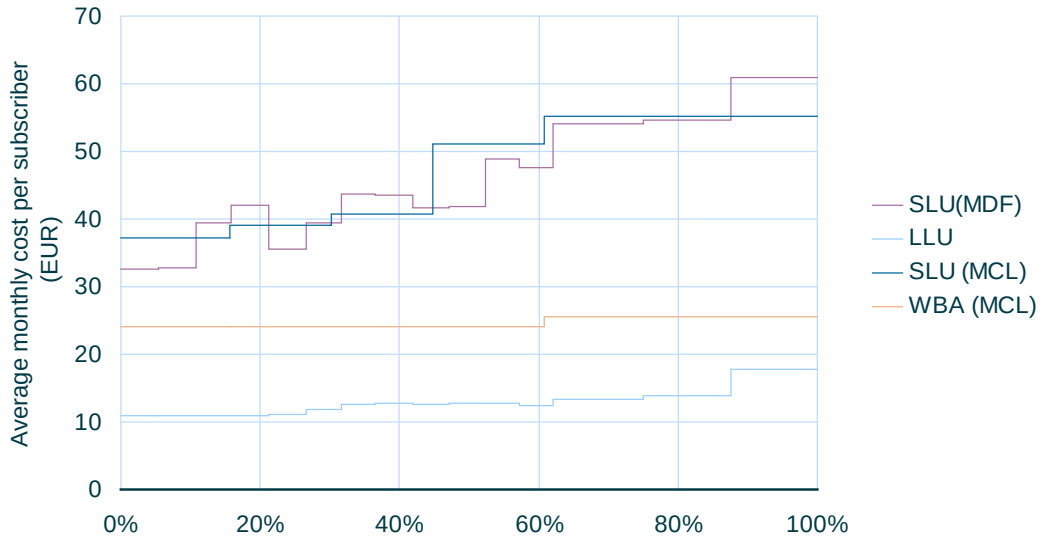

Exhibit 4.2: *Average monthly cost per subscriber as line density decreases for the base case scenario [Source: Analysys]*

The cost of SLU per subscriber, at both the MDF and MCL levels, increases as the operator rolls out to the more sparse areas of the country. This is because in rural areas there are fewer lines per cabinet, leading to increased co-location and SDF equipment costs per subscriber. The average distance between cabinets and MDFs also increases significantly in more rural areas, leading to a greater cost of buying the SDF to MDF point-to-point fibre from KPN.

Similarly, LLU costs per subscriber increase in more rural areas, again due to there being fewer lines per MDF in these areas, leading to increased co-location and MDF equipment costs per subscriber.

WBA services also cost slightly more per subscriber in more rural areas. This is due to KPN levying an ‘Area B’ surcharge of EUR1.50 per customer per month for line rental to these more rural areas.

The difference between the LLU line and the line for other options provides an indication of the annual incremental revenue that it would be necessary to recover from each customer in order to cover the incremental costs. For example, if you look at WBA (MCL)

on Exhibit 4.2, the revenue needed to cover costs to use WBA services rather than LLU to the 60% of the Netherlands with the highest line density is approximately an additional EUR13 per subscriber per month.

Increased market share

The second scenario contains the same inputs as the base case, except that the modelled operator has a 20% share of the total broadband market in the Netherlands.

Exhibit 4.3 below is similar to Exhibit 4.2. The cost per subscriber of WBA does not depend on the market share, and therefore does not change. However, SLU has reduced in cost by approximately EUR9 per subscriber in the areas with the highest line density as market share has increased from 10% to 20%. This occurs because the infrastructure (co-location and the SDF–MDF link) needed to cover a particular area is the same, meaning that there are no added costs due to the extra number of subscribers. There are only small additional costs due to increased SDF equipment and line rental required, hence the average cost per subscriber is reduced.

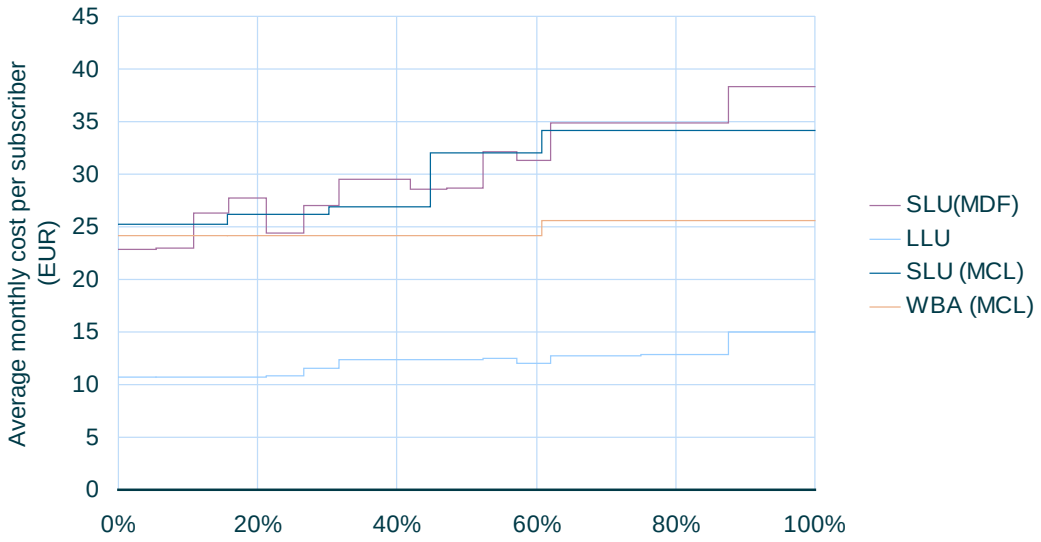

Exhibit 4.3: *Average monthly cost per subscriber as line density decreases for an operator with a 20% market share [Source: Analysys]*

The cost of LLU also decreases, again because there are no additional co-location costs for the additional subscribers, but as there are many fewer MDFs compared to street cabinets the change is not as dramatic.

Even when the operator has a market share of 20%, the WBA and SLU costs are far above current LLU costs. However, as market share increases, SLU costs become closer to their WBA equivalent, and SLU (MCL) is actually more economically viable than WBA for the 10% of the population with the highest line density.

We have also assessed the minimum market share required to make SLU as economically viable as LLU for approximately 60% of the population already served by LLU. We estimate that a market share of 59% would be required, even if we rely on our highest estimate for incremental revenue (which assumes an increase in ARPU across all broadband users of EUR10 per month by 2016).

Exclusion of one-off charges from KPN

The third scenario contains the same inputs as the base case with the exception that all of KPN's one-off SLU charges have been excluded. This includes charges for the SDF–MDF link, line rental and co-location. No WBA or LLU costs have been changed, so their values are the same as in the base case scenario.

The results are shown below:

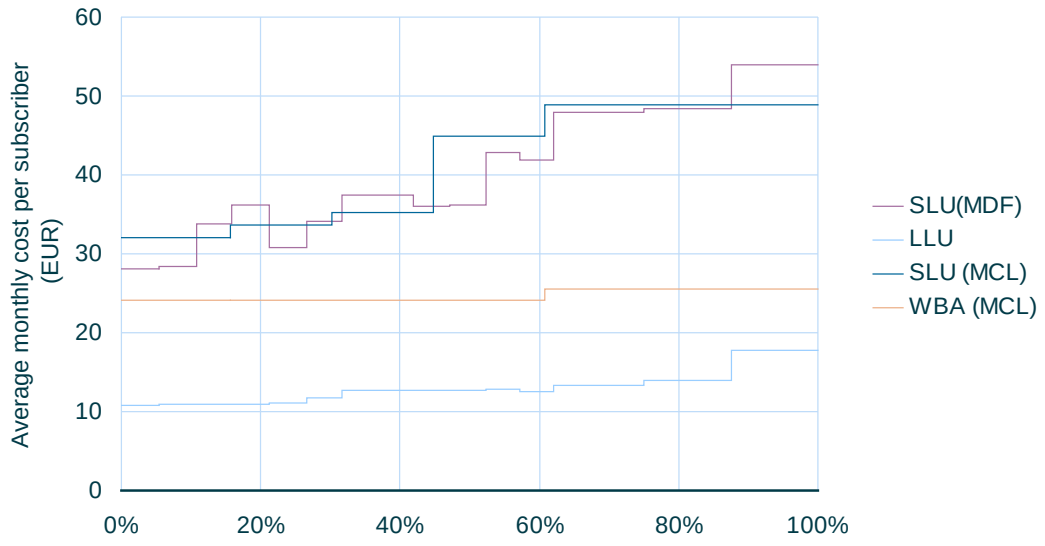

Exhibit 4.4: *Average monthly cost per subscriber, excluding KPN's one-off charges, as line density decreases [Source: Analysys]*

SLU costs per subscriber have decreased in each region by approximately EUR5 per subscriber, however, in all areas WBA is more economical than SLU. For higher market shares the difference in costs between WBA and SLU, and between LLU and SLU, would be reduced even further. However, the SLU and WBA solutions remain significantly more costly than continuing with an existing LLU solution.

New-build solution for the SDF–MDF links

The fourth scenario contains the same inputs as the base case, with the exception that we have assumed the SDF–MDF link is rented from a third party and not from KPN. We have based the price for this link on the basis that the build cost, plus a cost of capital of 12%, plus a gross margin of 30%, should be recovered by the third party over a ten-year period. However, we assume that the third party will be able to lease the links to two different alternative providers so that the costs are shared.

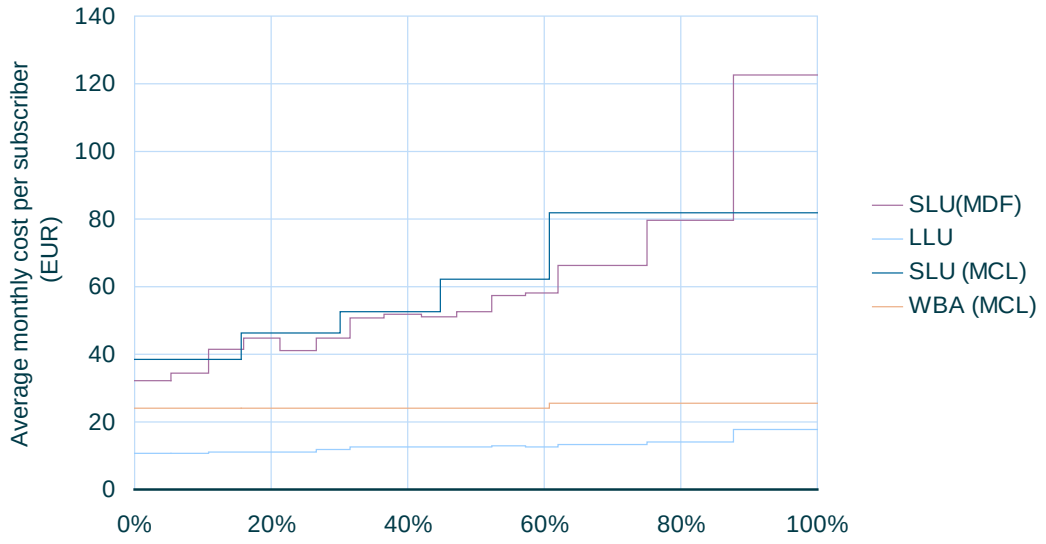

Exhibit 4.5: *Average monthly cost per subscriber as line density decreases when a third party provides the SDF–MDF link [Source: Analysys]*

It can be seen that the cost for SLU is similar in the areas of highest line density, but increases very quickly as line density falls. This indicates that the solution of leasing from a third party is more expensive than the current offer from KPN, which is unsurprising, given the duplication of infrastructure and reduced economies of scale involved. The impact is even more significant if the alternative provider builds its own dedicated network for the SDF–MDF links.

We therefore conclude that unless very substantial revenue streams can be generated from services other than SLU backhaul, then it will not be possible for a third party to provide such backhaul at prices at the same level as, or below, the current offer from KPN.

Reduction in prices offered by KPN

The penultimate scenario in this section contains the same inputs as the base case except that all the SLU regulated prices (including line rental) have been halved and the prices listed in KPN's SDF–MDF backhaul Reference Offer have also been halved.

Even with a large reduction in prices for these services, SLU is still over EUR8 per subscriber per month more expensive than LLU, even in the most dense areas, due to the up-front costs that are required for SLU, but not for LLU (the up-front LLU costs have already been incurred and are not included in the cost model). However, as WBA prices have not altered, SLU is now better value or on a par with WBA in the 40–50% of the Netherlands that contains the highest line density.

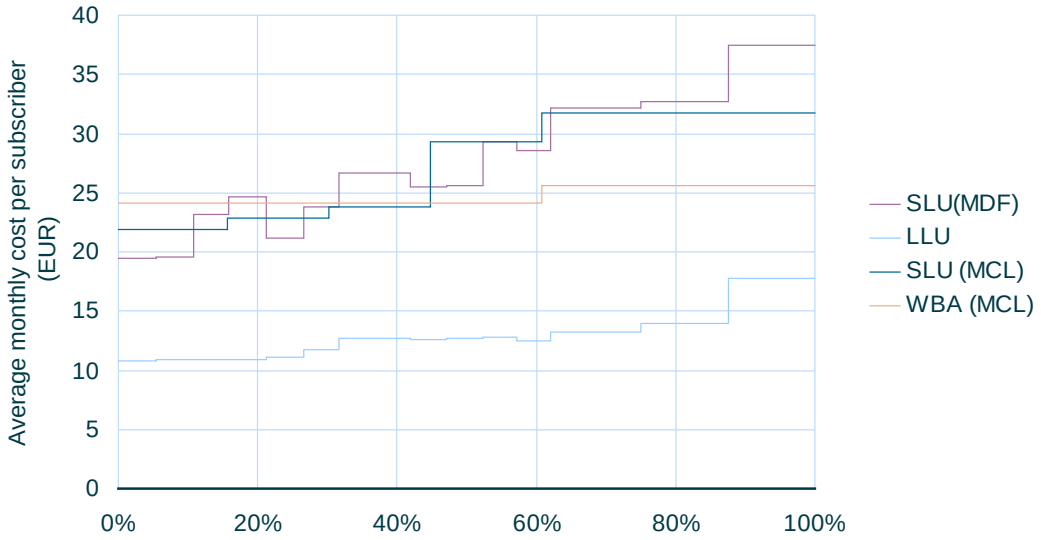

Exhibit 4.6: *Average monthly cost per subscriber as line density decreases when all regulated prices are halved, and the SDF–MDF rental charges are also halved. [Source: Analysys]*

For the 50% reduction in prices to be sufficient for SLU to be economically viable as an alternative to continuing with LLU to reach the mass market, we would also need to assume:

- a market share of 25%, together with our medium estimate for ARPU increase
- a market share of 16%, together with our highest estimate for ARPU increase.

Alternative co-location charges

In the final scenario in this section, we have compared the base case scenario co-location charges which are based on a per-cabinet, non-recurring and recurring charge, with charges that are based on a per-rack, co-location charge. Both scenarios assume that the 60% of lines with the highest line density are reached, and the modelled operator is the only operator co-locating with KPN.

For the purpose of this scenario, we have assumed that the per-rack, non-recurring and recurring charges are a quarter of the current per-cabinet tariffs, and that a rack is needed for each 24-port DSLAM installed at the street cabinet.

Exhibit 4.7, below, shows that such a per-rack charge would be cheaper than a per-cabinet, co-location charge for operators with either a 5% or 10% market share. However, as market share increases more racks are needed and the cost differential is reduced.

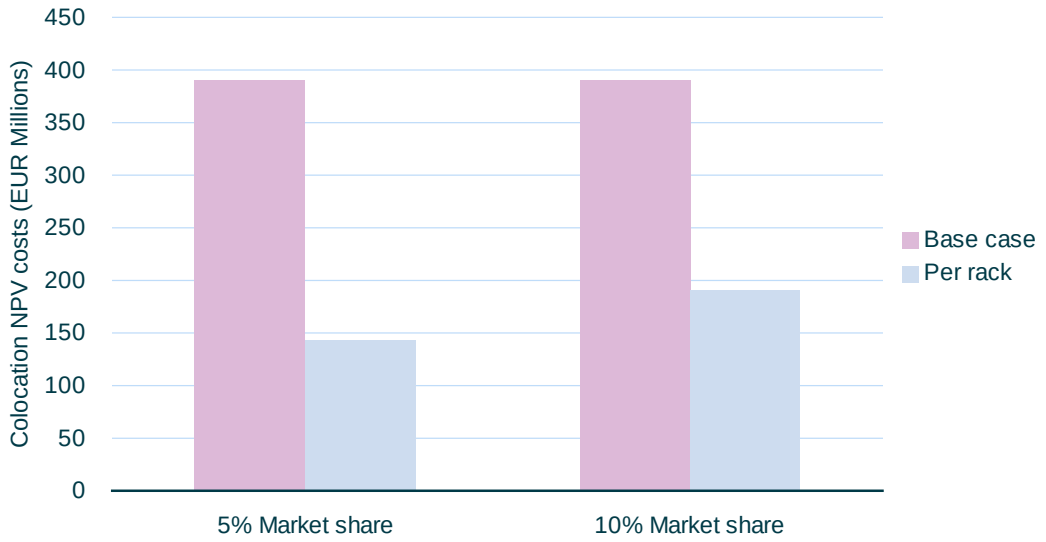

Exhibit 4.7: *NPV costs of co-location for different methods of charging for co-location [Source: Analysys]*

It should be noted that although there is a significant difference in co-location costs between the two types of charges, co-location represents 30% of total costs in the base case, so the overall impact is more limited.

4.1.3 Wide-scale deployment of services to the mass market

In this section, we consider an operator that covers approximately 60% of the lines in the Netherlands by targeting whole MCL areas. The operator has a market share of 10% in the areas it covers.

The chart below shows the total costs for the different options available to this alternative provider and compares them to the current costs for LLU:

- SLU (MCL): all 60% covered by SLU
- mixed strategy: 45% covered by SLU, 15% by WBA
- WBA (MCL): all 60% covered by WBA.

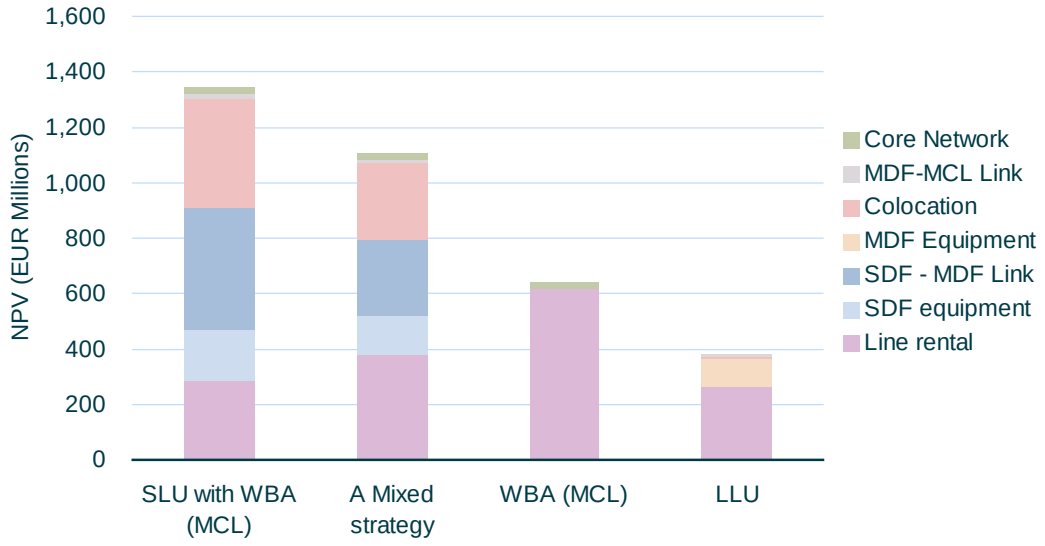

Exhibit 4.8: *Total cost of different options for an alternative provider with 60% coverage at the MCL level [Source: Analysys]*

This clearly shows that all options are more expensive than continuing with the present LLU offer, and that WBA is always cheaper than SLU in each type of MCL area. Further evidence of this is given by the cashflows for every year from 2007 to 2016, for each option shown below. The cashflows shown are incremental to LLU cashflows.

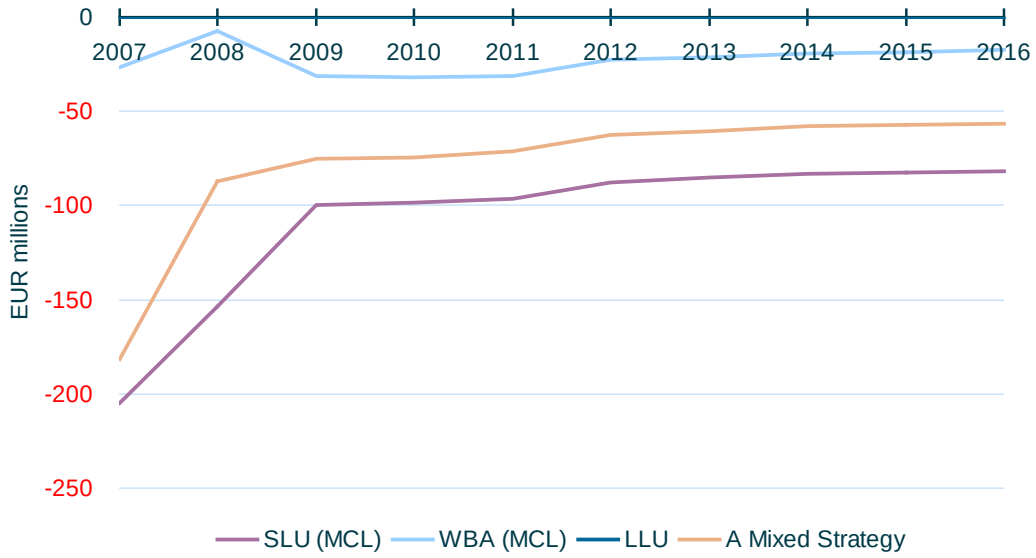

Exhibit 4.9: *Annual cashflows, relative to LLU, for different scenarios at the MCL level [Source: Analysys]*

This chart also indicates the high investment costs necessary to migrate to SLU.

4.1.4 Targeted use of SLU in densely populated areas to serve the mass market

In this section, we consider an operator which covers approximately 60% of the lines in the Netherlands by targeting individual MDF areas. The operator has a market share of 10% in the areas which it covers.

The chart below shows the total costs for the different options available to this alternative provider, and compares them to the current costs for LLU:

- SLU (MCL): all 60% covered by SLU
- mixed strategy: 45% covered by SLU, 15% by WBA
- WBA (MCL): all 60% covered by WBA.

The costs and incremental cashflows are similar to the figures for deployment at the MCL level.

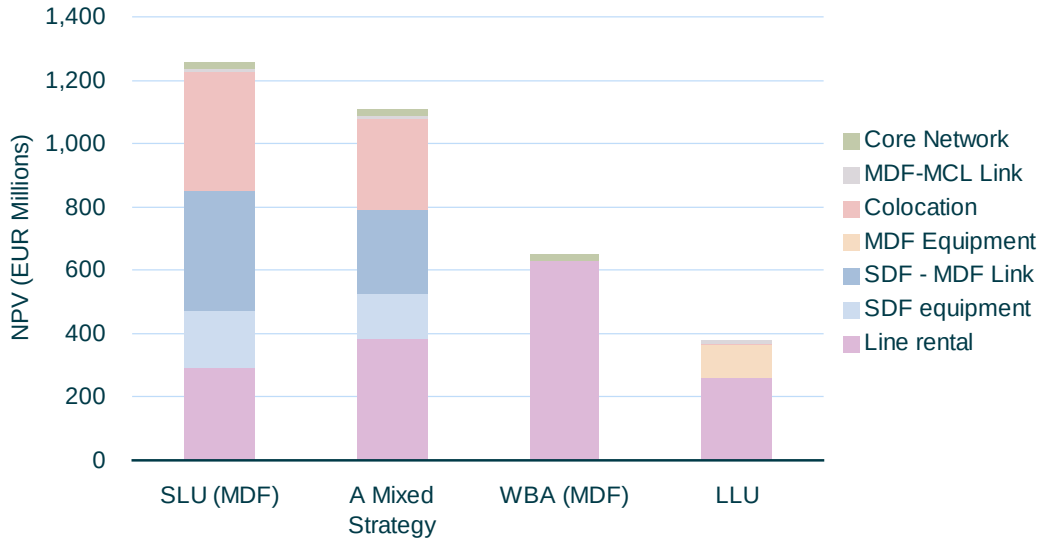

Exhibit 4.10: *NPV cost stacks for different scenarios at the MDF level [Source: Analysys]*

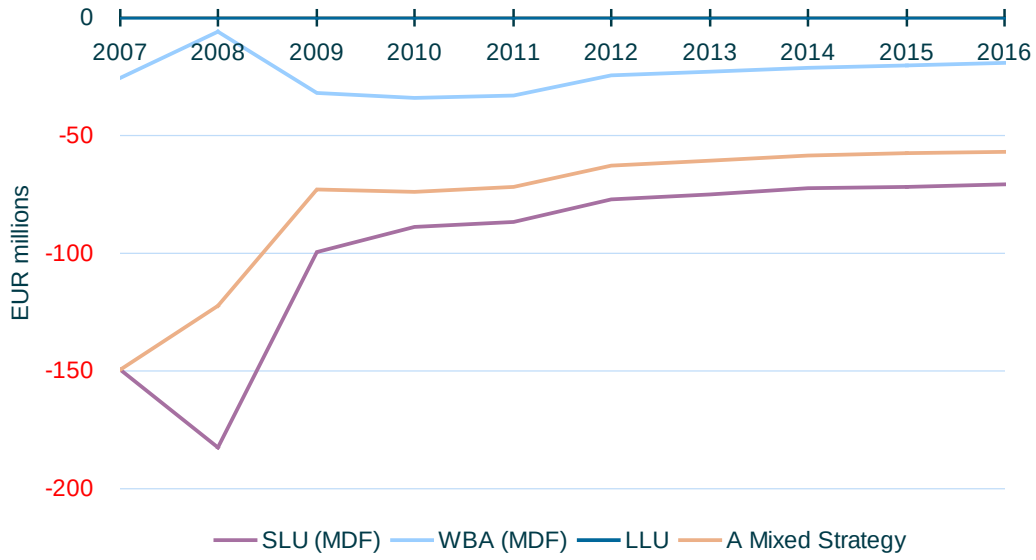

Exhibit 4.11: *Annual cashflows, relative to LLU, for different scenarios at MDF level [Source: Analysys]*

4.1.5 Targeted use of SLU for the largest street cabinets to serve the mass market

In this section, we consider an alternative operator which 'cherry picks' certain cabinets. The chart below compares the cost for scenarios in which the alternative operator offers SLU services to just the 'large' cabinets, both 'large' and 'medium' cabinets and to all the cabinets with the scenario in which the alternative operator uses WBA everywhere. In each case service is offered across the 60% area of the Netherlands with the highest line density. In the cases in which SLU is used, WBA is offered to the cabinets that are not served using SLU.

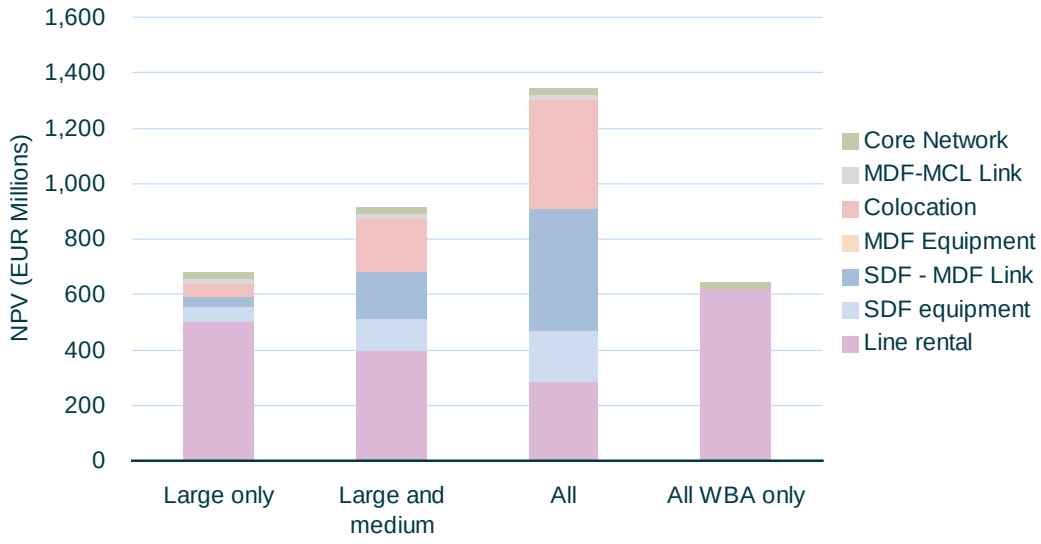

Exhibit 4.12: *NPV cost stacks for each scenario [Source: Analysys]*

Using SLU only to large cabinets and WBA to all others is marginally better than using WBA everywhere. This suggests that for an alternative operator targeting a small number of cabinets at which they have a significant number of existing customers, the deployment of SLU does make sense. The benefits of SLU would increase further should the price for co-location and for SDF–MDF links decline faster than the price for WBA.

The cashflows shown below also support this mixed strategy, although they indicate slightly higher initial costs if deploying some SLU. By 2016, the annual cashflow for using

WBA in areas is very similar to offering SLU to 'large' cabinets with WBA to the remaining cabinets.

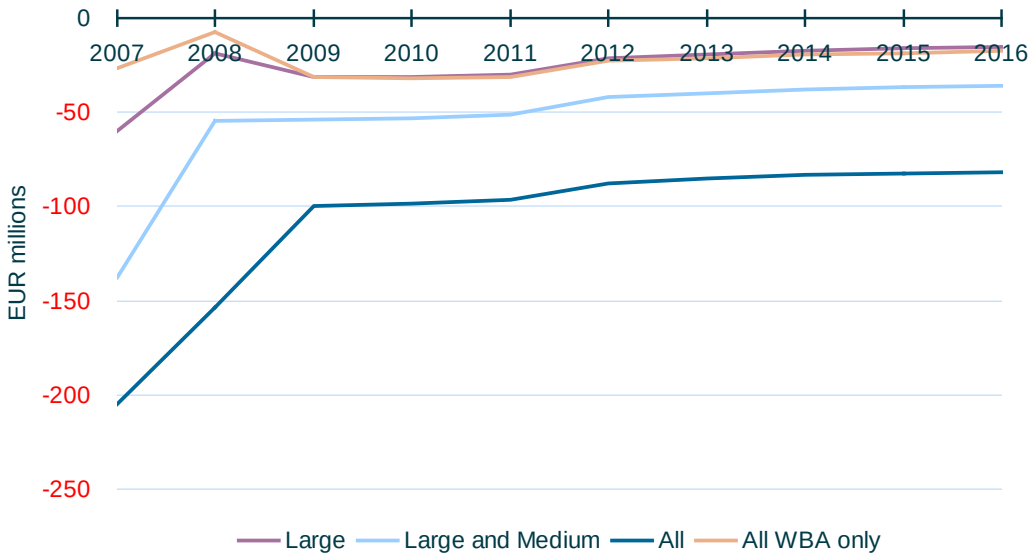

Exhibit 4.13: *Annual cashflows, relative to LLU, for different scenarios in which roll-out occurs to different sized cabinets [Source: Analysys]*

4.1.6 Targeted use of SLU to serve selected business customers

In this scenario, we consider what the costs would be if an alternative provider's customers are already concentrated on only a portion of street cabinets. The chart below shows how the total costs differ, depending on whether the customers are concentrated onto a quarter or a half or all cabinets, or are spread across all cabinets.

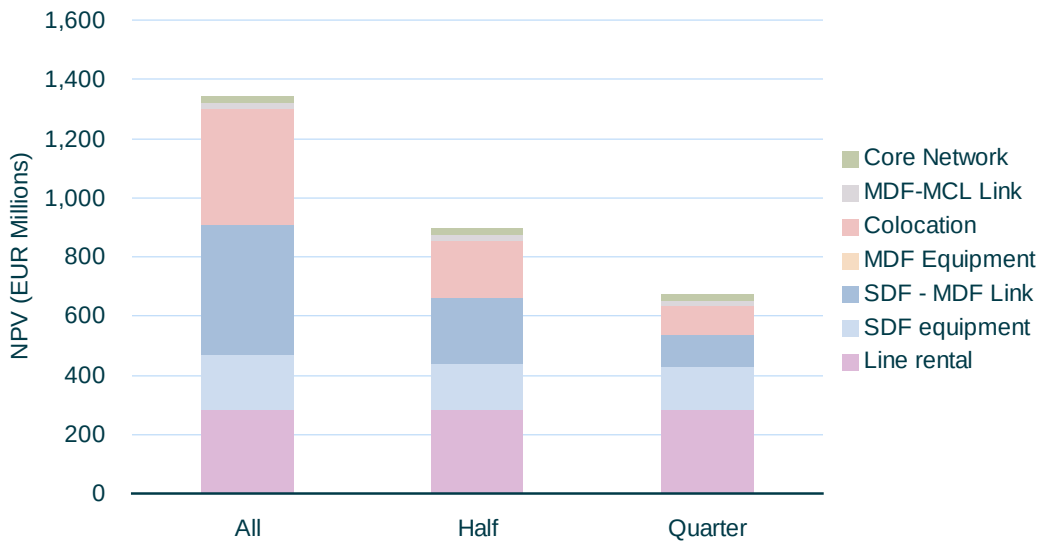

Exhibit 4.14: *NPV cost stacks depending on how many cabinets are rolled out to within the 60% coverage area [Source: Analysys]*

The main difference between the cost in each case is for the SDF–MDF link and the co-location, which both decrease if the provider serves fewer cabinets.

As before, the cashflows for each option are shown below relative to the LLU equivalent. By the end of 2016, if an alternative operator is able to reach its customers by going to just a quarter of cabinets, and manages to increase average revenue per subscriber per month by EUR7, then cashflow would be comparable to that of LLU. Such a revenue increase is likely only to be possible for a provider offering higher bandwidth to business customers.

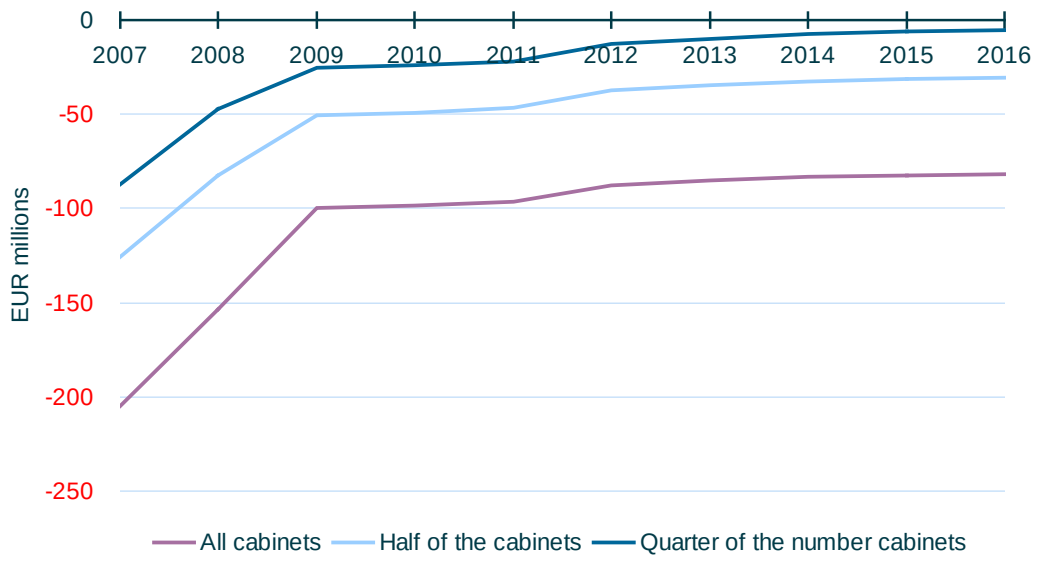

Exhibit 4.15: *Annual cashflows, relative to LLU, for different scenarios in which roll-out occurs to differing number of cabinets within the 60% coverage area. [Source: Analysys]*

4.1.7 Conclusions

Continuing use of LLU is significantly cheaper than switching to SLU or WBA in almost all of the scenarios considered. This is true even if one-off costs from KPN are waived and even if the current prices offered by KPN are decreased.

We have found that SLU offers no cost advantage compared to WBA even in the areas with the highest line density, unless at least some of the following are true:

- the alternative provider has a high market share
- the co-location prices from KPN are reduced
- the prices from KPN for SDF–MDF backhaul are reduced
- the alternative provider is able to adopt a very targeted strategy of serving selected street cabinets where it already has a significant number of customers.

Regarding the viability of alternatives to LLU, we conclude that:

- based on the current interconnect and wholesale offers from KPN, we have calculated that the use of SLU by an alternative provider is not economically viable as an alternative to continuing to use LLU except under certain conditions. We estimate that a business case for SLU with similar economic viability to that of continuing use of LLU for 60% of the population would require both:
  - a market share greater than 59% of all broadband lines (including cable) in areas served
  - our highest estimate for incremental revenue (which assumes an increase in ARPU across all broadband users of EUR10 per month by 2016)
- for an alternative provider with a 10% market share of all broadband lines in areas served, we estimate that it may be economically viable to deploy SLU to around 1000 of the largest street cabinets in the dense urban areas provided that:
  - the interconnect and wholesale tariffs from KPN for SLU line rental, co-location and links to the street cabinets are reduced significantly (we have tested 50%)
  - an increase in ARPU of around EUR9 per user per month can be achieved for the entire period (which we consider reasonable if business customers are targeted)
- the strong local economies of scale effects that are evident in deployment at the street cabinet level mean that even if such significant cuts of 50% in KPN's interconnect and wholesale tariffs were to be realised, the use of SLU would still not be economically viable as an alternative to LLU to reach the mass market unless we assume for example:
  - a market share of 25%, together with our medium estimate for ARPU increase
  - a market share of 16%, together with our highest estimate for ARPU increase
- the current offer from KPN for WBA is also unlikely to be economically viable as an alternative to continuing to use LLU to reach the mass market regardless of the market share and even with the highest estimate for ARPU increase
- should OPTA wish to influence the prices offered by KPN to make the SLU option more viable, the prices which affect the viability of an alternative operator's business plan the most are those for the line rental, SDF co-location and SDF–MDF link. Furthermore, our assessment of the cost of building a competitive network to provide backhaul to street cabinets indicates that unless very substantial revenue streams can be generated from services other than SLU backhaul, then it will not be possible for a third party to provide such backhaul at prices at the same level as, or below, the current offer from KPN.

4.2 The business case for KPN

4.2.1 Introduction

In order to validate our model against the figures presented by KPN for the cost of developing its All-IP network, we have adjusted the model to consider the costs to KPN. The key differences with the cases for the alternative providers are:

- 100% of the Netherlands is covered
- broadband market share is 40% (equivalent to current KPN levels)
- the deployment strategy is own-build
- the cabinet strategy is own-build
- no other operators are co-building with KPN
- 80% of new fibre can be laid in existing duct
- 10% of fibre required already exists.

We estimate the costs separately on the basis of serving only KPN's broadband customers, and on the basis of developing the capacity to serve all lines. We do not consider the cost to KPN of upgrading its core network.

4.2.2 Results

Considering the costs to KPN of serving only its own retail broadband customers, our model indicates a capex requirement of EUR1.1 billion over the next four years. Should KPN develop a network with the capacity to serve all lines with broadband, then this increases to EUR1.7 billion, as a result of the additional NGDSLAMs that need to be installed at street cabinets (if KPN's DSLAMs are more cost efficient at this scale than the small DSLAMs we have considered for alternative operators, then this figure can be reduced). This is illustrated below:

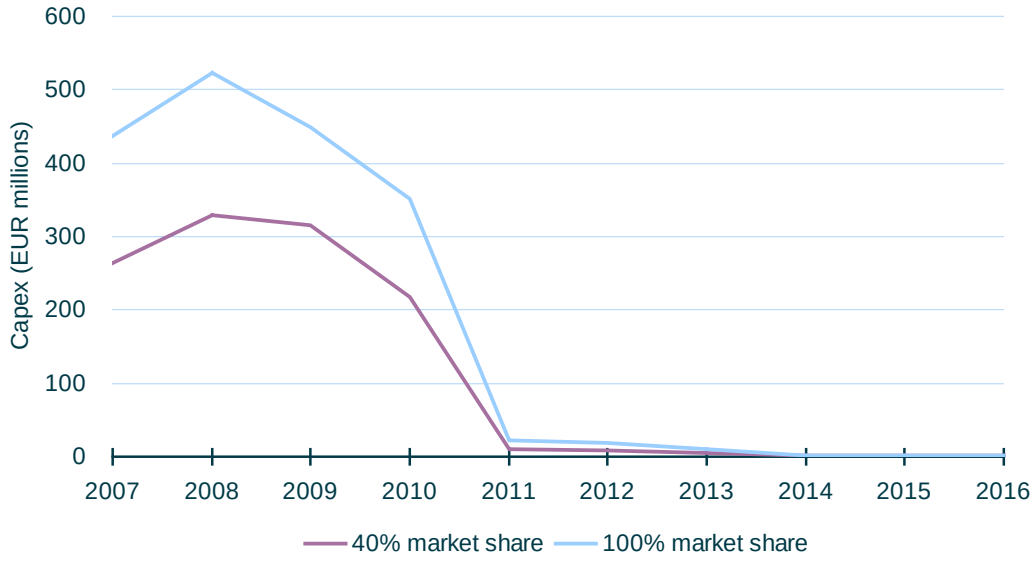

Exhibit 4.16: *Comparative capital expenditure of KPN, depending on KPN's share of the total broadband market [Source: Analysys]*

4.2.3 Conclusions

Our analysis indicates that KPN's estimate of a required EUR1.5 billion investment to upgrade its network to All-IP is not inconsistent with our model, provided that the majority of this investment is assumed to occur in the access network.

5 Conclusions

Whilst it has sometimes been necessary within the time constraints of the work, and based on the data available, to rely on estimated values in the course of our analysis, we have identified a number of conclusions about which we have a high level of confidence. These support the views of the operators with whom we have discussed the issue of All-IP deployment:

- KPN's own estimate of costs of EUR1.5 billion to deploy its All-IP network does not appear unreasonable.

- The deployment of SLU to a small number of (we estimate around 1000) street cabinets in dense urban areas appears viable provided that:
  - a market share of around 10% of broadband lines is achieved in areas served
  - there are significant reductions (we have estimated 50%) in prices for line rental, co-location and SDF–MDF links
  - it is possible to achieve an increase in ARPU of around EUR9 per month throughout the period.

  This could be consistent with a strategy targeting business customers.

- Operators' views that it is not possible to deploy SLU for the mass market are strongly supported by the significant costs associated with this and the ongoing negative cashflows in comparison with continuing with LLU.

- The fact that WBA has also been demonstrated to be significantly more expensive than continuing with LLU supports operators' views that continued availability of LLU at the MDF site would be the best outcome for their business cases.

In addition we note that:

- There are very strong local economies of scale effects that may disadvantage even quite large competitors to KPN if they opt to deploy SLU.

- A reduction or restructuring of the proposed co-location costs, whilst helpful, would not alone be sufficient to make the SLU case viable.

- The largest costs faced in the deployment of SLU are the line rental charge, SDF co-location, and the SDF–MDF link. In both cases (unless we assume substantial revenue streams from services other than SLU), it seems unlikely that competition will provide lower prices than those available from KPN. Therefore, obtaining a fair price from KPN for these services will be important if alternative providers are to be encouraged to deploy SLU. However, our analysis also indicates that even with very significant reductions in prices for these services there may still not exist an attractive business case for SLU deployment to reach the mass market.

Annex A: Definition of MDF and MCL areas

A.1 Introduction

This annex provides an overview of how pseudo-MDF and MCL areas have been determined for the purposes of the sub-loop unbundling model.

The definitions are derived from the following information:

- number of lines per street cabinet
- MDF to which each street cabinet is currently connected
- ZIP6 code for each street cabinet
- ZIP6 code for each MCL
- region associated with each ZIP4 code.

A.2 Definition of MDF areas

In order to determine pseudo-MDF areas we undertook the following steps:

- assigned each street cabinet to the relevant ZIP4 region
- used the association between street cabinets and MDFs to calculate, for each ZIP4 region, the number of lines connected to an MDF via a street cabinet lying in this region
- assigned each ZIP4 region to the MDF with the largest number of lines connected via a street cabinet in this region.

This resulted in the definition of MDF areas composed of contiguous blocks of ZIP4 regions. We defined 1300 MDF regions in this way (this is slightly lower than the actual number of 1359 MDFs; we believe the discrepancy is due to the fact that the information for ZIP4 regions is not as up to date as that for ZIP6 regions.

A.3 Definition of MCL areas

We assume that each MCL area is composed of the set of existing MDF areas that are closer to that MCL than to any other MCL. In order to determine these areas, we undertook the following steps:

- assigned each MCL to the centroid of the relevant ZIP4 region
- constructed Voronoi polygons around each MCL location. These allocate to each MCL the area that is closer to that MCL than to any other MCL
- assigned to each MCL all MDF areas for which the centroid lies within that MCL's Voronoi polygon.

This is illustrated below (the green MDF regions are those allocated to the MCL with the associated Voronoi polygon):

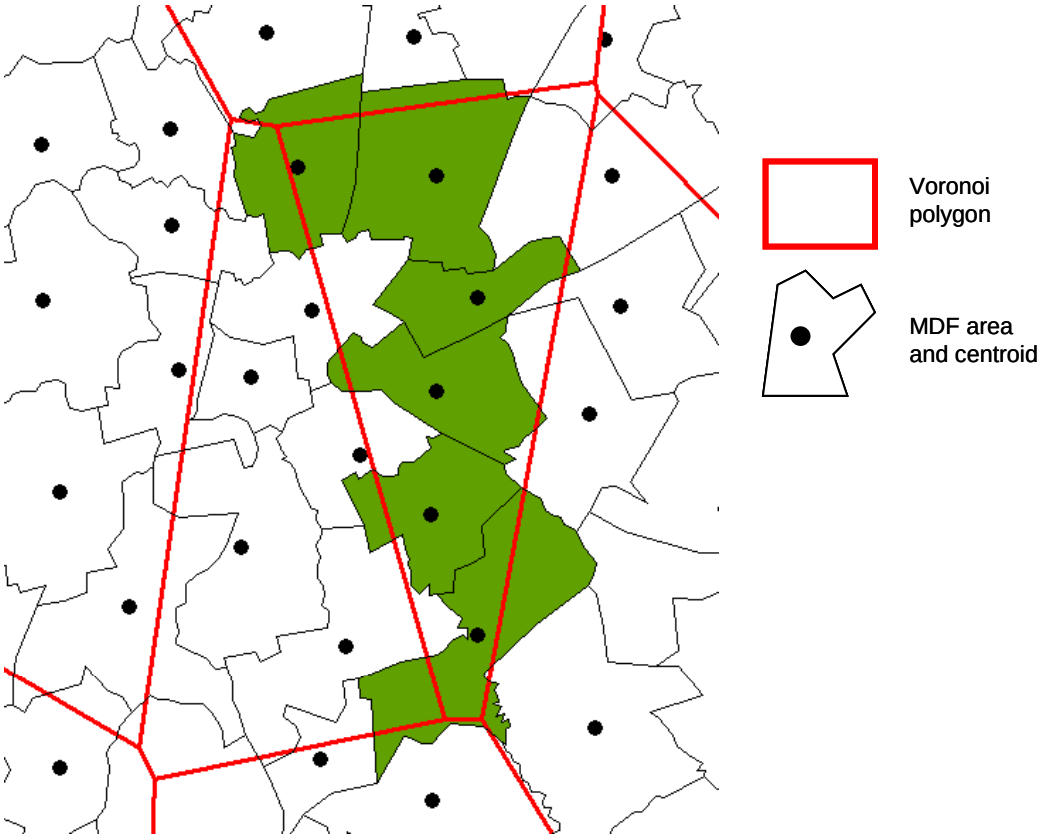

Exhibit A.1: Allocation of MDF areas to Voronoi polygon associated with each MCL [Source: Analysys]