

Wholesale access to cable

Final version

Client: VodafoneZiggo

Rotterdam, 23 November 2017



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1 Introduction

VodafoneZiggo commissioned Ecorys to conduct an independent assessment of the economic viability of VodafoneZiggo offering wholesale access product based on IP-bitstream. The reason for this request is to provide input for ACM's upcoming market decision. Below we briefly elaborate on ACM's market decision(s) followed by the main questions we aim to answer in this report.

1.1 Background

2015 decision

In 2015, ACM completed a market analysis decision in which it concluded that competition in the retail market for broadband services would be problematic in the absence of regulatory intervention. ACM also concluded that regulation of the wholesale local access market would be sufficient to remedy the identified problems at retail level.

During the same year, Vodafone and Liberty Global initiated talks about sharing assets¹. These talks led to a joint-venture between Vodafone and Ziggo in the Netherlands, which was completed by the end of 2016. The European Commission approved the joint venture under the condition that Vodafone would sell 'Vodafone Thuis' to T-Mobile. The new company is called VodafoneZiggo (VZ).

In 2017, several parties expressed concerns about the state of competition in the Dutch telecom markets:

- KPN requested ACM to re-investigate the Dutch telecom markets,
- ACM expressed concerns about the market's tendency to transform in a duopoly²,
- The Dutch Minister of Economic Affairs repeated its ambition to impose obligations on VZ to grant wholesale access to alternative operators³.

ACM's working hypotheses for the upcoming decision

On 4 July 2017, the Dutch regulator ACM informed stakeholders in the Dutch telecom market of its working hypotheses for the upcoming market analysis and decision. Again, ACM concluded that competition in the retail market could be problematic in the absence of regulatory intervention. ACM took the position that it is technically and economically feasible for VZ to offer wholesale access to alternative operators. ACM indicated that it is working towards defining one single market for wholesale access to telecom infrastructures, including wholesale local and central access to KPN's network and wholesale central access to VZ's networks⁴. ACM explained that it is analysing the hypothesis that KPN and VZ have a 'joint dominant position' or 'joint SMP'.

¹ <http://deadline.com/2015/06/john-malone-liberty-vodafone-asset-merger-rupert-murdoch-sky-vivendi-1201438216/>

² <https://www.ad.nl/economie/acm-strenger-voor-telecomreuzen-wij-gaan-de-grenzen-opzoeken-a2d4c0cc/>

³ In 2014 the Dutch minister already stated that *"Het kabinet zou het wenselijk vinden dat niet alleen KPN, maar ook kabelbedrijven direct worden geprikkeld door het toelaten van concurrenten op hun netwerk."* (Kamerbrief 7 november 2014, Kabinetsreactie en beantwoording vragen over de overname van Ziggo door Liberty Global). In October 2017, the Dutch minister stated *"[Het] is een algemene prioriteit van Nederland [om] meer opties voor de toezichthouder [te creëren] om toegang te reguleren, zodat ook in een situatie van twee vergelijkbare netwerken (in Nederland KPN en Vodafone-Ziggo) de toegang voor alternatieve aanbieders – en daarmee de mededinging – is gewaarborgd. Dominantie is in die situatie namelijk moeilijker aan te tonen. Nederland pleit daarom voor ruimte om zo nodig toegang tot netwerkonderdelen op te leggen zonder aangetoonde aanmerkelijke marktmacht, [...]".* (Kamerbrief 11 oktober 2017, Stand van zaken herziening Europees telecomkader).

⁴ Such approach is contrary to the European Commission's recommendation to define separate successive wholesale markets for local and central access (markets 3a and 3b respectively), and contrary to all of ACM's previous market

The WIK study

Earlier this year, the Dutch telecom regulator ACM assigned WIK Consult a study to assess the current and future technological access options for all fixed telecom infrastructures in the Netherlands. With reference to experiences in other EU Member States⁵, the WIK study concludes that using WCA (Wholesale Central Access) bitstream on VZ's cable network is technically and economically feasible.

WIK interviewed VodafoneZiggo during its study, however as far as the interview related to wholesale cable access, it was limited to a VULA-type access (virtual unbundled local access) to cable. The interview did not cover cable based IP-bitstream access (at national hand-over points). The WIK study therefore did not consider all the relevant costs associated with VZ entering the wholesale central access market. Without much further research, WIK simply assumes that VZ will apply a tariff structure and tariff rates similar to those applied to KPN's WCA products and that this will be sufficient to cover VZ's costs.

VZ's incremental and service-specific costs of entering the WCA market cannot be ignored as these costs may be sizeable. VZ's network is the result of a series of mergers between formerly local networks. All cable network architectures are different and VZ [REDACTED]. T [REDACTED]. [REDACTED]. [REDACTED]. [REDACTED], the incremental CAPEX and OPEX are considerable and cannot be ignored in regulatory decisions.

1.2 The main questions

The purpose of this report is to substantiate or disprove WIK's assumption that it is economically feasible for VZ to offer WCA services. The central question we answer is:

Is there a positive business case for VodafoneZiggo to offer wholesale central access based on IP-bitstream?

This business case depends on

- A. Is there demand for wholesale cable access? I.e. (when) is there a positive business case for an access seeker on cable?
- B. Can VZ offer wholesale cable access for a competitive wholesale price (relative to the wholesale prices charged by KPN) while earning a reasonable rate of return?

We deal with A in section 2 of the report, and with B in section 3. Section 4 is a conclusion.

Section 2: assessment of demand for wholesale cable access: what do we learn from WIK's analyses of the entrant's business case?

- Review of the assumptions used by WIK
- Review of the conclusions by WIK
- Sensitivity analysis of WIK's model

analysis decisions, ACM intends to define one single wholesale market comprising of both local and central level access products.

⁵ Such as Denmark and Belgium

Section 3: what are the incremental costs for providing access

- What is the impact of offering IP-bitstream access on VZ's network and operations?
 - What kind of changes would have to be made in terms of network design and network equipment?
 - What kind of changes would have to be made in terms of organisation and processes?
- What are the financial implications of these changes in terms of CAPEX and OPEX?
 - Capital expenditures in the network (CAPEX)
 - Capital expenditures in OSS/BSS (CAPEX)
 - Operational expenditures on the changes in operations and processes (OPEX)
 - Implications for the wholesale price

Section 4: Conclusions

This report is limited in its scope. We analyse whether access seekers are likely to make use of WCA over coax and what it would require from VZ (in terms of effort and costs) to offer such service. We make no judgement call as to whether any access obligation is appropriate and proportionate in respect of the perceived market failure because we do not assess market failures in this report.

2 The alternative operator's business case

Without prejudice to whether it is technically and economically possible for VZ to offer WCA over cable, we focus our analysis on comparing WIK's business case of an alternative operator pursuing a national strategy using WCA provided by KPN with WIK's business case of an alternative operator pursuing a national strategy using WCA provided by VZ. While discussing the alternative operator's choice between WCA by KPN and WCA by VZ, we also consider the alternative operator's options to further climb the ladder of investment as its market share grows. As such, we also discuss WIK's analysis of the entrant's business case to pursue a national strategy using KPN's VULA⁶.

Below we first discuss the assumptions made by WIK with regard to market demand, potential revenues for the access seeker, costs for the access seeker using WCA, and costs for the access seeker using VULA. Next, we present WIK's conclusions, followed by an analysis of the sensitivity of these conclusions with regard to certain key assumptions made by WIK.

We note that the sensitivity analysis is based on the public version of WIK's Excel model. The public version differs from the actual version used by WIK, as WIK has changed some values of input variables for confidentiality reasons. We assume that these alternative values have no impact on the sensitivity of the model.

2.1 Review of assumptions and calculations by WIK

2.1.1 Customer profiles and retail offerings

Both the costs and the revenues are affected by assumptions made regarding the user profiles on each network. User profiles can be categorised by the dimension of x-play bundles as well as the dimension of download speeds.

In the dimension of x-play bundles, WIK uses single-play (Internet-only), double-play (Internet + voice) and triple-play (Internet + voice + TV) bundles. In the dimension of download speed, WIK uses the following categories: 50Mb/s, 150Mb/s and 300Mb/s. These speeds no longer correspond to the download speeds offered by VZ.

WIK assumes that the distribution of customers across these products is similar for VZ and KPN⁷. We observe that this assumption is flawed. Firstly, VZ offers no subscriptions for internet-only, but always includes a (basic) cable TV (CTV) service. The basic CTV service includes 25 analogue channels, 25 SD channels, 4 HD channels, the Ziggo sports channel, and Ziggo Go for watching these channels online. Secondly, VZ does not offer a double play package of Internet+Voice (as argued by WIK). VZ does offer a double play package of Internet and Interactive TV⁸. Thirdly, compared to KPN, VZ's customers are more likely to purchase 3-play subscriptions of Internet, interactive TV, and Voice.

⁶ Considering that VULA by VZ is not becoming available within the respective timeframe, we do not elaborate on WIK's assessment of VULA by VZ.

⁷ "Assume same % single/double/triple play as in KPN network", see: wca-vula-vfziggo-coax-model.xlsx cell 'Input parameters'!L35

⁸ Which includes 77 channels (of which 36 are available in HD) or, for the 'Max' subscription, 129 channels (of which 50 in HD). The subscriptions also include additional functionalities such as on-demand TV, catch-up TV, etc.

The Tables below compare consumer profiles (and %-shares) used by WIK for VZ (Table 2-1) with data received from VZ on the actual situation (Table 2-2).

Table 2-1 Customer profiles on cable according to WIK (2017)

	50Mbps	150Mbps	300Mbps
Single Play (Internet)	4.4%	5.5%	1.1%
Double Play (Internet+voice)	8.8%	11%	2.2%
Triple Play (Internet+voice+TV)	26.8%	33.5%	6.7%

Source: WIK (2017)

Table 2-2 Customer profiles on cable according to VZ

Source: company data

Note that VZ's 3-play subscriptions include a few low-end bundles with basic Cable TV, but most 3-play bundles contain more advanced Interactive TV packages. Nearly all double play bundles include Interactive TV. Moreover, as speeds go up (moving from 'Start' to 'Complete' to 'Max'), the Interactive TV packages are enlarged with additional content (movies and series) and functionalities (recording, pausing, catch-up TV, etc.). Using the actual user profiles has the effect of (slightly) raising the calculated blended ARPU of VZ compared to the calculations by WIK. The change has little impact on the wholesale costs of the access seeker compared to the calculations by WIK. However, compared to WIK, the access seeker has higher costs for TV-content.

2.1.2 Revenues for VZ

With regard to retail prices, WIK says it has retrieved information about the prices from the VZ website. However, considering that VZ's actual bundles are dissimilar to the bundles used by WIK, it is not possible for WIK to retrieve prices from the VZ website for the categories they use (these prices simply do not exist). As such it is unclear how WIK has compiled the following table.

Table 2-3 VZ's retail prices (ex VAT) according to WIK (2017)

	50Mbps	150Mbps	300Mbps
Single Play (Internet)	€39.50	€48.00	€56.00
Double Play (Internet+voice)	€53.00	€57.00	€65.00
Triple Play (Internet+voice+TV)	€44.00	€57.00	€72.50

Source: WIK (2017)

WIK states in its report that it corrected retail prices for “*services not considered at the cost side of the calculations like [...] content related services [...] by the estimated value of that service*”. In other words, WIK states that it has corrected for the additional content and functionalities of the ‘complete’ and ‘max’ subscriptions. If we take the retail prices as advertised on VZ’s website (not considering temporary discounts) and we apply the same correction for content related services and functionalities, we arrive at the following retail prices for VZ’s product categories (see Table 2-4 below).

Table 2-4 VZ's retail prices (ex VAT) according to the VZ website

	40Mbps (start)	200Mbps (complete)	400Mbps (max)
Internet + CTV ⁹	€35.95	€42.56	€49.96
Internet + Interactive TV ¹⁰	€38.43	€45.08 ¹¹	€57.48 ¹²
Internet + Interactive TV+Voice ¹³ (+Volop bellen) ¹⁴	€48.31	€54.96 ¹¹	€67.36 ¹²

Source: Ecorys calculations based on information from the VZ website.

The prices in Table 2-4 are all considerably lower than the prices used by WIK (in Table 2-3). Using the actual retail prices has the effect of lowering the calculated blended ARPU of VZ compared to the calculations by WIK.

The section below calculates the net effect of correcting for user profiles (Table 2-2) and retail prices (Table 2-4).

Blended ARPUs

WIK calculates a blended ARPU as follows: *“The ARPU is derived from the prices of the targeted retail market services, the most important product bundles and assumptions about the share of customers of the incumbent that order these products.”*

For KPN, WIK calculates a blended ARPU of 48.22 euros/month. Based on the consumer profile shares in Table 2-1 and the retail prices in Table 2-3, WIK arrives at a blended ARPU for VZ of 53.10 euros. When we redo WIK's calculations based on the corrected consumer profile shares in Table 2-2 and the corrected retail prices in Table 2-4, we arrive at a blended ARPU for VZ of 50.69 euros/month¹⁵.

The approach followed by WIK (multiplying consumer profile shares by the currently advertised retail prices) ignores the fact that that VZ gives discounts to new customers as well as the fact that most legacy clients have had a contract for many years and consequently pay a (much) lower subscription fee than new clients, while benefitting from capacity improvements over the years. Based on internal company data of VZ, we have been able to establish the true ARPU per product category reflecting the above and arrive at a blended ARPU of █████ euros/month (see Table 2-5).

⁹ <https://www.ziggo.nl/internet/vergelijken/>.

¹⁰ <https://www.ziggo.nl/tv-internet/>.

¹¹ to correct for the additional content delivered in the 'complete' package we deducted the amount which VZ charges for this when added to the 'Start' subscription (6.95 euros/month including VAT).



¹² To correct for the additional content delivered in the 'Max' package we deducted the amount which VZ charges for this when added to the 'Start' subscription (11.95 euros/month including VAT)



¹³ <https://www.ziggo.nl/alles-in-1/>

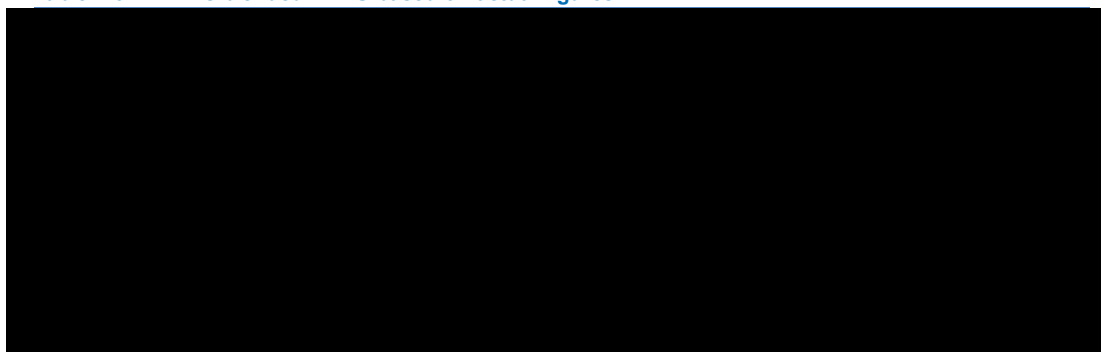
¹⁴ For the inclusion of the voice service we have included the price of VZ's additional package 'Volop Bellen' (of around 10.95 euros including VAT) as to account for voice related retail revenues.



¹⁵ VZ was not able to split double play subscriptions into Internet+CTV and Internet+Interactive TV. Our calculations assume that all double play subscriptions are Internet+Interactive TV. Consequently, our assessment of the blended ARPU is an overestimation of the actual figure.

In other words, VZ's customer base pays on average [REDACTED] than VZ's currently advertised retail prices.

Table 2-5 VZ's blended ARPU based on actual figures



Source: company data

Note: [REDACTED]

We expect that a similar legacy effect is leading to an overestimation by WIK of KPN's blended ARPU. However, we cannot verify this due to a lack of access to KPN's internal company data.

The overestimation of VZ's blended ARPU (and possibly KPN's blended ARPU) may have an impact on the estimation by WIK of the access seeker's revenue potential, as WIK assumes that the access seeker determines its price on the basis of the blended ARPU of the network provider of the wholesale access service.

2.1.3 Revenues for the access seeker

Retail prices of alternative operators

WIK assumes that the alternative operator can realise a blended ARPU that is 10% below the blended ARPU of the respective vertically integrated operator. WIK assumes that this price discount properly reflects the entrant's strategy to gain customers and is based *"on observations in the current pricing of alternative operators of services with comparable packages and line speed"*. WIK does not further elaborate on these observations with examples or underpinning data.

When we compare retail prices on the price comparison website of the Dutch Consumer Association (Consumentenbond), we find the following data on monthly prices and annual costs for different DSL providers.

Table 2-6 Discounts of alternative DSL operators relative to KPN prices

	Monthly charges						Monthly discounts					
	50 mbps			100 mbps			50 mbps			100 mbps		
	I	I+V	I+V+T	I	I+V	I+V+T	I	I+V	I+V+T	I	I+V	I+V+T
KPN	€ 39,00	€ 40,00	€ 50,00	€ 44,00	€ 45,00	€ 55,00	0%	0%	0%	0%	0%	0%
Online	€ 30,00	€ 32,50	€ 45,00	€ 32,00	€ 34,50	€ 43,00	-23%	-19%	-10%	-27%	-23%	-22%
T-mobile	€ 27,50	€ 30,00	€ 39,00				-29%	-25%	-22%			
Tele2	€ 28,00	€ 33,00	€ 41,00	€ 30,00	€ 35,00	€ 43,00	-28%	-18%	-18%	-32%	-22%	-22%
	Annual costs						Annual discounts					
	50 mbps			100 mbps			50 mbps			100 mbps		
	I	I+V	I+V+T	I	I+V	I+V+T	I	I+V	I+V+T	I	I+V	I+V+T
KPN	€ 444,00	€ 456,00	€ 540,00	€ 504,00	€ 516,00	€ 600,00	0%	0%	0%	0%	0%	0%
Online	€ 360,00	€ 360,00	€ 400,00	€ 384,00	€ 384,00	€ 486,00	-19%	-21%	-26%	-24%	-26%	-19%
T-mobile	€ 360,00	€ 390,00	€ 438,00				-19%	-14%	-19%			
Tele2	€ 361,00	€ 421,00	€ 493,00	€ 385,00	€ 445,00	€ 517,00	-19%	-8%	-9%	-24%	-14%	-14%

Source: <https://www.consumentenbond.nl/alles-in-1/vergelijker>

Note: the difference between monthly charges and annual costs is that the latter includes (temporal) discounts and promos

From this data we conclude that, on average, alternative operators offer a discount of 23% relative to KPN's monthly charges and a discount of 18% relative to the annual costs for an end-user of a KPN subscription. It follows that, based "*on observations in the current pricing of alternative operators of services with comparable packages and line speed*", WIK should have used a **discount of around 20%** rather than a discount of 10% relative to the advertised prices. This seems logical considering that the analysis above shows that t

(The same may apply to KPN).

If the alternative operator aims to gain market share, it would have to offer a higher discount on the currently advertised prices to be able to compete effectively at the actual retail price level.

Taking VZ's blended ARPU based on advertised prices (50,69 euros) as a benchmark, the blended ARPU for the access seeker on VZ's network would be 20% lower at 40.55 euros per month per subscriber (rather than 47.80 euros as calculated by WIK). Similarly, taking KPN's blended ARPU based on advertised prices as a benchmark (48.21 euros), the blended ARPU for the access seeker on KPN's network would be 20% lower at 38.57 euros per month per subscriber (rather than 43.40 euros as calculated by WIK).

We conclude that WIK has overestimated the revenue potential of the access seeker. This conclusion applies to WIK's assessment of the access seeker's business case when using WCA over VZ's network, as well as to WIK's assessment of the access seeker's business case when using WCA over KPN's network.

2.1.4 Costs for the access seeker using WCA products

The costs for the access seeker presented in WIK's public report are slightly different from the costs calculated in the accompanying public Excel model. The outcomes of the public Excel model differ because the values of some input parameters have been changed for confidentiality reasons. The changes are minor and we can still use the public Excel model to evaluate WIK's work.

Comparing the results from WIK's report and its (public) Excel model

With regard to the total monthly cost per subscription, we conclude from the public report that WIK has calculated the following values:

- [REDACTED] euros / month using KPN WCA¹⁶
- [REDACTED] euros / month using VZ WCA¹⁷

The costs resulting from WIK's public Excel model are approximately [REDACTED] euros higher¹⁸.

Total costs consist of wholesale costs and other costs incurred by the access seeker (such as retail costs and investments in CPE). These cost categories can be further sub-divided. We assume that the relative shares of each of these cost categories is the same in the public and the confidential version of the Excel model.

With regard to wholesale costs for WCA, WIK assumes that:

- VZ applies a tariff structure that is similar to KPN's tariff structure;
- on aggregate, the tariff structure entails:
 - costs for colocation, line rental, and traffic costs,
 - one-off costs for connection, disconnection, etc.;
- VZ would charge (approximately) similar prices for each element in the tariff structure;
- VZ would not offer a 15% volume discount as does KPN for its national WCA product;
- total wholesale costs form about 60% of total costs¹⁹.

With regard to the other costs for the access seeker, WIK makes several assumptions that result in slight differences between cable and copper access, however these differences partly cancel each other out²⁰. In sum, monthly costs other than wholesale costs are about [REDACTED] euros (per access line) higher on cable compared to copper²¹.

Table 2-7 and Table 2-8 below summarise the results from WIK's public model for VZ and KPN respectively, and present the results from WIK's confidential version, derived on the basis of %-shares.

Table 2-7 Cost structure of the alternative operator with 2% market share using VZ's network

	Public Excel model		Confidential Excel model (values derived based of %-shares)
	monthly costs	% of total costs	monthly costs
Average monthly costs/subscription	42.04	100%	[REDACTED]
<i>Total wholesale costs</i>	<i>25.48</i>	<i>60.6%</i>	[REDACTED]
Colocation	0.51	1.2%	[REDACTED]
Line rental	24.97	59.4%	[REDACTED]
One-off	0.79	1.9%	[REDACTED]
Access line	19.13	45.5%	[REDACTED]

¹⁶ [REDACTED]

¹⁷ [REDACTED]

¹⁸ In the public version of the Excel model the corresponding values are 37.40 euros/month for KPN WCA and 42.03 euros/month for VZ WCA.

¹⁹ In WIK's public Excel model, total wholesale costs form 58% of total costs on copper and 60.6% of total costs on coax.

²⁰ At least, this is the case in the public version of WIK's Excel model.

²¹ [REDACTED] €/m compared to 15.70 €/m in WIK's public Excel model

Transport	5.05	12.0%		
<i>Total non-wholesale costs</i>	<i>16.55</i>	<i>39.38%</i>		
Total own network and equipment costs	5.07	12.1%		
Total voice termination costs	1.22	2.9%		
Total retail costs	6.02	14.3%		
Total other costs	3.45	8.2%		
Total common costs	0.79	1.9%		

Table 2-8 Cost structure of the alternative operator with 2% market share using KPN's network

	Public Excel model		Confidential Excel model
	monthly costs	% of total costs	(values derived) monthly costs
Average monthly costs/subscription	37.40	100%	
<i>Total wholesale costs</i>	<i>21.70</i>	<i>58%</i>	
Colocation	0.51	1.4%	
Line rental	21.19	56.7%	
One-off	0.80	2.1%	
Access line	15.90	42.5%	
Transport	4.50	12.0%	
<i>Total non-wholesale costs</i>	<i>15.70</i>	<i>41.97%</i>	
Total own network and equipment costs	5.36	14.3%	
Total voice termination costs	1.76	4.7%	
Total retail costs	5.47	14.6%	
Total other costs	2.36	6.3%	
Total common costs	0.75	2.0%	

Calculating the cost for corrected user profiles and retail prices

The above comparison of costs depends on the assumption that VZ's customer profiles are the same as KPN's. Using the actual data on user profiles slightly lowers the wholesale costs with ■■■ euros/month and slightly raises the access seeker's own costs (for TV servers, TV content, and common costs) with ■■■ euros/month per access line. The net effect on the access seeker's total costs of correcting the user profiles in WIK's public (non-confidential) model is an increase of ■■■ euros/month per access line.

In WIK's model, the access seeker's retail costs are a function of its revenues. Using the corrected data on retail prices and using the corrected factor of 20% by which the access seeker undercuts VZ's advertised retail prices (the discount factor), lowers the access seeker's retail costs by ■■■ euros/month per access line. Moreover, the change in the access seeker's retail prices lowers 'common costs' by ■■■ euros/month per access line. The net effect on the access seeker's total costs of correcting the access seeker's retail prices in WIK's public (non-confidential) model is a decrease of ■■■ euros/month per access line. Similarly, for the access seeker using KPN's network, retail and common costs go down because its revenue potential on KPN's network is lower. Retail and common costs go down with ■■■ euros/month per access line when using WCA over copper.

In sum, adjusting user profiles, correcting advertised retail prices, and correcting the discount factor, results in a decrease of the access seeker's total costs on VZ's network by ■■■ euros/month

per access line²², and by ■■■ euros/month per access line on KPN's network. We assume that the impact of using alternative user-profiles is the same in the public and confidential models. It follows that total monthly costs per subscription for the alternative operator using WCA on VZ's network **decrease to ■■■ euros / month** (from ■■■ euros / month). Its total monthly costs per subscription using WCA on KPN's network **decrease to ■■■ euros / month** (from ■■■ euros / month).

We conclude that WIK (slightly) overestimates the costs for the access seeker.

2.1.5 Costs for the access seeker using KPN's VULA

WIK concludes that the monthly wholesale costs for VULA are only slightly lower than the monthly wholesale costs for WCA. This is a wrong conclusion based on a misinterpretation of KPN's tariff schemes for VULA.

In the public version of the model, WIK calculates that the monthly wholesale costs incurred by the access seeker when using VULA by KPN are 19.38 euros. However, WIK overestimates the costs of transport by misinterpreting KPN's wholesale tariffs for transport. KPN's wholesale tariffs for transport are 7500 euros/month *per 10Gbps steps measured cumulatively on all LWAP's*. WIK wrongly multiplies the transport charges by the number of metro-POPs to which the entrant has rolled out (with a maximum of 161), rather than the cumulative capacity on all metro-POPs.

From WIK's public Excel model it follows that an access seeker with 2% market share has around 170.000 subscribers requiring a joint traffic capacity of approximately 41 Gbps. As such, the monthly transport charges are 5 x 7500 euros (KPN's wholesale tariff is charged per 10Gbps, so this is required 5 times to meet the joint traffic capacity of 41Gbps). In the public version of WIK's Excel model, WIK calculates transport charges by multiplying 7500 euros by 161 metro locations. This results in overestimating the costs for transport by a factor of 32.

Correcting for this mistake results in total monthly wholesale charges when using VULA on KPN's network of **12.51 euros/month** rather than 19.38 euros/month. Table 2-9 below compares the results of WIK's original calculations with the results of the model after correcting the calculations for transport costs.

Table 2-9 Wholesale costs for VULA, comparing original model with model corrected for transport costs

	Original model	Corrected model
	monthly costs	monthly costs
<i>Total wholesale costs</i>	<i>19.34</i>	<i>12.51</i>
Colocation	0.75	0.75
Line rental	18.59	11.76
One-off	2.04	2.04
Access line	9.50	9.50
Transport	7.04	0.22

We conclude that WIK's assessment of the access seeker's business case when using VULA over KPN's network (considerably) overestimates the costs for the access seeker. The reason is that WIK has made a calculation error in its model regarding the costs for transport.

²² Some rounding differences

2.2 Review of the conclusions drawn by WIK

2.2.1 Net margin for WCA over copper is (much) higher compared to WCA over cable

According to WIK, an entrant with a 2% market share and pursuing a national strategy realises a 2.4%-points higher net margin using KPN's WCA services (16.8%) compared to using VZ's WCA services (14.4%); see figure below.

Table 2-10 Overview of WIK's tested business case scenarios and their respective possible margins

Scenarios	Margin (for base case of 2% market share)
1) National coverage with WCA KPN Copper & Fibre network	16.8%
2) National coverage with VULA KPN copper network	12.8%
3) Regional coverage with VULA KPN copper network	17.4% With 10 largest access points connected
4) Complete network coverage with Fibre LLU KPN fibre network	-55.6%
5) Partial network coverage with Fibre LLU KPN network	-25.8% With 10 largest access points connected
6) National coverage with WCA for VodafoneZiggo coax network	14.4%
7) National coverage with VULA for VodafoneZiggo coax network	-11.9%
8) Regional coverage with VULA for VodafoneZiggo coax network	18.1% With 10 largest access points connected

The colours indicate the level of margin possible; dark green for stark positive to dark red for stark negative.

Source: WIK (2017)

WIK argues that this conclusion is based on its assumption that VZ does not offer a 15% volume discount, such as offered by KPN²³. Without this discount, the business case of the access seeker on KPN's network would result in a lower net margin compared to cable²⁴.

However, as pointed out above, WIK has made some assumptions that are wrong, and which affect the conclusions on the net margins:

1. WIK assumes that consumer profiles on cable are like those on copper. As discussed above, this assumption does not hold in practice.
2. WIK used wrong data on VZ's advertised retail prices.
3. [REDACTED]
4. WIK assumes that alternative operators undercut the price benchmark (i.e. the advertised retail prices of the respective vertically integrated operator from whom they purchase the WCA

²³ WIK (2017, p. 2) "The lower margin for the coax business case is explained by the significant volume discount (15%) on KPN's WCA service, which is applicable for KPN's copper network only."

²⁴ [REDACTED]

service) by 10%. We have shown that this percentage is in reality closer to 20% (see section 2.1.3).

5. From 3. and 4. it follows that the blended ARPU for an alternative operator on VZ's network should be █████ euros/month (rather than █████ euros/month), and on KPN's network it should be █████ euros/month (rather than █████ euros/month).
6. After correcting for the differences in user profiles on cable, using the correct data on retail prices, and applying the correct discount factors by access seekers, the alternative operator's costs of WCA over cable decrease with █████% (or █████ euros / month per line, from █████ to █████ euros/month per line – see section 2.1.4). The alternative operator's cost of WCA over KPN's network go down with █████% (or █████ euros/month per line, from █████ euros/month to █████ euros/month – see section 2.1.4).

From 5. and 6. it follows that the net margins for the alternative operator are as follows

- █████ when using KPN WCA²⁵
- █████ when using VZ WCA²⁶

We note that the positive business case for alternative operators when using WCA provided by KPN heavily relies on the 15% discount offered by KPN²⁷. The question is then whether VZ would be able to offer a similar discount²⁸. WIK assumes that this is not the case²⁹. We find this assumption appropriate as VZ would need to make changes to the network and the organisation involving a considerable increase of CAPEX and OPEX³⁰. Without a discount, we conclude that the business case for an access seeker to offer a retail product on the basis of WCA over cable is negative and that demand for WCA over cable is likely non-existent.

2.2.2 Business case for rolling out to VULA is already positive with 1% market share

WIK concludes that for an entrant with a market share of above 2%, it is profitable to invest in rolling out its network to the metro locations of KPN, as it can realise a higher net margin using KPN's VULA services compared to using KPN's WCA services as well as compared to VZ's WCA services. (See Figure 2-1 below).

25

26

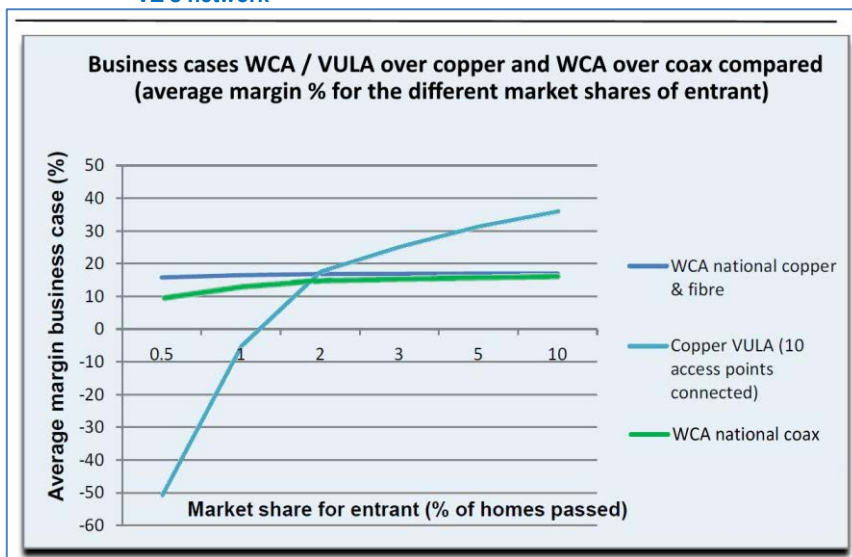
27

28

29 WIK (2017, p. 2) "The lower margin for the coax business case is explained by the significant volume discount (15%) on KPN's WCA service, which is applicable for KPN's copper network only."

30 In chapter 3 we assess the size of these incremental CAPEX and OPEX related to the provision of WCA over cable.

Figure 2-1 WIK's comparison of the entrant's business cases for WCA and VULA using KPN's and VZ's network

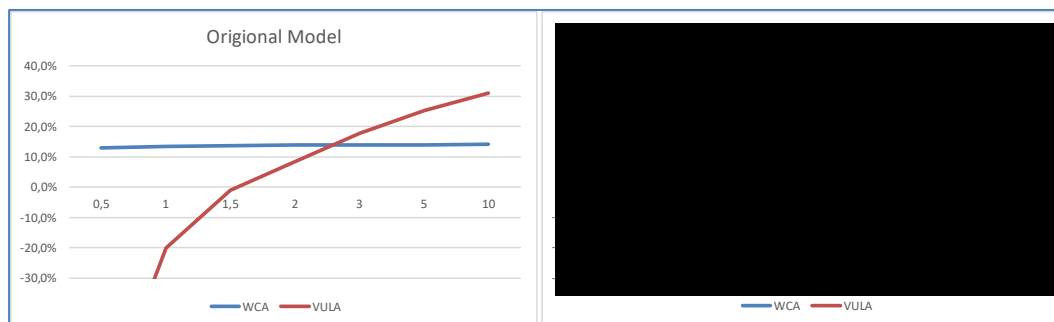


Source: WIK (2017)

The above conclusion on the threshold market share of 2% is affected by the overestimation of transport costs (see section 2.1.5 above), the underestimation of the discount offered by alternative operators relative to the incumbent's retail price, as well as by the assumptions made on user profiles on cable networks. Correcting for these mistakes, WIK's Excel model shows that the business case for VULA access becomes positive at much lower market shares. Based on the results from the public Excel model³¹, we conservatively estimate that WIK's conclusions would have to be adjusted as in the Figure 2-2 below³².

³¹ In WIK's public Excel model (using some alternative values for certain input parameters), the business case for a national VULA roll-out becomes positive at a market share of more than 2,5% (see left panel in figure below). After correcting the mistake related to transport pricing, the VULA business case for a national VULA roll-out already becomes positive at a market share of 1%. (see right panels in the figure below).

Net margins WCA/VULA over copper compared for different % market shares

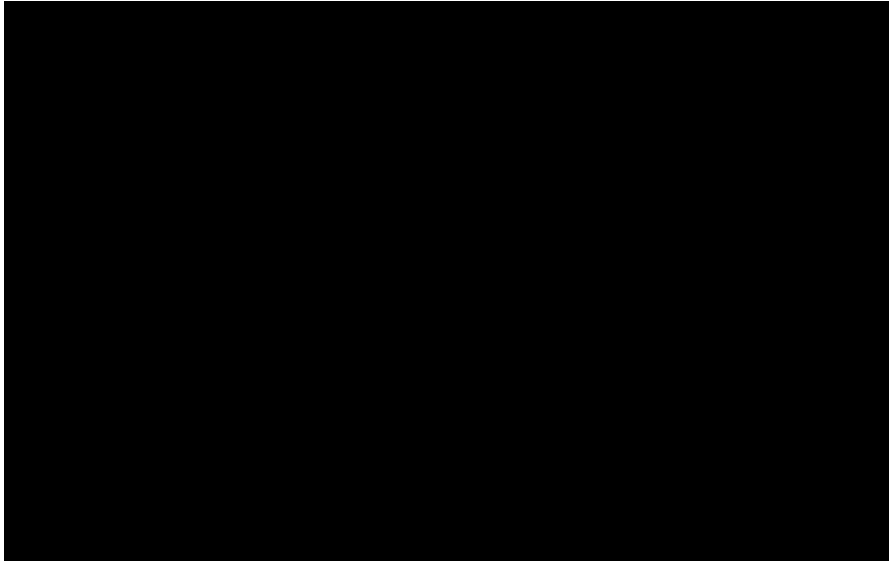


WIK (2017)

Ecorys using a corrected version of WIK's model

³² Conservative in the sense that the analysis using WIK's public Excel file indicates that correcting the mistake leads to a 1.5%-point decline of the threshold market share while Figure 2-2 assumes that the effect is only 1%-point.

Figure 2-2 Adjusted comparison of the entrant's business cases for WCA and VULA using KPN's and VZ's network



Source: adjusted from WIK (2017)

It follows that a new entrant aiming for a future market share of 2% will always choose for WCA over copper rather than for WCA over cable. This conclusion is reached not only from the observation that the net margin for WCA over cable is very low for all market shares, but also from the fact that choosing WCA over copper allows the entrant to migrate to VULA and realise a much higher net margin once it has passed the 1% market share threshold³³.

2.3 Sensitivities in WIK's analysis

Below we analyse how sensitive WIK's model is to assumptions made regarding user profiles, market share potential of the access seeker, and to assumptions made with regard to the hypothetical tariff structure and rates applied by VZ.

2.3.1 *Alternative assumptions on the entrant's customer profiles on cable*

The focus of the WIK model is "on best effort products without premium services. The entrant offers products that are as good as those of the incumbent." However, we have shown in the previous chapter that a new entrant aiming for a future market share of 2% will not choose WCA over cable. Therefore, a new entrant contemplating using WCA over cable may have another strategy than simply offering the same (no premium) services as the incumbent, e.g. specifically targeting heavy users or specifically targeting light users.

To properly assess the effect of these strategies, we use as base scenario our adjusted customer profiles on cable using VZ data (Table 2). We explore three alternative scenarios for heavy users, and two scenarios for light users. For the base case, we consider the blended ARPU for VZ to be 50,69 euros/month (recalculation of WIK's methodology based on Table 2-2 and Table 2-4). We assume that the alternative operator undercuts VZ's blended ARPU by 20%. ARPUs in the alternative scenarios are adjusted according to adjustments in user profiles.

³³ Even if VZ could offer a 15% volume discount, the entrant's business case for WCA over copper remains superior despite the lower net margin, because it can migrate to VULA and once the entrant has surpassed a market share of ~1%.

The distribution across speeds (shares according to bandwidth) in the heavy user scenarios is as follows³⁴:

Table 2-11 User profiles in the heavy user scenarios

--

Note that we used WIK’s public model for the analysis. The confidential version of the model would result in █████-points higher net margins for the access seeker using WCA over coax (after having corrected for user profiles and retail prices). For the heavy user scenarios, the outcomes of the public model are as follows:

Table 2-12 Results of the heavy user scenarios

--

More heavy users make the business case marginally profitable. Even when we correct for the differences between the public and confidential version of WIK’s model and add █████points to the results of the heavy user scenarios, the net margins remain far below the net margin an access seeker can realise when using WCA over copper (████) or VULA over copper (████).

Moreover, the heavy user scenarios do not account for the fact that there is only limited growth capacity; the WIK model does not provide for this. In reality, an increase in bandwidth use will result in severe problems in quality of service unless major investments in capacity are made. See also chapter 3.

The distribution across speeds (shares according to bandwidth) in the light user scenarios is as follows:

Table 2-13 User profiles in the light user scenarios

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For the light user scenarios, the outcomes of the public model are as follows:

³⁴ The scenario’s use the same distribution for double and triple play within speed categories as the Base case

Table 2-14 Results of the light user scenarios

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A lighter user profile obviously makes the business case less profitable compared to the base case..

We conclude that the business case for a new entrant is not profitable using WCA over cable if they target lighter users and hardly profitable if they target heavier users.

2.3.2 Alternative assumptions on the entrant’s market share potential

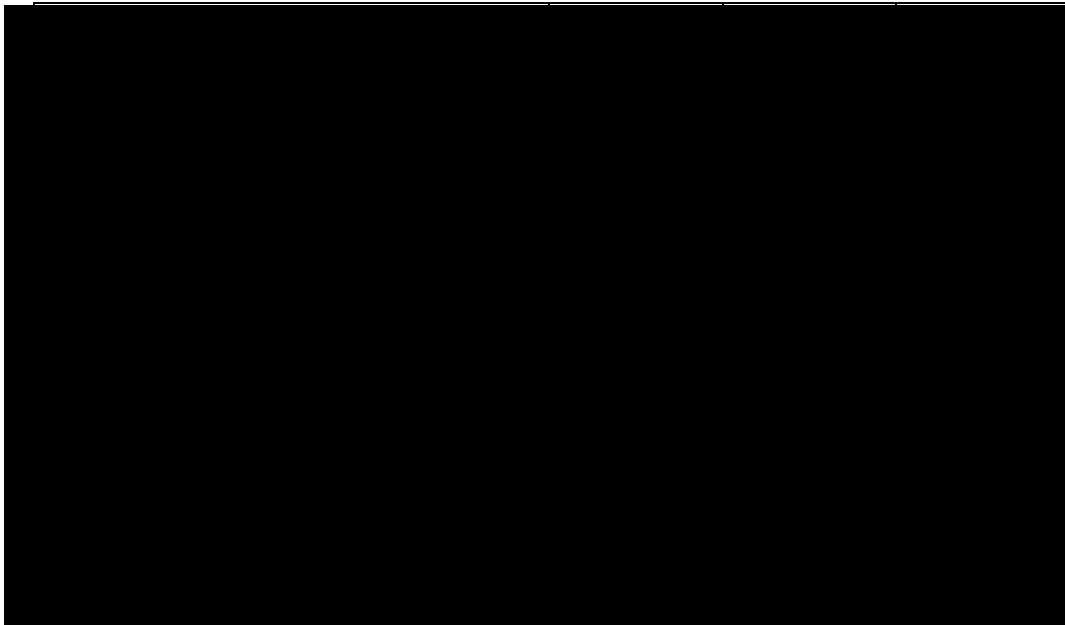
WIK uses a market share of 2% in the report as representative of the viable business case of an alternative operator. We have shown above that the business case for an entrant using WCA over coax is not viable with a market share of 2%. Logically, the business case for the entrant worsens when it has 1% market share. But even when the market share grows to 3%, the business case for an entrant using WCA over coax becomes only marginally positive. The tables below present the calculations behind these conclusions.

Table 2-15 Business case for WCA over coax with 1% market share

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With 1% market share the net margin deteriorates to -5.6% in WIK’s public model, which implies a net margin of █% in WIK’s confidential model.

Table 2-16 Business case for WCA over coax with 3% market share

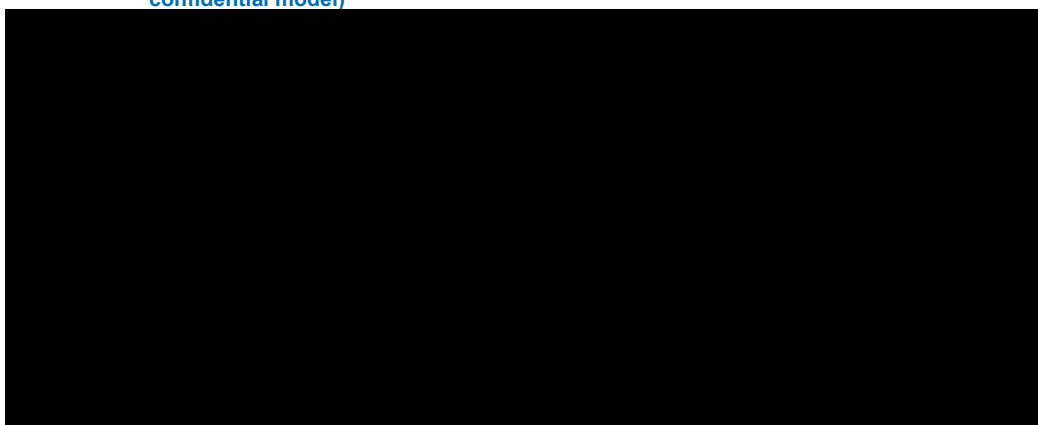


Even with a market share of 3%, the business case for the entrant remains negative in WIK's public version of the model. WIK's confidential version of the model would result in a (marginally) positive net margin of █%.

For completeness, the figure below compares the net margins for different market shares. The left panel illustrates the results from WIK's confidential model (that we expect) when using the original values for user profiles and retail prices³⁵. The right panel illustrates the results of WIK's confidential model (that we expect) when using the corrected values³⁵. Comparing the left and right panel shows that, after correcting the data on user profiles and retail prices, █

█. █.

Figure 2-3 Net margins WCA over coax compared at varying market shares (likely results from the confidential model)³⁵



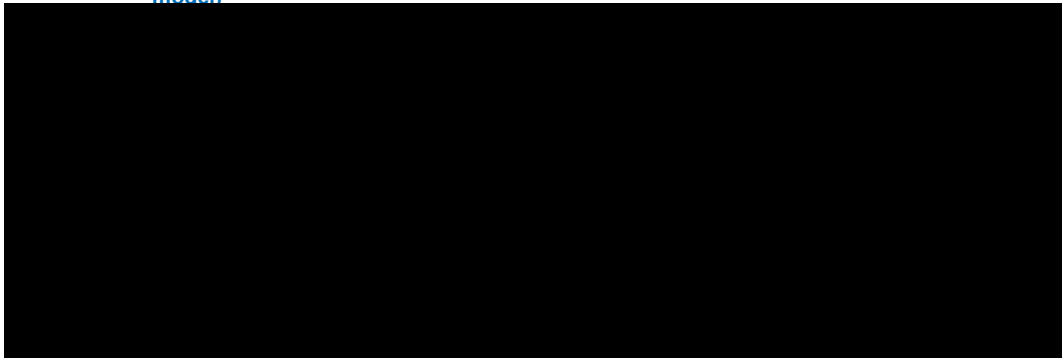
Source: Ecorys based on WIK (2017).

³⁵ This data is produced by changing market shares in WIK's public model and adding █%-points to the resulting net margins.

2.3.3 Alternative assumptions on the wholesale prices charged by VZ

WIK has assumed that the tariff structure and rates for WCA over coax would (approximately) be the same as the tariff structure and rates for WCA over copper (not accounting for volume discounts). When, however, VZ's prices would be 10% higher or lower, the wholesale costs for the access seeker operating over VZ's network would change. Given the cost share of ~60%, the impact on the alternative operator's net margin is ~6%-points higher or lower. The figures below illustrate this.

Figure 2-4 Net margins WCA over Coax at different price levels (likely results from the confidential model)



Source: Ecorys based on WIK (2017).

The right panel shows that, when the price for WCA over Coax would be [REDACTED] lower, the net margin for an access seeker with a 2% market share is [REDACTED]%, and remains below the net margin it would realise using WCA over copper ([REDACTED]% – see section 2.2.1) and far below the net margin it would realise using VULA over copper ([REDACTED]% – see section 2.2.2). When the price for WCA over coax would be [REDACTED]% lower, the net margin with WCA over Coax (purple dashed line in the right panel above) would (approximately) equal the net margin realised with WCA on the copper network. However, this would still be far below the net margin for VULA over copper.

For an entrant aiming at a market share of more than 1%, the rational choice would remain to operate over KPN's network.

2.4 Summary and conclusions

- We used WIK's model to analyse the business case of the access seeker using various wholesale access products. This analysis provides information on whether there would be demand for a WCA product offered by VZ. As WIK, we assumed that VZ would apply a similar tariff structure and tariff rates as KPN.
- We conclude that WIK's analysis of the access seeker's business case is based on several flawed assumptions. Consequently, the analysis by WIK (considerably) overestimates the revenue potential of access seekers on the retail market, it overestimates the access seeker's (non-wholesale) costs for WCA over VZ's cable network, and overestimates the access seeker's wholesale costs for VULA over KPN's copper network.
- Both a new entrant as well as the currently active alternative operators are likely to use KPN's network, rather than using a WCA service offered by VZ. For access seekers with a market

share of less than 1%, the optimal choice is to use KPN's WCA services. (In fact, the business case for using WCA by VZ is negative). For access seekers with a market share of more than 1%, the optimal choice is to use KPN's VULA services.

- Even if the price for WCA over cable were to decrease by 15%, the rational choice of the access seeker aiming at a market share of more than 1% would remain to operate over KPN's network. With a discount of 15%, the net margin when using WCA over coax may be (slightly) higher than the net margin realised with WCA over copper, but it remains (far) below the net margin realised with VULA over copper.
- It follows that there would be no demand for WCA over cable; or at least this demand is highly uncertain and not based on the actions of a rational entrant.

3 Costs of providing access

This section provides an analysis of the incremental costs for providing WCA L3/bitstream service over VZ's HFC network. Section 3.1 highlights the impacts of the wholesale service on VZ's network and operations. Section 3.2 calculates the financial implications of the required changes in terms of capital expenditures. Section 3.3 calculates the financial implications of the required changes in terms of operational expenditures. Section 3.5 presents the required wholesale revenues to cover the incremental CAPEX and OPEX. Section 3.6 summarises our results, reviews all the important assumptions we made during the cost analysis, and highlights their impact on the results.

We start our analysis with five assumptions. First, initially, there will only be one entrant. Second, VZ will not offer wholesale access before 2020. Third, the entrant will resale the video service and will not offer an Internet-only package. Fourth, Customer Premises Equipment (CPE) will be provided by the entrant from a list of VZ approved devices. Fifth, the entrant will be able to offer differentiated service packages with reasonable limitations only.

3.1 Impact on VZ's network and operations

3.1.1 Description of the current network

VZ has over [REDACTED] million residential Internet end-users and has a penetration rate of about [REDACTED]%.³⁶ VZ's hybrid fibre coax (HFC) network is based on the DOCSIS 3.0 standard, and at present VZ operates up to 862 MHz. [REDACTED]

[REDACTED] 37

The MPLS-based core IP backbone of VZ comprises ■ Regional Core locations. The ■ Regional Core locations are connected via DWDM³⁸ optical rings to a total of ■ Regional Centers (RCs). The ■ Regional Centers then are connected to a total of ■ Local Centers (LC's), where the DOCSIS 3.0 CMTs are located. Approximately ■ regional nodes are connected to the ■ Local Centers using a ring topology.

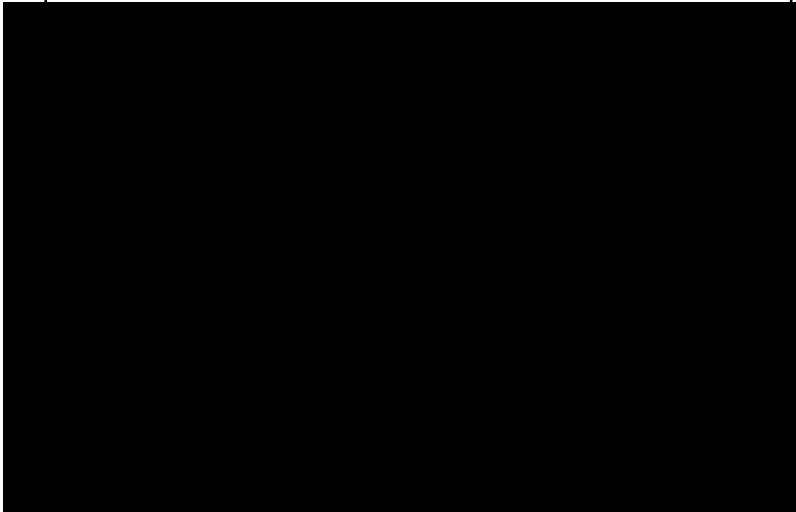
The coaxial cable segments are fed by the [REDACTED] fibre nodes, which are connected to CMTSSs located at the Local Centers. The coax network segment currently has approximately [REDACTED] group amplifiers and a total of [REDACTED] end amplifiers. Each end amplifier serves about [REDACTED] customers on average. Figure 3-1 describes the current topology of VZ's HFC network.

³⁶ These Q2'16 figures are from VodafoneZiggo's preliminary Q2'2017 report. The Q2'17 figures are [REDACTED] million Internet users and [REDACTED] % penetration rate.

37 [REDACTED] standard enables transmission speeds of up to 10 Gbps downstream and 1 Gbps upstream making use of more spectrum, better modulation and coding schemes, and more efficient error correction.

38 DWDM: Dense Wavelength Division Multiplexing.

Figure 3-1 VodafoneZiggo's current data-over-cable network topology



Source: VZ

3.1.2 Changes to the network

In order to prepare its HFC network for a wholesale offer using Layer 3 (WCA) bitstream service, VZ and the access seeker(s) would need to [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED].

To prepare its network to offer L3 bitstream access, VZ would need to:

- Prepare for [REDACTED]
- Plan and provide [REDACTED]
[REDACTED].
- Integrate its [REDACTED].
- Provide proper (and non-discriminatory) engineering, field, and operational support to the access seeker's Internet service.
- Change its existing organisation to ensure that the new organisation can handle wholesale-service related tasks and guarantee adequate operation.

Assumptions

We assumed that VZ would have sufficient capacity installed at the beginning to transport the additional wholesale traffic; therefore, we only added handover points to VZ's network topology. After the wholesale service is introduced, the capacity demand then will grow faster than without the access seeker's traffic and capacity upgrades will have to be performed sooner (e.g. higher backbone link capacity, new core node system and/or hierarchy, additional CMTS capacity, frequency readjustment, fibre node splitting). These cost elements are detailed in Section 3.2.1.

3.1.3 Changes to operations and processes

On top of the technical changes described in Section 3.1.2, there are significant changes that need to be implemented in VZ's operations and processes to be able to offer WCA services.

- Changes in the OSS/BSS system
- Changes in the VZ organisation.

Changes in the OSS/BSS system are needed to enable access seekers to handle retail customer orders, faults, and inquiries in a manner that is equivalent to that of the incumbent's retail arm.

_____.

VZ's organisation needs to adapt to ensure compliance with the wholesale agreement. VZ must provide adequate engineering, field, and operational support to the access seeker(s) on a non-discriminatory basis. A new wholesale department must be created to ensure that VZ's processes and systems operate as expected, to monitor processes, to act as an interface between the access seeker and VZ, and to assist in dispute resolution.

According to VZ's own traffic analysis, the average weighted busy-hour traffic of a residential end user is [REDACTED] kbps (mid-2017 data). Assuming a year-to-year growth of 40%, using a 25% mark-up factor for port-dimensioning, and assuming linear growth of end users, this implies an initial handover capacity need of [REDACTED] Gbps for the first 2-3 years. [REDACTED].

When calculating the incremental capacity upgrade costs related to the WCA service, we made the following assumptions:

1. The Access Seeker captures approximately ~162,000 customer gradually, over a period of five years starting in 2020.⁴⁰
2. By 2024, the Access Seeker will have a total of ~162,000 customers, which represents █% of the total (retail + wholesale) cable customers served by VZ.
3. Because retail broadband services over coax are considered near perfect substitutes for retail broadband services over copper, we assume that a total of 50% of the Access Seeker's end users are retail customers who were previously with VZ; and the other 50% of the Access Seeker's end users are new; i.e. previously non-VZ customers.
4. The average weighted busy-hour traffic of the Access Seeker's end user is approximately the same as that of VZ.⁴¹

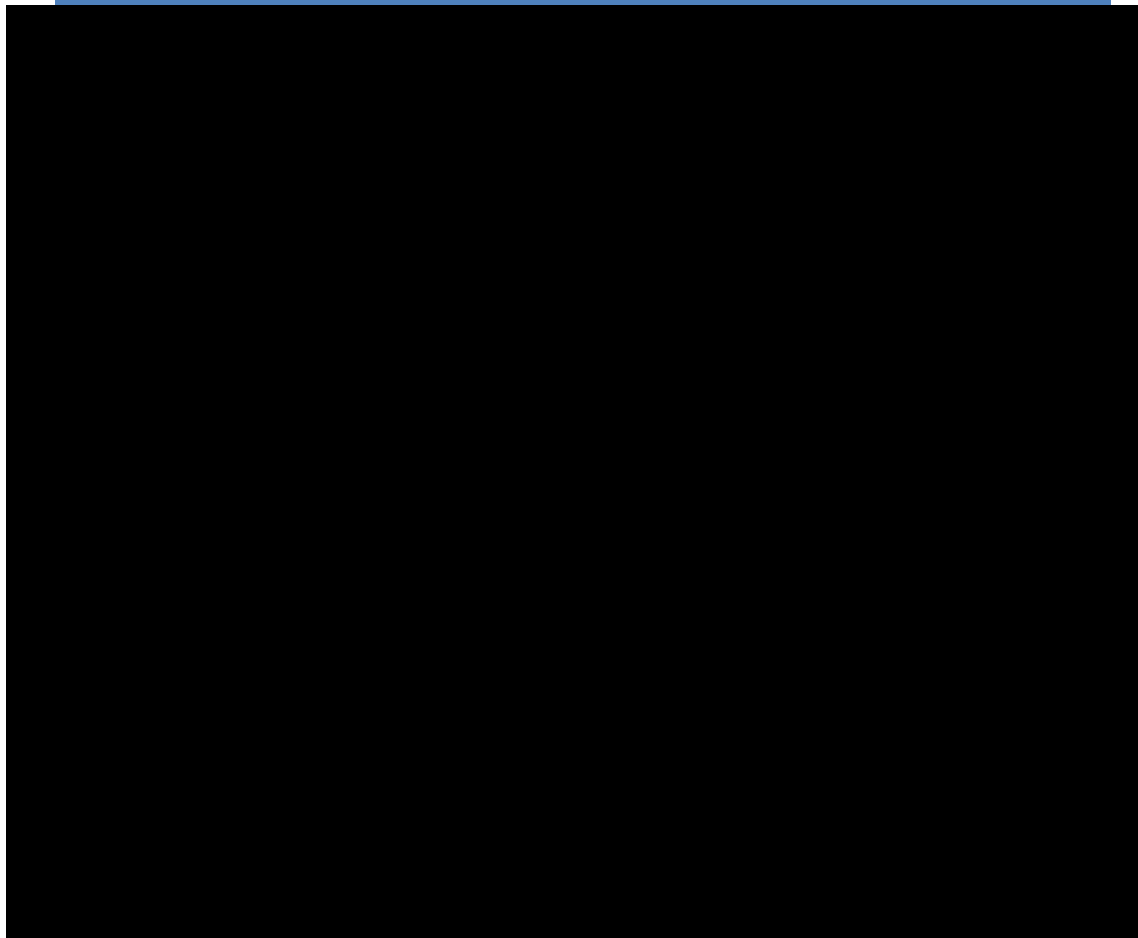
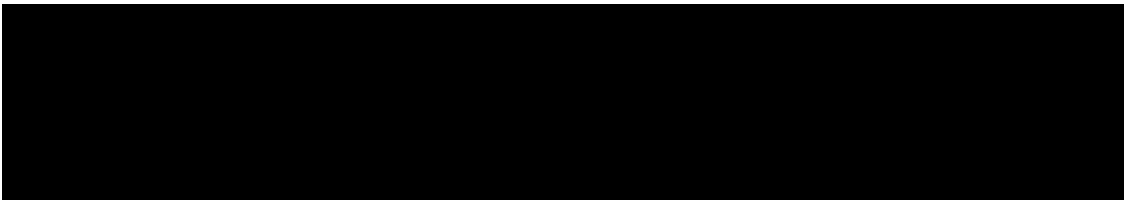
We disregarded the spectrum upgrade costs from the list of capacity-related CAPEX items, and took a conservative position that this cost item would be spent anyway; regardless of VZ's obligation to offer WCA L3/bitstream service. In addition, we assumed that VZ's incremental CAPEX spending will be proportional to the incremental cable customers VZ would need to serve due to its assumed wholesale service obligation.

Table 3-2 shows the calculation of VZ's incremental (CAPEX) investment due to its assumed WCA service obligation. We assumed that the service starts no earlier than █.

⁴⁰ The 162,000 customer is equivalent of █ of the VZ's customer base, or █% of the total households passed (demand potential).

⁴¹ If the Access Seeker will attract heavy users or if the distribution of the access seeker's customers is not homogeneous across the VZ network, the total costs of the additional capacity will likely be higher than the figures shown in [Table 3-2](#).

Table 3-2 Capacity upgrade costs allocated to WCA

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Source: VZ (2017)

3.2.2 *Investment (CAPEX) in the OSS/BSS*

The investments in VZ's own OSS/BSS need to enable the support of the wholesale processes efficiently and cost effectively. We assumed that an appropriate level of automation (a highly efficient electronic data exchange) will be provided to properly support the access seeker's mass-market retail product. In addition, we assumed that the features, the level of automation, and the access to the support systems are provided on a non-discriminatory basis.

Based on inputs from VZ, we assessed the CAPEX estimates of integrating VZ's own OSS/BSS with the OSS/BSS of the Access Seeker(s) and grouped the cost estimates into six categories:

- Customer Interface Management
- Service Assurance (incl. fault repair)
- Order Intake & Fulfilment
- Operational Support & Readiness

- Billing & Customer Relationship Management
- Data Protection Regulation

Customer Interface Management CAPEX [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED].

VZ's Service Assurance and Fault Repair processes [REDACTED]
 [REDACTED]
 [REDACTED]s.

The Access Seeker's business processes related to *Order Intake and Fulfilment* [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED].

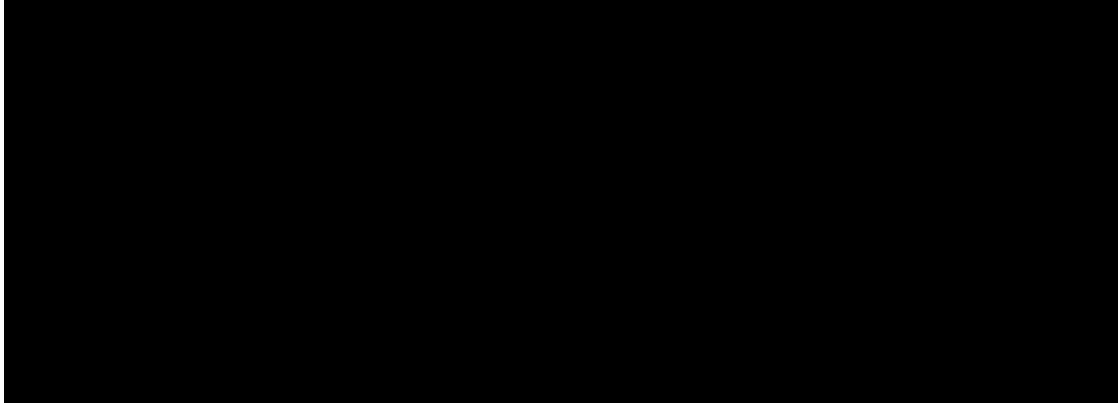
The business processes related to *Operational Support & Readiness w* [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]s.

As to *Billing & Customer Relationship Management*, [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED].

The *General Data Protection Regulation (GDPR)* [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED]

Table 3-3 shows the OSS/BSS integration costs required to support WCA L3/bitstream services. These costs have been estimated based on interviews with internal experts and accounts of VZ.

Table 3-3 OSS/BSS integration costs

The table content is completely redacted with a solid black box.

Source: VZ (2017)

The figures in Table 3-3 are based on the assumption that the WCA L3/bitstream service will not be implemented [REDACTED]. If the wholesale service must be implemented [REDACTED], the required CAPEX investment will be *significantly* higher.

3.3 Financial implications – change in OPEX

The introduction of the WCA L3/bitstream service will result in additional operational expenditures. These incremental operating expenses include employee salaries/wages, employee travel and training expenses, utilities, supplies, maintenance expenses, insurance costs, and outside consultant fees. Our assessment of the additional OPEX cost items is based on the investment amount required to perform the OSS/BSS integration (see Section 3.3.1) and is based on the estimated increase of the FTE in the organisation due to the wholesale activities (see Section 3.3.2).

3.3.1 OSS/BSS OPEX changes

The assessments of the add-on OSS/BSS operation and maintenance costs are based on the calculated CAPEX requirements for implementing the changes due to the layer 3 bitstream service requirements.

According to VZ, the incremental OPEX for the operation and maintenance of the modified OSS/BSS system is estimated to be [REDACTED]% of the identified OSS/BSS integration costs. Based on the CAPEX estimates of [REDACTED] million (see Section 3.2.2), this results in an incremental increase of [REDACTED] that VZ would need to pay to run its modified OSS/BSS.

We assumed that WCA L3/bitstream service will not be implemented [REDACTED]. If WCA must be implemented [REDACTED], the required incremental OPEX investment for the operation and maintenance of the modified OSS/BSS system will be *significantly* higher.

3.3.2 Other OPEX changes

VZ must provide adequate network engineering, field engineering, and operational support to the access seeker(s) on a non-discriminatory basis.

We assume that a new wholesale department will be created with a total of █ FTE to perform the following tasks:

-
- | Government | Percentage |
|---------------------|------------|
| Current government | 100% |
| Previous government | 0% |

The estimated OPEX for the wholesale department is based on the FTE budgeting cost of [REDACTED] Euro per year; for [REDACTED] FTE the total is [REDACTED] Euro per year.

3.4 Summary of financial implications

To summarize:

- Total upfront CAPEX related to CMTS upgrades (see section 3.2.1) and to OSS/BSS integration (see section 3.2.2) add up to roughly █ million euros.
- Recurring CAPEX related to capacity upgrades and traffic handover (see section 3.2.1) grow over the years from █ million euros in year one to █ million euros in year 5 (adding up to a total of █ million euros during the period 2020-2024).
- Total incremental OPEX related to OSS/BSS operations and maintenance (section 3.3.1) and to other wholesale related activities (section 3.3.2) add up to roughly █ million euros per year, or a total of █ million euros during the period 2020-2024.

3.5 Required wholesale revenues to cover the incremental CAPEX and OPEX

Apart from the current cost-base of VZ's operations, the incremental CAPEX and OPEX associated with the provision of wholesale access, require VZ to realise an additional annual stream of wholesale revenues of approximately █████ million euros during a period of 5 years:

- About █ million euros is required annually to cover the one-off upfront investments in CMTS upgrade and in adjusting the BSS/OSS system⁴².
- And an additional revenue stream of █ million euros is (on average) required to cover the recurring investments in capacity expansion and traffic handover⁴³.

⁴² Based on a NPV analysis assuming a 5-year period to earn back the investment of █████ million euros and assuming a discount rate of 4.5% (which is the WACC used by ACM for KPN's copper network), the required annual revenue stream is about █████ million euros. (Note that the discount rate is conservatively chosen. ACM applies a WACC of 6% for KPNs FttH networks and VZ uses an even higher WACC for internal accounting purposes)

43 Which grows over the years from █████ million euros in year one to █████ million euros in year 5. Based on an NPV analysis which assumes a 5-year period to earn back the investments and a discount rate of 4.5%, the required cumulative annual revenue stream is growing from █████ million in year one to █████ million euros in year five.

- An additional annual revenue stream of █ million euros is required to cover the incremental OPEX.

From a commercial business case perspective, VZ would charge these incremental costs to its wholesale clients (who cause these incremental costs). For the assumed case of one access seeker gradually expanding its market share to 2% over a period of 5 years (representing ~162,000 customers in year 5), this implies an additional mark-up of around █ euros/month/access line on top of the current cost base of VZ's self-supplied wholesale services⁴⁴.

3.6 Summary and concluding remarks

Table 3-4 summarises the incremental CAPEX and OPEX items to enable L3 bitstream access over the existing VZ HFC network and to offer WCA services from 2020 onwards.

Table 3-4 Summary of incremental CAPEX and OPEX (€ million)

* This CMTS upgrade would likely take place █. See Section 3.2.1.

** To be able to start wholesale service in 2020, OSS/BSS integration works █

In order to break even, VZ should realise an additional annual revenue stream of 4.4 million euros to cover the incremental Opex and Capex (or █ euros/month/access-line).

The cost calculations in this section assume that:

- VZ will not offer wholesale access █ and (initially) there will only be one entrant.
- The CPEs will be provided by the entrant (and they make their selections from a VZ approved CPE hardware/software list).
- The entrant will resale the video service and will not offer an Internet-only package.
- The 3rd party ISP(s) can offer differentiated data packages with reasonable limitations.
- VZ prepares for the traffic handover at its IP core central location(s).
- VZ plans and provides additional CMTS, backbone, plant capacity that takes the additional demand into consideration.
- VZ integrates its OSS/BSS platform with the access seeker's OSS/BSS platform.
- VZ changes its existing organisation to ensure that the new organisation can handle wholesale-service related tasks and guarantee adequate operation.
- VZ provides adequate engineering, field, and operational support to the access seeker's Internet service.

⁴⁴ Because the market share of the access seeker is still small in year one, the mark-up is relatively high (about █ euros/month/access line). As its market share grows, the mark-up per month/access line gradually decreases to █ euros in year five. On average, the mark-up is about █ euros/month/access line.

Note that there are several sources of potential cost increases which we did not consider in our calculations:

- If VZ needs to offer wholesale cable bitstream access [REDACTED] then the OSS/BSS integration costs will be significantly higher than we calculated. [REDACTED]; therefore integration with the entrant's OSS/BSS platform [REDACTED].
- [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED].
- If the Access Seeker has the flexibility to pick its own CPE and if they pick a CPE which is not on the VZ approved CPE list, then the cost of CPE testing and data delivery ecosystem integration testing will also need to be considered. These system integration test costs will depend on the specific CPE (HW/SW) selected and the frequency of such request.
- If the Access Seeker can offer many differentiated data packages without reasonable limitations, VZ's total costs of fulfilling such requirement will be higher than we calculated.
- If the Access Seeker attracts heavy users or if the distribution of the Access Seeker's customers is not homogeneous across VZ's nationwide network, then the incremental costs of the additional capacity will likely be higher than we calculated.
- If the Access Seeker can also offer Internet-only service, VZ might need to replace a large number of legacy STBs to support scrambled video content. The cost of this potentially required CPE replacement is not considered in our calculations.
- If the Access Seeker cannot just resale the video service but also offer its own video content, VZ's then will incur additional costs of fulfilling this requirement. The cost of the entrant seeker's add-on video service is not considered in our cost calculations.

4 Conclusions

The purpose of this report is to substantiate or disprove WIK's assumption that it is economically feasible for VZ to offer WCA services. The central question we answer is:

Is there is a positive business case for VodafoneZiggo to offer wholesale central access based on IP-bitstream?

This business case depends on

- A. Is there demand for wholesale cable access? I.e. (when) is there a positive business case for an access seeker on cable?
- B. Can VZ offer wholesale cable access for a competitive wholesale price (relative to the wholesale prices charged by KPN)?

In chapter 2 we assumed (like WIK) that VZ applies a tariff structure and tariff rates similar as those applied by KPN. In Chapter 2 the following conclusions are drawn:

- The business case when using WCA services over cable is negative. The net margin for an access seeker with 2% market share using WCA services over cable would be ■■■■%, which is approximately ■■■■%-points lower than the net margin realised when using WCA services over copper.
- For access seekers with a market share of less than 1%, the optimal choice is to use KPN's WCA services. For access seekers with a market share of more than 1%, the optimal choice is to use KPN's VULA services.
- It follows that there would be no demand for WCA over cable; or at least this demand is highly unlikely.

In chapter 3 we conclude that, in order to provide WCA over coax, VZ would need to make a number of changes in its network and in its organisation. These changes include:

- An initial increase in CAPEX of around ■■■■ in CMTS upgrades and in adjustments to the BSS/OSS system;
- A recurring increase in CAPEX, which grows from ■■■■ million euros in year one to ■■■■ million euros in year five, for annual improvements in capacity expansion and traffic handover; and
- An annual increase in OPEX of ■■■■million.

Total expenditures (CAPEX and OPEX) related to the provision of wholesale access during the period 2020 to 2025 add up to ■■■■million euros.

The analysis by WIK (and the analysis in chapter 2 of this report) do not account for the incremental CAPEX and OPEX associated with the provision of wholesale access. The incremental CAPEX and OPEX require VZ to realise an additional annual stream of wholesale revenues of approximately ■■■■ million euros during a period of 5 years, or an additional mark-up of around ■■■■ euros/month per access-line. Such a mark-up would further deteriorate the already negative business case for alternative operators using WCA over coax.

We conclude that:

- VZ cannot offer wholesale cable access for a competitive wholesale price (relative to the wholesale prices charged by KPN).
- Imposing an obligation on VZ to offer WCA services for a price similar to KPN's prices would imply an annual loss for VZ of ■■■ million euros (■■■■■ million euros over a period of 5 years), while demand for WCA over cable is still highly uncertain.

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