ERG (09) 34

ERG DRAFT Common Position

on

Next Generation Networks Future Charging Mechanisms / Long Term Termination Issues

Consultation period: 14 October 2009 – 10 December 2009

October 2009

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Executive summary

The last few years have seen a lively debate on charging mechanisms for terminating services (interconnection of communication networks) at the wholesale level. Currently payments for terminating services at the wholesale level in PSTN/mobile and IP-networks are typically governed by different charging mechanisms. As separate networks are expected to converge towards a multi-service (including voice) NGN IP-network such differences may not be sustainable or efficient in the long run, and it may be appropriate to define a charging mechanism for voice termination that would avoid arbitrage between regulated and unregulated services and resulting competition problems. A converged multi-service NGN-IP seems to benefit from a *single* terminating charging mechanism[1].

This convergence is considered an important factor driving the need to assess which interconnection regime is appropriate for the long-term. This Draft Common Position (CP) specifically assesses Bill & Keep (BaK) as an alternative to the currently used regime for voice in Europe: calling Party Network Pays (CPNP). If a regime change is appropriate, a new long-term regime might be introduced before the migration to NGN takes place, however the migration provides a unique chance to adjust in parallel the networks and the charging mechanism[2].

Another important driver for this assessment of BaK, is the expected decrease of cost price (unit cost) for both voice and data services.[3] Due to this expected fall in cost price the difference between BaK and CPNP is decreasing facilitating the migration. Irrespective of this the relative merits in the long run of BaK and current CPNP need to be assessed.

This document is a follow-up document of the Common Statement on IP-IC/NGN Regulatory Principles for NGN Core[4], where the ERG concluded that BaK has a number of attractive properties, but needs further study.

The issues to be discussed arise equally for fixed networks as well as for mobile networks. Factors like the convergence of fixed and mobile networks could lead to consider new regulatory approaches for current-generation networks as well. Taken together these convergence developments require a technological neutral and consistent regulatory regime.

The most appropriate long term regulatory regime for termination should be efficient in terms of welfare results from a static and a dynamic perspective. Given the objective that sector specific regulation should be temporary, there is also a clear desire to simplify regulation and reduce the regulatory costs for all parties involved.

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1 For a more detailed discussion see ERG (2008) which also analysed charging mechanisms (CPNP vs BaK) in the context of migration to NGNs.
2 See Vogelsang (2006) and ERG (2007)
3 NGNs are expected to exhibit significantly lower OPEX and CAPEX in the long run than current legacy technologies (see ERG, 2008b, Part 4, No. 2 and ERG, 2008, p. 83/84).
4 See http://erg.ec.europa.eu/doc/publications/erg_08_26_final_ngn_ip_ic_cs_081016.pdf.

This draft CP specifically assesses BaK as an alternative to the current CPNP interconnection regime. The reason for this is that BaK (or a variant of it) is the most promising alternative to CPNP with support in the relevant literature.[5] Assessing different alternative regimes would unnecessarily complicate the assessment.

If the expected decrease in regulated prices (or price caps) for wholesale termination under the current CPNP regime materializes, the difference between CPNP and BaK, in terms of effects, will decrease. This is an important development that also effects the relative merits of interconnection regimes and which may pave the way for a regime change.

The structure of this assessment (the CP) is as follows. Chapter 2 describes the elements of the interconnection regime. Chapter 3 defines BaK and at which network locations (or which network level) BaK would be applicable. The latter is called the boundary of BaK. Chapter 4 contains empirical data that is used and referred to in the remainder of this CP. Chapter 5 contains the assessment of the effects of BaK. Chapter 6 assesses issues of practical implementation such as the effect of traffic to and from outside the domain that uses BaK (BaK domain), arbitrage and migration. Finally, Chapter 7 contains a summary and overall assessment (see below). Specific questions to address areas where input of the stakeholders is sought are included throughout the document and summarized again at the end.

The main results of the assessment can be summarized as follows:

First it was observed that the convergence of networks, the transition to NGN networks and the growth of data services, all cause the costs of voice per minute to fall. This is relevant for the full cost including common and joint cost, but even more relevant for the incremental cost of termination. This is an important fact because the more the costs per minute decrease and come closer to zero, the less the difference between CPNP and BaK in terms of effects will be and the more important the higher regulatory cost of setting a rate under the CPNP regime will become. Regarding the falling costs per minute, it is also important that the absolute difference in cost per minute between fixed and mobile is decreasing.

Second, the effects of BaK on the termination bottleneck where assessed in section 5.1. The conclusion was that BaK reduces regulatory cost and uncertainty (see section 5.1.3). Another conclusion was that moving cost recovery from termination, which is a regulated market, to competitive retail markets increases incentives for cost minimization as more cost are subjected to competitive cost recovery (see section 5.1.2).

Third, it is assessed how well BaK internalises call and network externalities. Consideration of *call* externalities would lead to the conclusions that – assuming usual plausible cost and utility distribution and bearing in mind their uncertainty - BaK is likely to internalize these effects better than CPNP. There is also not much evidence that network externalities are important

5 See e.g. DeGraba (2000); Littlechild (2006); Marcus (2006); Harbord/Pagnozzi (2008); WIK-Consult (2008).

when setting termination rates and even if they were important in general, it is not clear that termination rates are a good tool to increase the number of subscribers to telephone networks.

Fourth, the effects of BaK on different retail offers and customer groups are assessed. There are two main probable effects that can be discerned here. The first is that BaK is expected to lead to higher average usage per capita and a lower average price per minute. The second is that BaK could possibly lead to a slightly lower handset ownership. The prediction of these effects is based on both empiric data as on logical reasoning. From the section on empirical evidence it seems evident that countries that use BaK – or near BaK – regimes have far higher usage and a lower average price per minute. From the adjusted Merrill Lynch data it follows that, on average, usage in BaK countries is more than twice as high and price is half of the price in countries with a CPNP regime. Logical (theoretical) reasoning also predicts these effects. Crucial in the logical reasoning is the mechanism that BaK decreases the marginal costs of traffic and the cost risk related to especially flat-rate offers that drives higher usage. Higher usage in combination with the large scale effects (economies of scale present in fixed and mobile networks) create lower costs per minute and so BaK feeds a positive feedback loop of higher usage and lower prices.

Overall these two effects suggest that BaK is likely to deliver a material welfare gain to consumers overall. Consumer welfare is mainly determined by usage per capita and price. Total welfare is mainly determined by usage per capita and the cost per minute. For consumer welfare and total welfare the ownership is mainly only an indirect variable that is relevant as far as it drives higher usage per capita. Ownership is therefore integrated in the weighing of aggregate effects by looking at the usage per capita and not at the usage per active user.[6] Weighing the usage per capita, price and ownership effects together, the higher usage and lower price per minute clearly indicate BaK results in a higher consumer and higher total welfare.

On the evidence available, the possibility of slightly lower handset ownership and penetration under BaK is less important than the potential positive effect of higher usage and lower prices. We do not have strong evidence to suggest that the impact of BaK on ownership rates would be significant, and in any case (as noted with network externalities) higher termination rates are a blunt tool for boosting handset ownership. It is further noted that high penetration is generally related in Europe with handset subsidies that drive churn and frequent replacement of handsets, a phenomenon of which the efficiency (in terms of total welfare) is questionable. This higher welfare for BaK is a total, aggregate effect however and at more disaggregated level low usage consumers could possibly face slightly higher prices.

Fifth, the effects on operators are assessed. These effects are mixed. Moving to BaK will influence the competitive strength of groups of operators and individual operators especially in the migration to BaK. It is in general not possible to say which category or group of operators will benefit. What is clear is that mobile operators will lose their current cash stream from fixed

6 In formula form: usage per capita = usage per user x ownership = usage per subscriber x penetration

operators related to the relatively high MTRs. Thereby the move to BaK and the expected adjustment of fixed and mobile prices will imply an adjustment of the competitive balance between fixed and mobile operators.

It is noted again that predicting in general the effects on other groups of operators is not possible. The effects depend on the traffic balance of the individual operators. By moving to BaK some operators will benefit but others will have a disadvantage especially during the migration in which the industry adjusts to the new regime. Given the falling cost per minute and the expected lower level of terminating rates under a CPNP, these effects are not expected to be very substantial in general. However, a change of regime and the resulting adjustment process could result in some transaction costs and as such this is a negative element of moving from the current regime to BaK.

Sixth, the effects on cost efficiencies (or productive efficiency) are assessed. The conclusion is that BaK has no positive or negative impact on investment incentives. These are expected to remain unchanged because termination rates just transfer money between operators and do not change the general ability to raise revenue from the retail market. The assessment of efficiency of cost recovery, externalities and the effect on usage and pricing assessed in other sections, do not indicate BaK leads to a lower efficiency that could negatively impact investment incentives. On the contrary, BaK seems to lead to higher usage and related higher investment levels. The so called problem of hot potato routing does not exist as long as the application of BaK is limited to termination at a specified boundary and does not extend to transit services.

Seventh, the effect on QoS is assessed. Regarding voice termination BaK is not expected to result in lower QoS because the terminating operator has an incentive to deliver reasonable service for his own customer who is receiving the call.[7] At least incentives regarding QoS are not different in CPNP or BaK.

Eighth, the effect on CPS is assessed. Possible distortions by moving to BaK in the competitive balance between CPS and non-CPS operators can be corrected by applying a mark-up on the regulated tariff that the CPS operator pays to the incumbent for originating traffic.

Finally, some practical implementation issues are assessed. This leads to the conclusion that there are no blocking implementation issues regarding BaK, but that there is one negative aspect related to the implementation of BaK in a certain domain (for example a country of group of countries) while the outside world remains at CPNP. This effect results from the fact that there will be cash flow from BaK to CPNP domains, which means users within the BaK domain subsidize users in the CPNP domain. Another conclusion regarding the practical implementation is that if BaK is introduced, it should be done in gradual change requiring a sufficiently long glide path to allow retail business models and retail pricing to adjust slowly.

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7 Possible exceptions regarding dominant operator are outlined in Section 5.5.

The following major effects (pro and con) of BaK were assessed:

The most important effect is the expected significant higher usage and lower price per minute that, although with possibly slightly higher prices of low usage offers and slightly lower mobile ownership, overall will lead to higher consumer and total welfare. The ERG assesses this as a primary and big advantage of BaK. The other effects that where identified in this CP are secondary in nature.

Secondary positive effects of BaK are the following: firstly, the shift of cost recovery to the competitive retail domain as such gives better incentives for efficient cost recovery. Secondly, there will be a reduction of regulatory costs and uncertainty.

Secondary negative effects of BaK are the following. firstly, the transition and adjustment process to BaK could create limited transaction cost of the regime change. Secondly, users inside the BaK domain subsidise users outside the domain. The significance of this effect depends on the percentage of outside BaK domain traffic and the level of termination rates outside the BaK domain.

Some other issues are neither positive nor negative for BaK, but nevertheless are relevant for this final integrated assessment. Firstly, there is some inherent uncertainty in the prediction of effects of different interconnection regimes. Secondly, due to falling cost per minute and especially lower incremental cost per minute, the difference in the effects of BaK and CPNP will decrease. Thirdly, If BaK is introduced it should be done gradually through a sufficiently long glide path. NGNs with lower costs will give an additional incentive to shorten the migration period needed for a shift of the charging mechanism towards BaK.

Weighing the pros and cons summarized above the ERG concludes that the expected higher usage and lower price under BaK outweighs the cons in general if BaK is introduced gradually through a sufficiently long glide path. The lower regulatory cost and uncertainty is an extra benefit of BaK. This is the more relevant in the longer term where the cost per minute decreases, the difference in effects of CPNP and BaK decrease and the cost of determining a cost oriented tariff becomes relatively more important.

However, some of the cons could justify continuation of the CPNP regime at least for the short and medium term. Especially in countries (1) where CPS operators are important for competition (moving to BaK could be more complicated in that case, because of the possibly appropriate mark-up on voice originating), (2) that have a significant percentage of traffic to neighboring countries that use CPNP regime (which means BaK introduces a subsidy to the CPNP domain). Also the uncertainty about the effects could be a reason to be cautions, possibly keep the CPNP regime in place and monitor the effects of lowering terminating rates under the CPNP regime first, before the step to BaK is made.

Therefore, BaK is more promising than CPNP as a regulatory regime for termination for the long term and based on national circumstances (including legal issues) NRAs could set a glide path to BaK within the regulatory period related to the next market analysis they carry out for voice termination. However, for the short and medium term CPNP can also be an appropriate

choice based on national circumstances, so NRAs can also continue the CPNP regime at least in the next regulatory period.

1 Introduction and drivers of change

The last few years have seen a lively debate on charging mechanisms for terminating services (interconnection of communication networks) at the wholesale level. Currently payments for terminating services at the wholesale level in PSTN/mobile and IP-networks are typically governed by different charging mechanisms. As separate networks are expected to converge towards a multi-service (including voice) NGN IP-network such differences may not be sustainable or efficient in the long run and it may be appropriate to define a charging mechanism for voice termination that would avoid arbitrage between regulated and unregulated services and resulting competition problems. A converged multi-service NGN-IP seems to benefit from a *single* terminating charging mechanism[8].

This convergence is considered an important factor driving the need to assess which interconnection regime is appropriate for the long-term. This Draft Common Position (CP) specifically assesses Bill & Keep (BaK) as an alternative to the currently used regime for voice in Europe: calling Party Network Pays (CPNP). If a regime change is appropriate, a new long-term regime might be introduced before the migration to NGN takes place, however the migration provides a unique chance to adjust in parallel the networks and the charging mechanism[9].

Another important driver for this assessment of BaK, is the expected decrease of cost price (unit cost) for both voice and data services.[10] Due to this expected fall in cost price the difference between BaK and CPNP is decreasing facilitating the migration. Irrespective of this the relative merits in the long run of BaK and current CPNP need to be assessed.

In its Common Statement on IP-IC/NGN Regulatory Principles for NGN Core, the ERG laid the basis for this work by providing an economic analysis of different charging mechanisms (CPNP versus bill & keep, "BaK").[11] The ERG concluded that BaK has a number of attractive properties, but needs further study. In the ERG WP 2009 a work plan on Charging mechanisms for IP interconnection with the following items has been identified:

- Implications for different business models, competition and subscribers

- Practical implementation issues:
  - Migration issues;
  - Defining the border for application of the BaK regime;
  - How to treat traffic from outside the BaK area;

- Other long term forms of regulation.

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8 For a more detailed discussion see ERG (2008) which also analysed charging mechanisms (CPNP vs BaK) in the context of migration to NGNs.

9 See Vogelsang (2006) and ERG (2007)

10 NGNs are expected to exhibit significantly lower OPEX and CAPEX in the long run than current legacy technologies (see ERG, 2008b, Part 4, No. 2 and ERG, 2008, p. 83/84).

11 See http://erg.ec.europa.eu/doc/publications/erg_08_26_final_ngn_ip_ic_cs_081016.pdf.

The issues mentioned in the ERG work plan arise equally for fixed networks as well as for mobile networks. Factors like the convergence of fixed and mobile networks could lead to consider new regulatory approaches for current-generation networks as well. Taken together these convergence developments require a technological neutral and consistent regulatory regime.

The most appropriate long term regulatory regime for termination should be efficient in terms of welfare results from a static and a dynamic perspective. Given the objective that sector specific regulation should be temporary, there is also a clear desire to simplify regulation and reduce the regulatory costs for all parties involved.

In doing so ERG will work from the objectives included in Art 8 of the Framework Directive (Para 2-4) namely promoting competition and in so doing encouraging efficient investment in infrastructure and ensuring that users derive maximum benefits in terms of choice, price and quality as well as promoting the internal market.

Other important criteria are that the interconnection regime sets incentives for efficient use of the network and arbitrage can be prevented. Regulatory costs should be low and uncertainty and distortions being prevented. The regime should be flexible with regard to future network and service evolution.

This Draft CP specifically assesses BaK as an alternative to the current CPNP interconnection regime. The reason for this is that BaK (or a variant of it) is the most promising alternative to CPNP with support in the relevant literature.[12] Assessing different alternative regimes would unnecessarily complicate the assessment.[13] This CP will therefore analyze more specifically all aspects of BaK trying to break down the abstract analysis done so far in the IP-IC/NGN Common Statement to concrete areas including an assessment of the various effects on different consumer groups, for different operators and business models as well as the competitive situation in the markets, harmonization and practical implementation issues.

As stated before in the beginning of this introduction, the cost price of both voice and data services is expected to fall in the near future. This is expected for both fixed and mobile services and is mainly driven by the development of NGN networks that deliver all or most services through a common, shared infrastructure. This decreasing cost price is relevant for the full cost including common and joint cost, but even more relevant for the incremental cost of termination. Regarding the falling costs per minute, it is also important that the absolute difference in cost per minute between fixed and mobile is decreasing. Beside this also the view on which costing methodology is appropriate within the CPNP regime is changing. The European Commission has released a new recommendation on the regulatory treatment of

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12 See e.g. DeGraba (2000); Littlechild (2006); Marcus (2006); Harbord/Pagnozzi (2008); WIK-Consult (2008).

13 Other charging mechanisms, e.g. based on imposing reciprocity while leaving the level of rates to the negotiation as proposed by Valetti et al., are not elaborated to the extent that allows a similar comprehensive analysis or are somewhere in between the two charging mechanisms (CPNP and BaK) compared in this paper (and therefore from the methodological issues covered anyway).

fixed and mobile termination rates in the EU.[14] A crucial element in this recommendation is the pure LRIC costing methodology. In this pure LRIC methodology the non-incremental (common and joint cost) should not be allocated to termination, resulting in a lower relevant cost price.

Both these developments (expected decrease of inherent cost prices and the different costing methodology) are expected to result in lower regulated prices (or price caps) for wholesale termination under the current CPNP regime. If this development materializes, the difference between CPNP and BaK in terms of effects will decrease. This is an important development that also effects the relative merits of interconnection regimes and which may pave the way for a regime change.

The structure of this assessment (the CP) is as follows. Chapter 2 describes the elements of the interconnection regime. Chapter 3 defines BaK and at which network locations (or which network level) BaK would be applicable. The latter is called the boundary of BaK. Chapter 4 contains empirical data that is used and referred to in the remainder of this CP. Chapter 5 contains the assessment of the effects of BaK. Chapter 5 first looks at the effects of directly addressing the termination bottleneck, i.e. the effects of moving cost recovery from a whosale market with SMP to a retail market with competition and the effects on regulatory cost and uncertainty. Secondly, the impact of call and network externalities on the efficiency of interconnection regimes are assessed. This is mostly a theoretical assessment. Then in section 5.3 the effects on retail pricing for several user groups and different operator categories are assessed. This is assessment is a combination of what theory predicts and what empirical data show. In section 5.3 cost efficiency issues like investment incentives and hot potato routing are assessed. Section 5.5 deals with Quality of Service (QoS) and section 5.6 with the impact on Carrier PreSelection (CPS). Chapter 6 assesses issues of practical implementation such as the effect of traffic to and from outside the domain that uses BaK (BaK domain), arbitrage and migration. Finally, Chapter 7 contains a summary and overall assessment of all issues. Specific questions to address areas where input of the stakeholders is sought are included throughout the document and summarized again at the end.

Question 1 (Section 1):

Do you agree that in a multi-service NGN environment, in which different services use a shared transport layer, different interconnection regimes for different services could create arbitrage problems? If yes, could you describe the problems that you foresee or that have already occurred. If no, what prevents these arbitrage problems in your view?

14 Commission Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, C(2009) 3359 final, 7 May 2009.

2 Elements and application of an interconnection regime

Interconnection is the physical and logical linking of public communications networks used by the same or a different undertaking in order to allow the users of one undertaking to communicate with users of the same or another undertaking.[15] On a general level interconnection comprises the following aspects:

- connecting two networks and;
- routing the traffic; and
- auxiliary services (e.g. gateways or collocation[16]).

For the purpose of this paper only the first two points are looked at.

2.1 Elements of an interconnection regime

Interconnection contracts have to specify at least the following items:

- the number and geographic location of interconnection points as well as functionality and hierarchy of these interconnection points. They are determined by the network architecture;[17]
- the network performance needs to be specified (e.g. best effort and/or some additional transport classes specifying the relevant network performance parameters like jitter, delay and packet loss);[18]
- furthermore, an interconnection regime is characterized by the charging mechanism used, i.e. who pays for which part of the value chain. This has an impact on the market power that can be exerted by different market parties at different levels of the value chain;[19]
- in case interconnection is regulated according to ex-ante cost based regulation (assuming that CPNP is applied as charging mechanism), costing and pricing principles have to be discussed (structure of tariffs according to hierarchy, accounting units such as minutes, bandwidth, etc., thus, the relevant question rather is “what is paid for”). [20]

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15 Definition based on Art. 2 b Access Directive.
16 If the number of interconnection points is at choice of the terminating operator, inclusion of gateways and colocation of one rack could be used as incentive to avoid to high number of interconnection points. See 3.2)
17 For a detailed description of this issue and related problem see ERG (08) 26rev1, Ch. B.3.3.
18 See ibid, Ch. B.3.5
19 See ibid, Ch. C.6
20 See ibid, Ch. C.5

Other elements like service level agreements (SLA), that may also need to be agreed upon in an interconnection contract, are not discussed here.

2.2 Application of an interconnection regime to transport and/or services

Electronic communications networks will become packet switched, mostly or completely based on the IP. They will be multi-service networks, rather than service specific networks, for audio (including voice), video (including TV-services) and data networks, allowing a decoupling of service and transport provision.

As the transition towards IP-based NGNs is considered to be one of the main drivers for a general discussion on charging mechanisms[21] and had already been taken up by ERG in this context (ERG (2007), ERG (2008)) it also provides a good opportunity for discussing the timeline of a change of charging mechanism. Nevertheless a change to BaK may also be conceived either before or after the transition to NGNs is completed since charging mechanisms are applicable in a technologically neutral manner and are always part of the interconnection regime.

Multiservice character of IP networks

This document takes account of the multi-service nature of NGNs and the decoupling of service[22] and transport, the paper looks at IP interconnection in general, and is not confined to voice interconnection. Nevertheless, the following aspects respects require a closer look at voice interconnection: traditional network operators are mainly preoccupied with migrating their voice service to NGN/IP networks. Furthermore, VoIP is the service best known to telecommunications network operators, whereas other services like VoD, IP-TV or presence services are still in early stages of evolution, and are less well understood at the service level. Also a more regulatory perspective requires a certain focus on voice services. The markets that are regulated today relate to the public telephone network. For example, the markets for call origination (market 2) and call termination (market 3) of the Recommendation explicitly refer to public telephone networks.[23]

However, VoIP traffic already constitutes a relatively small fraction of overall IP traffic, in the future it is to be expected this fraction will continue to be small in comparison to other services.[24] Therefore considering the migration to all IP-networks it seems plausible to apply the charging mechanism of the IP-networks (that are *not* phased out as PSTN networks will

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21 See e.g. Marcus (2006) or WIK-Consult (2008)

22 In this document the term service will be used in a wide sense signifying services provided to the end-user. Therefore use of the term service is not confined to the service layer described in some NGN documents but includes parts of the control layer (relevant to services), the service and the application layer.

23 It should be noted that telephone services provided on the public telephone network are not confined to voice service, for which the public telephone network was originally designed but include fax and Internet access.

24 Cisco estimates global consumer Internet traffic until 2011, cf. WIk-Consult (2008), p. 42.

over time). To reflect convergence towards multi-service networks the current Review proposal foresees that the term public telephone network will converge to the broader definition of electronic communication networks.[25]

Separation of transport and service

The multiservice character of IP networks is related to the key feature of the possibility to decouple service[26] and transport.

A core feature of NGN architecture is the separation of the main functional levels, i.e., generally a distinction can be made between transport and service. This separation of transport and service constitutes an essential feature of NGN specifications in both the specifications on NGN (ITU-T) and NGI (IETF).[27] A crucial point is the adoption of open and standardised interfaces between each functional level in order to allow third parties to develop and create services independent of the network. In the present Internet this allowed easier service creation (as it lowered entry barriers) which contributed to the success of the Internet and TCP/IP protocol suite.

This separation of transport and services would require a change of the definition of "interconnection services" i.e., service interconnection and transport interconnection:[28]

- Transport interconnection includes the physical and logical linking of networks based on simple IP connectivity irrespective of the levels of interoperability. It is characterised by the absence of the service-related signalling, implying that there is no end-to-end service awareness. Consequently, service specific QoS and security requirements are not necessarily assured. Only transport-specific performance objectives[29] for performance parameters are negotiated that affect the transmission performance at the point of interconnection (e.g. availability) and the IP packet transmission performance via interconnected networks.[30]

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25 Note: In the current Review proposal the term „public telephone network" is deleted thereby better taking account of the multiservice nature of future networks.

26 In this document the term service will be used in a wide sense signifying services provided to the end-user. Therefore use of the term service is not confined to the service layer described in some NGN documents but includes parts of the control layer (relevant to services), the service and the application layer.

27 See e.g. the description of ITU architecture in ERG (2007), Ch. A1.1 (p. 39). For a comparison of NGN and NGI see Hackbarth/Kulenkampff (2006), Ch. 3.4.

28 See Ch. 1.3.1 (p. 5) stating that with IC taking place at separate levels, this may require defining different IC services.

29 For e.g. bit rate, delay and packet loss ratio.

30 This definition does not exclude that some services may provide a defined level of interoperability or the establishment of transport classes to guaranty specific quality parameter at this level.

- Service interconnection is understood as including solely service-specific aspects.[31] It consists of logical linking of network domains, having access and control of its resources including the control of signalling (i.e. session based service-related signalling[32]). Depending on the kind of service, different aspects must be considered. For example, in the voice service, the call server interconnection is required for call setup and disconnection. Interconnection between services from different operators requires a minimum set of technical (e.g. defined by a SLA) and commercial conditions to be fulfilled by both operators.[33]

Considering the multiservice character of NGNs future networks can possibly evolve in two different ways: they can be either "service-aware" or "service-agnostic". This in turn may impact on the definition of the interconnection "service" and respectively the charging mechanism for it.

The separation of transport and services will be crucial for the definition of the interconnection points. Transport and service interconnection might occur at different nodes and hierarchy levels. Considering the distinction between transport and service, transport interconnection could take place at a greater number of locations than service interconnection.

We now turn to the definition of the BaK charging mechanism bearing in mind the changes implied by the transition towards NGN architectures (e.g. with regard to the number of points of interconnection - PoIs).

Question 2 (Section 1 & 2.2):

What is the influence of the separation of transport and service for the interconnection regime and in particular the charging mechanism and in what way are NGNs and BaK related?

3 Definition of the BaK Charging mechanism

3.1 Definition of BaK

BaK is a wholesale billing regime under which each network bears the costs of terminating traffic coming from other carriers. Therefore, under BaK the terminating access network operator does not receive payments at the wholesale level for the termination provided.

31 This definition is taken from the Common Statement (ERG (2008).
32 Information that allows identification of the end-to-end service that has been requested.
33 These conditions may include inter alia: mutual policies for exchange of data, agreement of charges, agreement on performance and reliability levels.

Instead, it recovers its net costs incurred for termination –- and any payments for upstream connectivity – in other ways, e.g. by billing them to its end customers.[34]

3.2 Definition of the boundary

The term "boundary" describes the locations or PoIs of the terminating network (in other words: the *network level*) from where BaK is applicable. So the boundary *is defined* as the set of PoIs at which BaK only applies if an operator connects to *all* these PoIs, unless the terminating operator voluntarily also provides the possibility to connect at fewer PoIs. In the latter the terminating operator in fact provides BaK at a range of network levels and the operator that interconnects can choose the most convenient one. The larger the number of PoIs, the lower is the network level.

In addition to the remark that BaK only applies if operators are connected to "all" the PoIs on the boundary, it is noted that operators can connect at fewer PoIs. However, in that case BaK only applies for the traffic that is destined for the area at which the connection is made. For other cases, restricting BaK to the situation where interconnection is made at all PoIs on the boundary is crucial in the definition of the boundary. If "all" is left out of the definition, the result would be that the border is a "range of network levels from which the sending operator can choose". Although this is a possibility that the receiving operator can voluntarily choose to offer, this would be too broad as a generic definition of the boundary. This broader definition would not be appropriate if BaK is imposed by regulation. This illustrated by an example: if a regulator imposes BaK and states the lower limit of the boundary is a set of 10 PoIs, than it would not be reasonable if BaK also applied when an operator connects only at 2 or 5 PoIs. This would de facto mean that an obligation is imposed to offer BaK at a range of network levels. The latter is not necessarily the least intervening remedy and may therefore not be appropriate.

Regarding the network level at which operators interconnect and the technical (or productive) efficiency of interconnecting, there is a trade-off in interconnecting at a lower network level or at a higher network level. The costs that play a role in this trade-off are (1) the cost of purely connecting to the different PoIs - these are not traffic related and are called the "non-traffic related costs" here - and (2) the cost to transport local traffic to a higher level where networks are interconnected and then transporting it down to a lower network level again, that are called the "transport costs". Non-traffic related costs are for example the costs of collocation, network

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34 This is also the definition used in the ERG Common Statement on Regulatory Principles of IP-IC/NGN Core, page 88). It is further outlined there (page 23/24) that BaK for the last segment of termination of the broadband access provider requires no regulatory intervention as long as two conditions are fulfilled: 1) The transit market on IP-backbones is sufficiently competitive to exert competitive pressures on IP-backbone providers. With an oligopoly of Tier 1 providers allowing choice of transit provider this condition has so far been considered to be fulfilled. 2) The broadband access market is sufficiently competitive so that access providers are under competitive pressures to be prevented from establishing abusive mark-ups on retail prices

gateways. They rise if the number of PoIs rise.[35] On the other hand, transport costs rise if the number of PoIs decrease, that is: as the level of interconnection moves to a higher level. After all, connecting at a higher level means that local traffic – that is traffic within a certain geographical region – must be transported up to a higher level where it is transferred to the other network and then transported down again. To summarize, the efficient interconnection level is a trade-off between choosing a level that is not too low, because then the non-traffic related costs get too high, and not too high, because then the transport costs get too high.

It is generally believed that the efficient network level for interconnection will move up with the transition to NGN, because transport costs are believed to decrease and connecting at to many PoIs increases the complexity of routing traffic between networks. So, the number of PoIs at which interconnection is efficient is expected to decrease with the transition from legacy to NGN networks.[36]

If BaK is applied as a regulatory obligation, it maybe necessary to set rules regarding the boundary where BaK is applicable. In principle, this is not different from rules for providing regulated termination under a CPNP regime. Those rules should prevent an operator providing BaK at a too low or possibly also at a too high network level. In both cases, interconnection could become inefficient or could be used in an anti-competitive way, for example to raise rivals costs. A terminating operator could effectively block the use of BaK by making interconnection to his network costly (inefficient). For example, by setting the level too low, a terminating operator could maintain the SMP termination bottleneck. Such a remaining termination bottleneck could be prevented by a rule that sets a certain maximum number of PoIs at which BaK should be provided, or in other words: a rule that sets a *lower limit* to the boundary.

Assessing the nature of a rule regarding the lower limit of the boundary, the following can be said. On the one hand, the lower limit of the boundary should not be too low as this would require the originating operator to interconnect at too many PoIs, creating to much non-traffic related costs. This would mean that some PoIs would not be connected by enough operators, so not enough operators are active in the market above the network level of the boundary (this is the transit market), thus leading to the existence of a non competitive transit market. The lower limit of the BaK boundary should thus be set at a level at which the SMP termination bottleneck is removed. On the other hand, the lower limit of the network level where BaK should be applied should also not be set at a too high network level. After al, setting the lower limit at a high level may just not be necessary to address the SMP bottleneck and therefore be too intrusive and not proportional.

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35 The number of interconnection points and its related costs should not be used in an anti-competitive way. NRAs would need to observe these issues critically. However, these issues are not considered in this draft CP.

36 See ERG (08) 26rev1, Ch. B.3.3.1

The necessity for rules regarding an upper limit to the boundary seem less likely. After all, the expectation that the efficient level for network interconnection is increasing with the transition to NGNs, the actual offered boundary in an NGN context can not easily be too high. However, the minimum number of PoIs (upper limit to the network level) should at least be one, but could be higher for reasons of preventing inefficient transmission cost or for ensuring redundancy in the interconnection.

Regarding the boundary is it further noted that even in a BaK regime payments may apply in certain situations, e.g. for auxiliary services (such as gates or collocation). These services are not assessed in this CP.

Conclusions

BaK only applies at a certain specified boundary (set of PoIs) of the termination network. Regulators could set rules regarding this boundary, for example specifying a lower limit defined by a maximum number of PoIs.

Question 3 (Section 3.2): How would you define the boundary for the application of BaK and where should it be located (i.e. points of interconnection where BaK is applicable)?

4 Empirical data

The following section presents empirical data that is used later in this CP. This mainly concerns data about the downstream retail markets that are influenced by the termination regime at wholesale level. The level of termination rates at the wholesale level will only be fully passed through to the retail level, if the retail level is competitive.

4.1 Empirical evidence on retail pricing models used

The retail pricing models used in a set of EU members[37] have been analysed in order to identity the situation of the different categories of calls and the connection with the termination markets. Such models can be sorted out in four broad categories: per minute, flat rate, partial flat rate and bucket of minutes. The information obtained is summarized here.

37 Austria, Belgium, France, Germany, The Netherlands, Slovenia, Spain and UK.

Fixed operators

- All kind of retail plans (per minute, flat rate, partial flat rate and bucket of minutes) are available for fixed to fixed calls (F2F) across Europe (not necessarily in every *single* country). In some countries a huge percentage of broadband connections are bundled with F2F flat rates, but in any case all kind of retail plans are available for all fixed costumers. The perception is that there are really attractive offers for this category of calls.

- In most cases, for fixed to mobile calls (F2M) are available only per minute pricing schemes. Buckets of (few) minutes are also available in some countries.

- The most common pricing scheme for international calls is per minute. In some countries there are also partial flat rates and buckets of minutes. In some countries pre-paid cards with buckets of minutes are very popular. These kinds of cards are used to offer better value than per minute standard pricing.

- Calls to service numbers: Due to the special characteristics of these type of calls, in all countries the unique pricing scheme is per minute.

Mobile operators

- On-net calls, off-net and Mobile to Fixed (M2F) calls: Per minute and buckets of minutes are the most common schemes. Some of the buckets of minutes are so huge (up to 1000 minutes per month), that the product is almost a flat rate (in fact, some operators offer the product as such). Also, it has to be pointed out that in many countries from the sample usually there is no price discrimination between on-net, off-net and M2F calls. In other countries there are available buckets of minutes to these three categories but the best deals are for mobile on-net and M2F calls. Total flat rates, if they exist, are more expensive.

- International calls: the situation is similar to fixed, with per minute as the most common pricing scheme and other alternatives in some countries such as partial flat rates and buckets of minutes (in form of bolt-on or prepaid cards).

Convergence offers

In some countries there are available “Home Zone” offers where the user has a fixed network tariff scheme for calls to fixed lines when it is located in the home cell or is using a dual WiFi/GSM handset. However, the penetration of these offers is still very low.

Conclusions

The absence of alternative pricing schemes (flat rates, buckets of minutes) is usually related with calls to services with high termination rates. This trend is even more noticeable if there are asymmetric termination rates between calling and called party (i.e. fixed to mobile calls). The empirical evidence of F2F calls suggests that symmetric and low termination rates

between calling and called party allow great variety of retail schemes and are directly correlated with the availability of total flat rates in the market.

4.2 Integrated (empirical) country comparison

The following section is mainly based on data for mobile termination, since these are the only data available. So far there is little empirical data available for IP-interconnection agreements since they are not part of the regulated sphere. However, this limited data base does not constrain the conclusions to mobile networks only.

The presence of different regimes for termination around the world offers an opportunity to compare market outcomes under different regimes. A particularly interesting comparison arises between the CPNP countries of Europe and the very low termination rate regime of the United States (US) which for mobile services can be considered a BaK regime.[38]

In this section we use the following data sets:

- Merrill Lynch, Interactive global wireless matrix for 2008Q3 (ML data);
- ERG regarding the level of MTRs in Europe.

When comparing the regimes from a welfare perspective and from a perspective of explaining correlation and causation between variables or indicators, the following market indicators are particularly useful:

- minutes of use (MoU) per subscriber and per capita;
- subscriber market penetration and ownership, that is percentage of population with one or more phones;
- revenue per minute, which is a proxy of the retail price per minute;
- the level of MTRs in CPNP countries.

There are at least two reasons to treat the raw ML data with caution. First, the ML data is not strictly comparable across countries. As stated by ML:

38 It is noted that (1) it is not sure that mobile operators are all within BaK agreements, although it seems to be the case of the majority of interconnections; (2) that the BaK regime In the US is not a regulatorily imposed BaK, but negotiated commercially between mobile operators, (3) that these agreements are likely to have clauses in which mobile operators keep the possibility to opt out from these agreements if they want. However, we use the US data here to get a prediction of the effects of BaK and in that light it does not seem to be relevant that BaK is not a regulatory regime.

- There is some double counting in BaK countries whose traffic is, therefore, overestimated (about 20%). This concerns the fact that in BaK countries on-net incoming minutes are counted and reported, while in CPNP countries these minutes are not counted and reported;

- The revenue figure used for ARPU i) includes termination revenues in CPNP countries (overestimating their revenues by about 20%) ii) includes handset subsidies (overestimating call revenues in CPNP countries).

Second, penetration measures may be misleading. Penetration is measured as the number of SIM cards per capita, however this does not allow for differences in the number of SIMs held by active subscribers. Therefore, the percentage of the total population that has one or more phones, which is called ownership, is a more relevant variable to consider.

Given the above the ERG conclusion is that the ML data need to be adjusted in order to compare the results in CPNP and BaK countries. Also Ofcom has made adjustments to this data in her recent consultation on MTR regulation.[39] Ofcom adjusted the data to correct for different counting of minutes (minus 20% correction in BaK countries) and to correct for wholesale revenue in CPNP countries ARPU/RPM, that overstates the comparable revenue in CPNP countries by 30%.[40, 41]

Usage and price

The figure below shows the main results for the variables usage and price. Even in these adjusted results, the difference in output between the US and Europe is considerable. US usage (MoU per capita) is about three times higher than the European average indicating a welfare gain for consumers. Singapore and Hong Kong have lower usage than the US but still more than twice the European average. The results for Canada are excluded in this figure because it is not clear which regime Canada is using. The adjusted revenue per minute data

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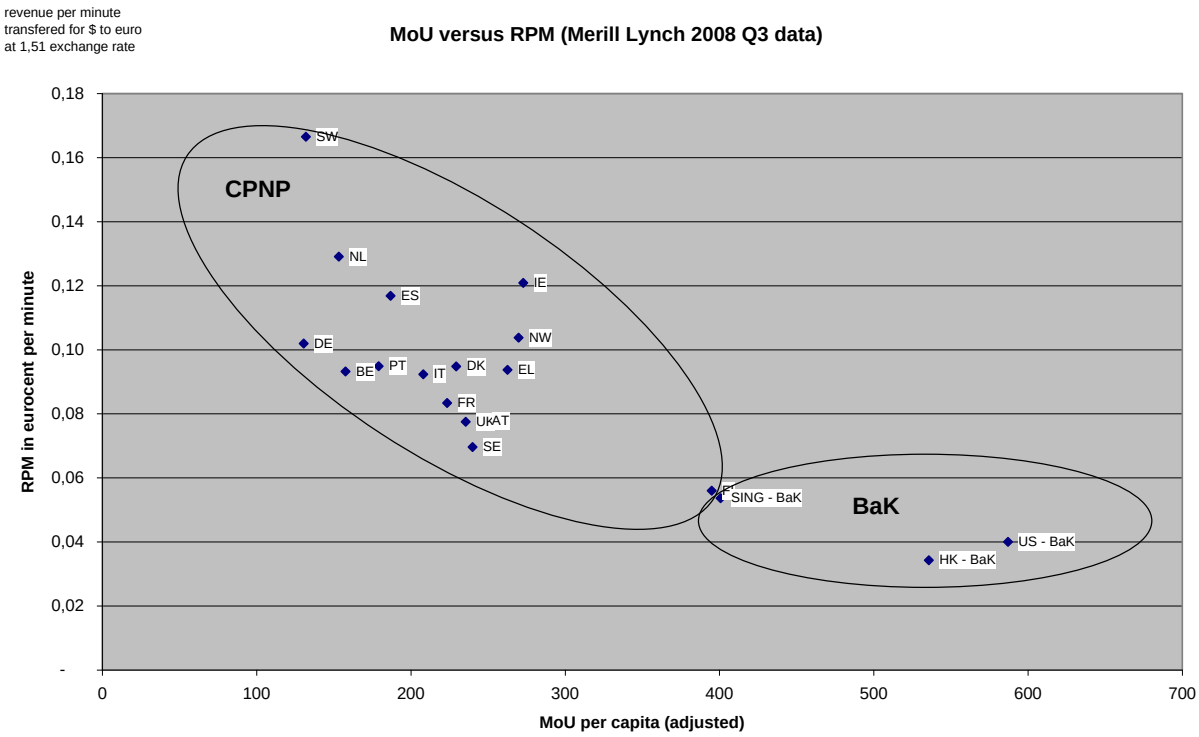
39 Ofcom(2009), Wholesale mobile voice call termination, 20th May 2009. See annex 5, paragraphs 18 to 20.

40 In the figure the MoU and RPM adjusted measures and penetration are computed in the following way. **Penetration** = number of mobile subscription (SIMs) / total population. **MoU [BaK]** = total retail minutes outgoing and incoming (both on-net and off-net). **MoU [CPNP]** = total retail minutes outgoing and total wholesale incoming off-net. MoU [BaK] minus MoU [CPNP] = on-net incoming minutes. **ARPU** = MoU x RPM. **MoU per capita** = MoU per subscriber / penetration. **MoU per capita adjusted [BaK countries]** = MoU per capita x (1- 20%), the 20% being the estimate of on-net incoming minutes (that are not reported in CPNP countries) as percentage of total MoU in BaK countries. **MoU per capita adjusted [CPNP countries]** = MoU per capita (unadjusted). **RPM** = average price for all reported MoU minutes. **ARPU adjusted [CPNP]** = ARPU (1 + 30%) the 30% being the correction for wholesale revenue that should not be counted. ARPU adjusted [BaK] = ARPU (unadjusted). **RPM adjusted {both BaK a & CPNP]** = ARPU adjusted / MoU adjusted. ARPU.

41 Because of the adjustment process the revenue per minute is not the same as the retail revenue per minute in Europe. In fact it is the total retail revenue divided (per) all retail and off-net wholesale incoming minutes (on-net traffic also generates revenues) . Therefore, the actual retail price per minute is higher.

which is a proxy of retail price per minute, show price in Europe is on average roughly twice as high as in BaK countries.[42]

Figure 1: The adjusted revenue per minute (proxy of retail price) and minutes of use per capita (proxy for usage) plotted for CPNP (Europe) and BaK countries



It is sometimes claimed that when prices between Europe and the US are compared on the basis of baskets, the picture regarding price is different. There are several studies that indicate a higher price in the US expect for the highest usage profiles.[43] However, these data are far less aggregated than the adjusted ML data and therefore are less precise as a total, aggregated indicator of price. Therefore, the ERG considers the adjusted ML data a better indicator of real, average price per minute. On a more disaggregated level these price comparisons do indicate that mobile lower usage offers (low end prepaid) have a lower price in the EU compared to the US.

Penetration and ownership

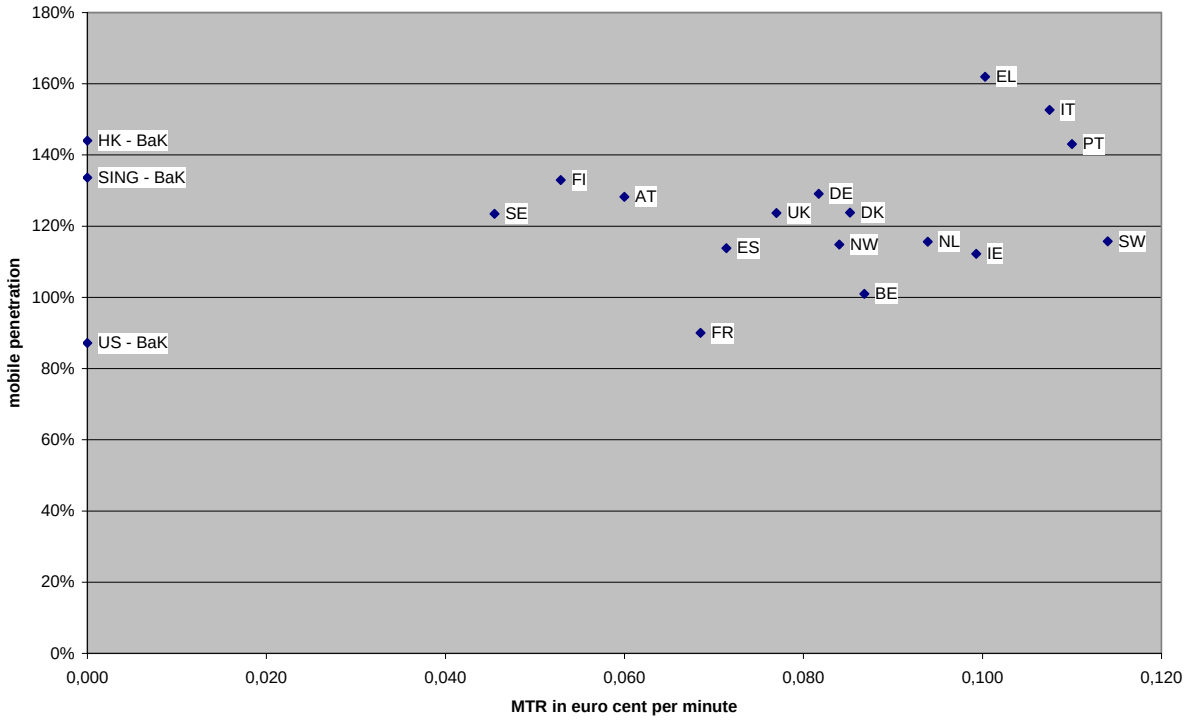
Figure 2 shows the penetration of BaK and CPNP plotted against the level of MTRs (zero for BaK countries). We use penetration in stead of ownership here because we have no data for ownership in individual EU member states. The US penetration of 87% is far lower than the

42 Ofcom, Annex Annex 8.1, p. 11: "B&K with mutual compensation" (actually looking like peering as traffic imbalances are paid for)

43 Ofcom(2009), Vodafone(2008), Plum report, Analysys (2007) talk is cheap in Canada.

EU average of 123%. However, the penetration in Hong Kong and Singapore is somewhat above the EU average. Therefore, this data does not clearly show that penetration is lower in BaK countries. The figure does not show a strong correlation between the level of MTRs and penetration within the EU CPNP countries. For the more relevant variable ownership there is limited data. For 2007 the adult ownership in the US is 76% while 83% in the EU.[44] This shows the difference between the US and EU in ownership, which is to be considered the more relevant parameter for welfare, is smaller than for penetration. Penetration rate in Europe may be artificially inflated due to multiple SIM-cards possibly resulting from on net/off-net price differentiation and handset-subsidies.

Figure 2: Mobile penetration plotted against the level of MTRs. Source: ML and ERG (2008Q3)



Conclusion

Even after making adjustments, the comparison between BaK and CPNP countries still shows that BaK countries have on average twice the usage (in MoU per capita) of that of CPNP countries, while the retail price per minute in BaK countries is half of that of CPNP countries. For penetration and ownership no strong conclusions can be drawn on the correlation with the BaK/CPNP regime. While the lower penetration in the US may be an indication that

44 Vodafone(2008) annex H, table 1, shows several measures indicators of ownership.

penetration could be lower due to BaK, looking at ownership being the more relevant parameter regarding consumer welfare, the difference between the US and Europe is not significant.

Question 4 (Section 4.2): What is your conclusion on the relationship between the charging mechanism and penetration, usage and price level?

5 Issues and effects of BaK

The basic elements of the assessment consist of all kind of relevant issues and questions that are identified in the different sections of this chapter. For example: will there be hot potato routing under BaK or will there be more unwanted calls? All these issues could result in (sub)effects on consumers, producers (and their business cases), competition, harmonization (and in the end: total welfare). These effects on consumers, producers business cases, consumers, competition and harmonization are the central relevant effects on which the (final) total assessment is based.

5.1 Termination bottleneck and effects on competition

5.1.1 Introduction

The competition problems related to termination result from what is called the 'termination bottleneck': an operator completely controls the access for traffic that is destined for his subscribers. Seen from the opposite side: the calling user and originating network have no control over which network the called user is connected to and therefore, under a CPNP regime, the caller can only choose between not making the call or pay whatever charge the terminating network sets for termination. This gives the receiving operator a monopoly position from which it can dictate the charging regime to be CPNP and set the price for termination at monopoly level. Excessive pricing is therefore the main competition problem related to termination.

It is likely that this problem also remains after transition to NGNs.[45] WIK-Consult stated that *"As long as Europe operates under CPP/CPNP retail and wholesale arrangements, the migration to IP-based NGNs will not ameliorate the termination monopoly ... until and unless*

45 See ERG (2008), Ch. C.3.2, 74

mechanisms emerge to enable more than one telephone service provider to terminate calls to a single telephone number."[46]

A crucial and primary advantage of BaK is that it directly addresses the termination bottleneck itself. Although in principle the bottleneck itself is not eliminated in a BaK regime, the main competition problem, excessive pricing of termination rates, can not occur anymore.[47] So, BaK eliminates excessive pricing and all detrimental effects that result from them, without the need of calculating and setting a cost-oriented tariff.[48]

Excessive pricing results in an inefficient pricing structure. The detrimental effects of these problems are already well-documented in a vast amount of research and are not repeated here.[49] These price-related competition problems can also be addressed by other regulatory models, like the current CPNP regime with cost-based regulation of terminating tariffs. However, the current regulatory model introduces significant regulatory costs, regulatory uncertainty (see section 5.1.3).

5.1.2 Moving cost-recovery to competitive markets

BaK prevents excessive pricing of termination rates by effectively setting a zero wholesale tariff for termination, which means operators may cover the net cost of providing termination from their own retail users. In this way the cost recovery is moved from a market with SMP (termination), in which setting the right price depends on regulation, to a retail service that is generally offered in a competitive market. If a provider has to bill termination cost to its own end-users in a competitive market he has no incentive to charge excessive prices to his customers, because he may risk losing them.[50] It is likely to increase incentives for cost minimization as more cost are subjected to competitive cost recovery. .

A regulator, on the other hand, faces information problems regarding the determination of the regulated price. Not all information necessary for setting the efficient price is available for the regulator who is dependent on operators that do not have incentives to provide the correct information. Apart from the latter, without the competitive pressure on prices, operators themselves will also not have all information: the full information will only arise from the competitive process in which prices are set, demand adjusts and prices are set again as an continuous process.

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46 WIK-Consult (2008), p. XI

47 See ERG (2008), Ch. 3.2 for an explanation how the termination bottleneck and the possibility to exploit SMP results from the interplay of a) the physical bottleneck for termination, b) control of the E-164 number and c) charging mechanisms.

48 See ERG (06) 33 for more extensive treatment of the competition problems. ERG(06)33, Revised ERG Common Position on the approach to appropriate remedies in the ECNS regulatory framework, May 2006.

49 See WIK(2007) for an overview of literature and report in interconnection.

50 Precondition: competitive broadband access market allowing end-users to change their operator, See eRG (08) 26rev1, Ch. C.6.7

The difficulty for regulators in setting the right tariff is formulated as follows by Valletti/Houpis: "…*the proper regulation of F2M termination charges is a challenging task and the inter-relationships between the different pricing choices and the scope of regulatory intervention are not always obvious. …[T]he direct intervention to set the welfare maximizing fixed to mobile termination charge requires a regulator to form a view on the demand elasticities, the existence and significance of network externalities, the type and intensity of competition in the mobile outbound market, and the pattern of demand of mobile subscribers. There are also a number of other factors that could affect the welfare maximizing charge, including the degree of competition in the fixed telecommunications market, the size of fixed and common costs in the mobile market and the size of any (un-internalised) call externalities*."

Moving cost recovery to retail markets increases incentives for efficient cost minimization as more cost are subjected to competitive cost recovery by allowing the price mechanism of a competitive market to work and by preventing regulatory distortion in setting the price of termination as regulation can only be a second-best solution. In theory, it could be the case that there is a non-zero optimal ("first best") wholesale termination rate, that gives a higher efficiency. However, as stated before, finding this "first best solution" depends on regulation and is difficult. Therefore, if the first best wholesale termination rate is non zero, actual termination rates in CPNP countries may not capture this first best rate. Assessing whether BaK with cost recovery on retail is more efficient than a possibly non zero first best solution, should therefore also be based on making an empiric comparison between the market result (in terms of average usage and retail price) in BaK countries and CPNP countries. Therefore, it is more appropriate to compare the results of a zero wholesale termination rate to the actual termination rate, rather than comparing the zero wholesale termination rate to the theoretical first best wholesale termination rate.

Contrary to what is sometimes claimed, the cost recovery from own retail-users does not mean that the prices for those users will have to increase on average. After all, in parallel to the eliminated wholesale revenue for termination there is *overall* the same amount of eliminated wholesale costs albeit effects on individual operators may differ. This reflects the zero-sum nature of termination revenues.[51]

In the retail market operators have several options to recover the cost of termination and to distribute the benefits of the eliminated termination payments (eliminated costs). This can be done through a relative change in the price structure of all involved retail 'prices', like subscriptions, handset subsidies, called minutes, received minutes. Market forces will set the incentives for this pricing structure. These market incentives are in principle more efficient than a regulated price. Furthermore there may still be room for efficiency gains incentivized by competitive pressures.

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51 If a country or group of countries move from CPNP to BaK, the transition is not completely zero-sum (see section 6.1).

A further efficiency advantage of moving cost recovery to retail is that the costs of termination are better considered by users who - when they select their subscription – have the choice between selecting a fixed and mobile subscription (assuming fixed and mobile termination have a different rate). This choice between fixed or mobile access is made in a more efficient way if all the costs, including that of termination, are taken into account. To illustrate this an example: assuming the total cost of a mobile subscription and its use is 100 and 20 of this cost would be recovered from termination (other users calling). Then, this cost of 20 is not passed through to the user choosing between a fixed and mobile subscription. In a CPNP regime this cost of 20 is not taken in to account by the user selecting the subscription. This could be especially relevant if a user chooses to drop his fixed access and become a mobile only user. The caller that would otherwise have called the fixed subscription is, in that case, forced to call the mobile phone and pay a higher price due to the higher termination costs while the utility of the caller does not necessarily increase. In that case, it would be more efficient if the called user is faced by this extra cost of 20 and makes a more efficient choice between fixed and mobile access.

Conclusion

Moving cost recovery to retail markets increases incentives for efficient cost minimization as more cost are subjected to competitive cost recovery by allowing the price mechanism of a competitive market to work and by preventing regulatory distortion in setting the price of termination.

5.1.3 Reducing regulatory cost and uncertainty

BaK will significantly reduce regulatory cost and uncertainty. Most of the current regulation effort in relation to termination addresses the price-related problems. This effort is about setting the right price and determination of the relevant cost prices. Determination of the cost price and setting the right price (cap) is a significant part of the effort of termination regulation (regulatory cost). These regulatory cost are eliminated by BaK.[52] BaK will not eliminate regulation per se: the regulatory issues that remain are defining the access obligation for termination, among which is the definition of the boundary (network level) at which BaK applies. However, it should be noted that the regulatory issues that remain, are not extra for or specific to BaK, but are also issues that are relevant to the current regime (CPNP). Therefore, BaK results in a decrease of the regulatory burden.

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52 In the section about CPS (see section 5.6), it is argued that a mark-up on voice origination could be used that is based on the cost of termination. Such a mark-up can be determined by the same cost system on which the originating tariff a set. Therefore, a special cost model and its associated consultation process for fixed termination, that will often be necessary in case BULRIC is used for determining the cost of termination, is not necessary. In all cases the cost of an cost allocation system or cost model for mobile termination, is eliminated.

The reduction of regulatory costs becomes more relevant with the change of cost structure in NGNs towards a higher proportion of common costs of a multi-service network which increase the complexity of cost allocation. A higher percentage of common costs to be distributed between regulated and unregulated products increases the risk of anti-competitive cross-subsidisation.[53]

BaK will obviously also decrease the regulatory uncertainty. Under the current CPNP regimes there is uncertainty about the future level of termination charges or price caps. Legal procedures are lengthy and result in relatively long periods of uncertainty on the current and near future level of FTRs (Fixed Termination Rates) and MTRs (Mobile Termination Rates), the long-run level is always uncertain. This induces business risks and through that reduced investment incentives. BaK would minimize this uncertainty: the price level of termination is always zero.

Conclusion

BaK reduces regulatory costs and increases regulatory certainty.[54]

Question 5 (Section 5.1.3): How does BaK affect regulatory certainty and the risk of legal disputes?

5.1.4 Summary

First, the shift of cost-recovery to the competitive retail market is likely to give better incentives for an efficient outcome. Second, the regulatory uncertainty and costs are reduced.

5.2 Externalities

This section is about termination related externalities. These externalities could be relevant because they could influence the most efficient price level for termination. So in assessing a regime like BaK it is relevant how efficient (in terms of increasing welfare) zero pricing is relating to these externalities.

An externality is an impact on any party not directly involved in an economic decision. An externality occurs when an economic activity causes external costs or external benefits (or utility) to third party stakeholders who did not directly affect the economic transaction. In this case of termination there are two types of externalities, being call and network externalities.

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53 See ERG (2008b), Part 4, No. 3.

54 This statement applies after the transition from CPNP to BaK. It does not apply in the transition from CPNP t to BaK.

5.2.1 Call externality and effects on competition, regulation and consumers

5.2.1.1 General

The call externality is determined by the costs and benefits (utility) that the called network and called user have when a call is made. CPNP does not internalise the utility externality since none of the call costs is recovered from the called user. CPNP is most efficient if the caller has all the utility and the called has none. It is obvious that in general the called user has a positive utility. Exceptions to this general case will be addressed in the next two paragraphs. Therefore, regarding call externalities the current regime is maximum efficient in the extreme case called user has no utility.

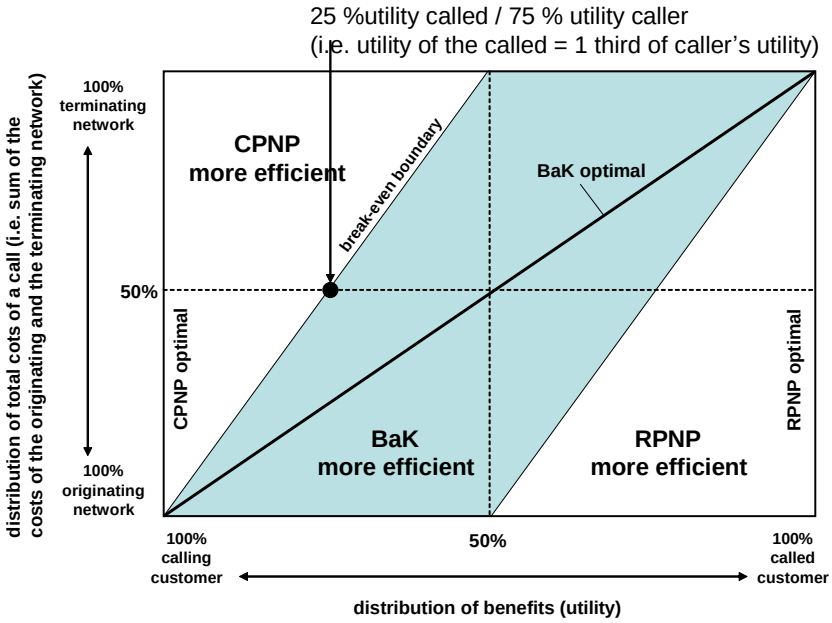
In contrast BaK means the terminating operator has to recover the cost of termination network from his own end-users. Therefore, BaK is maximum efficient if the utility between calling and called user is distributed in proportion to the relative cost distribution of the calling and called network. This means for example that if the cost of the calling and the called network are equal, BaK is maximum efficient if the utility is also equal. If the cost of the called network is twice that of the calling network, BaK is maximum efficient if the utility of called user is also twice that of the calling user. The most efficient regime regarding this issue would be a regime in which the price of termination would be set at efficient cost minus the utility of the called user. However, it can not be expected that regulation can achieve this optimal point due the impossibility to estimate the utility distribution.

Three things are mentioned here about the utility distribution between calling and called users. First, it will be extremely dependent on the nature of the call and so it will widely vary from call to call. Sometimes a call may be initiated from a call back request and the utility will be mainly with the called user. On other occasions there will generally be less utility with the called.

Second, there seem to be no estimates of this distribution up till now. It also seems nearly impossible to measure the utility distribution, given the difficulty of measuring utilities in general and the fact that incoming calls are not priced in Europe today. It is sometimes claimed that the utility of the caller is significantly higher than the utility of the called. Since it is the callers that decide to make the call, there is strong intuitive support for this claim. However, from the fact that there are countries with an RPP system, like the US, it can be derived in a qualitative manner that called users have a utility which is generally greater than the price of incoming calls (typically a few dollar cents). Otherwise users would either turn off their phone or not pick up calls. Regarding the difference in utility between the calling and the called parties, it is also relevant to note that there is in general no differential between the price for outgoing calls (paid by the caller) and the price for incoming calls (paid by the called user). This indicates the utility of the called user is similar to that of the caller. After all, if the utility of the called user was significantly lower, one would expect the price of incoming calls to be lower than that of outgoing calls. Therefore, although callers in general probably have higher utility than the called users, the US RPP regime indicates the difference between both will probably not be very large.

When the utility is distributed among caller and called users but the utility of the caller is higher, neither CPNP nor BaK is maximum efficient. The break-even point for BaK to become more efficient than current CPNP in regard to the call utility externality, when the cost of the calling and the called network are equal, is when the utility of the called user is more than one third of that of the calling user. The stylized figure below shows when current CPNP or BaK is more efficient for different distributions of the costs and utilities.

Figure 3: Efficiency of interconnection model regarding call externalities depends on distribution of benefits and costs [55]



55 This figure is an adaptation of figure 4 in CRA (2007). Economic study on IP interworking: White Paper http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/Documents_presentations/IP%20Interconnection%20-%20GSMA%20White%20paper%20-%20FINAL.pdf. The figure depicts the range of all possible utility and cost distributions (as a two dimensional field). It assumes a linearity between utility and costs, equally among all participants. A certain point in the figure depicts the average utility and cost distribution of a certain type of calls. It is clear that CPNP is only optimal efficient if the caller has all the utility (this is the left vertical axis). It is also clear that BaK is only optimal efficient if the utility distribution is equal to the cost distribution (diagonal axis). For example if the total cost of a call are for 50% in the originating network and for 50% in terminating network, BaK is optimally efficient (regarding call externalities) if the total utility of the call is for 50% with the calling user and for 50% with the called user. Apart from the two lines where CPNP and BaK are optimally efficient, there is a break-even line where both regimes are evenly efficient. The first end-point on the break-even line, is the point where the cost are 100% in termination and the utility is evenly distributed. In this point CPNP and BaK are evenly efficient because both the caller and the called have the same utility, while in BaK the called user pays and in CPNP the calling user pays. In this case, from an efficiency point, it does not make any difference who pays for the call. The second end-point on the break-even line is the origin (100% of utility with caller and 100% of cost in calling network), where there is no cost in the terminating network. For the origin, whether you apply BaK or not, the called user does not pay anything, and BaK and CPNP de facto are the same. The straight line between these end-points is the break-even boundary between BaK and CPNP. For example if total cost is 100 (originating + terminating) and total utility is 200, at the first end-point the called user utility is 100 and it covers 100 of cost. At the point where the called user has 25% of the total utility and the cost distribution is 50% originating and 50% terminating, the utility of the called is 50 and the cost it covers is 50. For a more elaborate and formal analysis, see Berger, Ulrich (2005), Bill-and-Keep vs. Cost-Based Access Pricing Revisited.

In the general case the *efficient* cost of the originating and the terminating network are the same (this is the case for fixed-fixed and mobile-mobile interconnection). An exception is the case of termination between fixed and mobile networks. Regarding the utility distribution between calling and called network, the case is less clear.

Third, for calls within a group of people that call each other in quite symmetrical way, the call externality is easily internalised. Whether, the termination rate captures the call externality or not is not very relevant is that case. Regarding these calls the call externality has no differentiating effect for either the current regime or BaK to be better.

In general it seems reasonable to assume that (1) the utility of the called user is lower than that of the calling user but that (2) the difference is not very significant. If the called user has more than a third of the utility of the calling user (see break-even point in figure) therefore, in the general case of equal cost of the called network and calling network, BaK seems a more efficient regime. Given the uncertainty about utility distribution this conclusion has to be treated with caution. Therefore, its important not only to consider this analysis of how call externalities can be internalised, but also to consider how BaK works out in practice on important variables, such as usage, that determine the efficiency of the regime in terms of welfare.

Conclusion

Consideration of call externalities would lead to the conclusion that - assuming plausible cost and utility distribution and bearing in mind their uncertainty - BaK is likely to internalize call and network externalities better than CPNP.

5.2.1.2 Exclusion of certain traffic categories (number ranges)

Sometimes calls are destined to information (and/or premium) services that are usually offered at 0900-numbers or other service number ranges. Obviously, these services need payment. Therefore, BaK can not apply to the services. Information services need to be excluded from the BaK.

Also, in the current regime these services are treated differently. In general, termination to these services is not regulated at the moment. Usually a charging of information services is done through an origination model, in which the party offering the information service sets the retail tariff. The originating operator charges the retail tariff to his end-user, withholds a originating fee (plus some payment risk mark-up) and passes the remainder to the termination network. Usually this latter cash transfer to the terminating operator is not regulated.

5.2.1.3 Unwanted calls - calls with negative utility for called user

A CPP[56] system (with CPNP at the wholesale level) is generally viewed as less susceptible to the problem of SPIT (SPAM over Internet Telephony) as the calling party has to pay for the whole call. On the other hand RPP[57]/BaK may (*ceteris paribus*) lead to a higher number of such unwanted calls because the costs of calling consumers for marketing and sales, would be reduced. While receiving parties can hang-up on such calls, doing so frequently may result in disutility and in fewer calls being answered generally.

However, the costs of voice traffic for engaging in such activities seems negligible compared with the costs of labour.[58] Furthermore, receiving customers can hang up and will do so more when they when they will get to much unwanted calls. This will restrict unwanted calls. In some countries consumer protection measures are in place and so called opt-out or opt-in systems exist.[59] A risk may be presented from machines delivering recorded messages, although automated machine calling is not allowed under current European telecoms law. A study done by Analysys Mason for Ofcom[60] does not show evidence of increasing SPIT in BaK-countries. According to this, it is not realistic to expect that BaK will significantly increase the amount of unwanted calls.

Question 6 (Section 5.2.1.3):

How do different wholesale charging mechanisms impact on the number of unwanted calls? Do you expect (other) effects on consumers/consumer groups? Where possible, provide a quantitative assessment of the expected effects.

5.2.2 Network externality and effects on competition, regulation and operators

The network externality is the extra benefit that existing users enjoy when new users join the network. The more users there are, the more valuable the service gets, and so the higher the utility of connecting to the network. The relevance of this for pricing of terminating traffic follows because all users (consumer welfare) could potentially benefit from subsidizing some users who would not otherwise join a network (marginal users). These marginal users that choose to join the network would increase the welfare of existing users. This mechanism would only work if marginal users specifically benefit from either an increased or decreased

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56 Calling Party Pays
57 Receiving Party Pays
58 This would be different under for automatic calling systems. However, unsolicited automatic machine calling not allowed under European law.
59 If the aim is to protect customers from paying for receiving unwanted calls one might conceive of a retail price of zero for the first minute. However, this would not avoid the annoyance for customers from such calls. It is acknowledged that SPIT may become more acute than today. Nevertheless, it may be more appropriate to tackle this issue with consumer protection measures as is the case in the Netherlands than with the wholesale charging mechanism.
60 Analysys Mason (2008)

termination charge. This requires that marginal users in general have a significant imbalance between incoming and outgoing traffic, that is: either more incoming or more outgoing traffic. The reason for this is as follows.

If marginal users have an imbalance between incoming and outgoing traffic they can be supported by either a low or high terminating rate. If a marginal user has more incoming than outgoing traffic (an input surplus), they can be subsidized by a mark-up on the terminating rate.

In reality, marginal users indeed usually seem to have an input surplus (see section 5.3.3). This means that a subsidy to these users could be given by increasing the termination rates. In this way the network externality could be internalised by the network operator. By moving to BaK this possibility will be lost. It is not clear if operators could internalise this network externality without a termination rate: competition for non-marginal higher usage customers could prevent operators from subsidising low usage, marginal users. So BaK could be less able to internalise the network externality and subsidise marginal users in order to boost penetration and ownership, i.e., BaK could be less efficient in capturing the network externality. On the other hand it could be the case that under the current CPNP regime low usage customers are over-subsidized contributing to artificially elevated penetration rates. The material effect of this depends on the size of the externality that would be reflected in the size of the mark-up that could be applied to the termination rate. The size of the externality mark-up (surcharge) that has been applied by Ofcom in the past (0,5 pence per minute), indicates that the network externality is rather limited. However, it is difficult to assess the impact of this issue in isolation and in theory. The issue is therefore assessed in more depth in the section on the effects on low usage mobile offers, which seem to be offers that are used by marginal users. Independent from the size of the network externality, it is not clear that termination rates are a good tool to increase the number of subscribers to telephone networks. More targeted and explicit instruments could be more appropriate for this than the blunt tool of higher termination rates.

Conclusion

Under BaK it is unclear if the network externality can be internalised. That said, the size of this effect seems limited and is further assessed in the section on low usage offers. However, there is not much evidence that network externalities are important when setting termination rates and even if they were important in general, it is not clear that termination rates are a good tool to increase the number of subscribers to telephone networks.

Question 7 *(Section 5.2)*: How do you assess the quantitative relevance of call and network externalities?

5.3 Retail price issues and their effects

5.3.1 Relationship wholesale versus retail regime/pricing

Wholesale and retail charging mechanisms are related because interconnection prices affect the structure as well as the level of the interconnecting operator's costs and revenues, impacting on the cost recovery and the retail prices of the services provided to the end-users.[61]

Retail billing mechanisms can be CPP structurally corresponding to CPNP[62] in which the calling party bears all the cost of a call or RPP, in which the receiving party pays part of the call rather corresponding to BaK. Nevertheless these structural similarities do not preclude flexibility in combining different wholesale and retail regimes.[63]

As long as prices are above marginal costs, applying CPNP as billing principle tends to set a floor for the retail price of a call because termination fees are perceived as costs for the network operator that provides the voice service. This occurs even if aggregated payments for termination netout due to traffic symmetry.[64]

A minute-based structure of wholesale pricing has frequently lead to a differentiation of on-net and off-net prices (in mobile networks and for VoIP based on PSTN termination charges).[65,66] With on-net retail prices being priced below off-net call, customers of the larger network benefit from lower average retail prices compared to customers of smaller networks.

In many countries flat rate scheme have become quite popular. Flat rates can be thought of as covering the total cost of outgoing calls (corresponding to CPNP) or as covering a share of the costs for incoming calls and a share of the cost for outgoing cost (corresponding to BaK). Where traffic flows can be considered symmetric, costs add up to the same amount for both cases. The end-users will focus mainly on the price level of the flat rate. Therefore, BaK is compatible with flat rate pricing at the retail level.

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61 Vogelsang (2006), Ch. 3.3.1 and 7.3.3.

62 With CPP, the calling party pays for the whole call, similarly, the network operators pays for the whole call at the wholesale level. Neither the receiving end-user nor the receiving operator pay anything. The CPNP termination payment paid by the calling party's network can be considered a compensation for the fact that the receiving end-user does not make a payment to his network operators under CPP.

63 Vogelsang (2006) provides a detailed analysis of the compatibility between wholesale and retail charging mechanisms, also considering different retail tariff principles (e.g. minute-based or flat-rate),

64 It is acknowledged that there are exceptions, that is retail offers that have a price per minute that is lower than the termination rate. See also footnote 69.

65 WIK-Consult (2008, p. 63). The costs of getting off-net traffic terminated turn out to be a floor for the network operator. If he were to set a retail price below this level, it risks that his customers make even more off-net calls, ultimately leading to a net payment to other operators. See also Laffont et al (2003) on the off-net pricing principle.

66 Vogelsang (2003) concludes that this differentiation "seems to have few desirable and many detrimental effects, largely because it increases the market power of the dominant incumbent".

Offering flat rates or bucket plans at the retail level implies a risk of loss-making if wholesale charges are usage-based because it is more difficult for the network operator to forecast the level of usage. Thus, high CPNP wholesale payments may even preclude flat rates or buckets of minutes plans.

Besides this effect on the ability to implement retail flat rates, the use of a particular wholesale mechanism does not preclude application of different retail pricing regimes.[67] Both CPNP and BaK provide flexibility at the retail level to offer retail schemes based for example on minutes, bits, or as buckets of minutes or bits plans as well as flat rates.

Summarizing the relationship between wholesale and retail regime/pricing, it can be stated that, although a certain (structural) relation exists, there is not a *direct* connection between them.[68]

5.3.2 Effect on fixed and mobile high usage offers

This section assesses the effect of BaK on fixed and mobile high usage offers. These are defined here as offers that have a more than average usage (in minutes of use per month per subscriber). An important driver for these offers are flat fee or partial flat fee offers. Flat fees offer an unlimited amount of calling for a fixed (monthly rate). Partially flat rate offers are offers in which unlimited calling for a fixed ('flat') fee is offered during some period of time, for example in the weekend, in off-peak periods, on-net calls or for calls to certain numbers.

There are two mechanisms that contribute to more attractive high usage (= usage above average) and flat rate offers as a result of BaK. First, high usage offers generally have an input *deficit* (receive less traffic than they send). This results in a mechanism that is the inverse from that described in the next section about low usage offers that have an input *surplus*. With the introduction of BaK the net cost of outgoing traffic is eliminated so the net cost of these offers are reduced.

The second mechanism is that the uncertainty of the external cost of offering (partially) flat rate offers is eliminated by BaK. This uncertainty will be called the "*cost risk*" in the remainder of this CP. Only the internal marginal costs remain as a source of cost risk, but these internal costs are far lower than the external cost of termination rates paid under CPNP in practice up till now.[69,70] This is illustrated in the following: if an operator introduces a (partial) flat rate

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67 Vogelsang (2006), Ch. 3.3.1 and 7.3.3. See also Ch. 3.3.1.6, Table 3-2 outlining the compatibility between wholesale and retail charging mechanisms. According to this, BaK is not only compatible with RPP but – to a lesser extent- also with CPP. CPNP and RPP are viewed as less compatible as this may involve a "double payment" to the receiving network operator on the retail and the wholesale level. Littlechild (2006) points out that the combination of BaK and CPP does also exist in practice.

68 See Vogelsang (2006), Ch. 3.3.1.

69 Because of this difference in relevant costs between on-net and off-net calls Laffont/Tirole (2001) speak of the "bill and keep fallacy". Even if traffic is balanced and payments between operators net to zero termination fees do matter. "It is correct that a change in the access charge need not affect the (absence of) net payments between the operators, but the access charge affects each network's perceived marginal cost and therefore

offer he is certain about the incoming retail revenue form the customers - this is the flat fee of the offer (the retail price). However, the operator is uncertain about the costs because he does not know the calling profile of the attracted customers. It could be that his offers attract users with very high usage. Because the amount of calls and minutes that the users will make, is unknown, the cost is unknown. Most of this uncertainty is due to termination rates paid for off-net calls. A smaller uncertainty is due to the marginal cost of on-net traffic. The first and largest uncertainty is completely eliminated by BaK. By reducing the cost uncertainty, BaK enables more attractive flat fee offers.[71]

The two mechanisms both lead to more attractive high usage and flat fee offers and therefore to a higher average usage per user under a BaK regime. The above is a theoretic prediction of the mechanisms involved and there effects. This theory, however, is clearly supported by empirical data that was presented in Chapter 4.2. The empirical data does not only show a higher average usage per user, but also show a far higher usage per capita in countries with BaK. For example, in the US the mobile usage per capita is about three times the European average and average price per minute is half the European average, even when adjustments in the data for reasons of comparison are taken into account. This means that the US customers on average pay a slightly higher monthly bill for a far higher usage.

The size and importance of this effect is significant. In the US a much higher amount of mobile minutes are delivered at on average only a slightly higher total monthly bill. This result reflects the economies of scale in the mobile market. Higher volume drives lower cost per minute and lower cost per minute drives lower price per minute. This creates a positive feedback loop.

Of course it is not certain that the US result is completely (or even partly) due to BaK. There could be other factors. It could be the result of another pricing policy that pushes high usage offers very hard and this policy is independent of BaK. But it does not seem likely that such a policy would not be triggered or facilitated at least partly through the BaK regime at wholesale level. Such a policy independent of BaK is not likely given that the BaK countries in the data set (US, Hong Kong and Singapore) all give similar high usage and low price results.

The ERG expects that a move to BaK in Europe would strengthen the current trend towards flat rate offers ultimately inducing higher usage.

On average this has a very positive effect on consumer welfare. Consumer welfare is mainly determined by the minutes of use per capita and the average retail price. Higher usage an lower price create more consumer surplus related to mobile services. If the effect would be similar to the result in the US, the effects on consumer surplus would be enormous. A stylized

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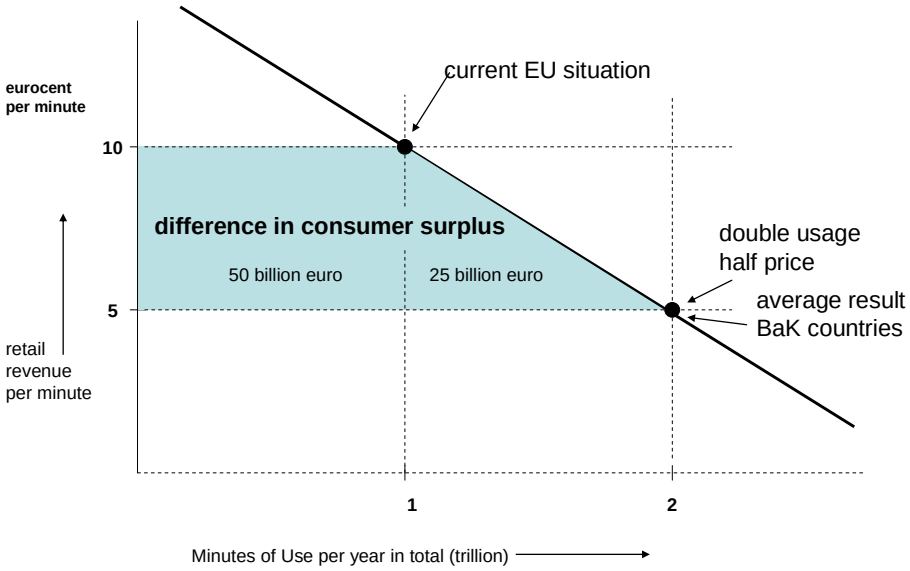
retail prices. It is, therefore, not neutral even if traffic is balanced." Thus, even where termination rates net to zero, operator will hardly set an off-net retail price below the termination rate, because this could lead to a process of adverse selection ultimately leading to a net-payment to other operators.

70 This discrepancy could change under a pure LRIC implementation of CPNP and would disappear with short-run marginal costs.

71 This analysis does not imply that on-net offers are necessarily non-replicable, or in other words: that offers for on-net traffic of operator X can not be matched by offers of operator Y for off-net traffic to operator X.

version of figure 1 is given below that indicates the potential gain in consumer surplus if the EU would move to the US market outcome. To illustrate the effect: total mobile call volume in minutes is roughly a trillion (1.000 billion).[72] If usage (minutes) doubled and average price fall from 10 to 5 euro cents (figures bases on refer to) the potential gain in consumer surplus would be 75 billion euro per year.

Figure 4: Size of potential gain in consumer surplus per year in Europe, if Europe had average retail price and MoU per capita as current BaK countries have



The ERG does not claim the effect of BaK in Europe would have this huge effect. However, the calculation does illustrate the size of the difference between the European and US result of which the latter is generally considered superior in terms of welfare.[73] The ERG assesses that these results indicate it is at least highly likely that the European market will move in the

72 GSMA Europe(2008), response to the Draft Commission Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU,10 September 2008, table 1.

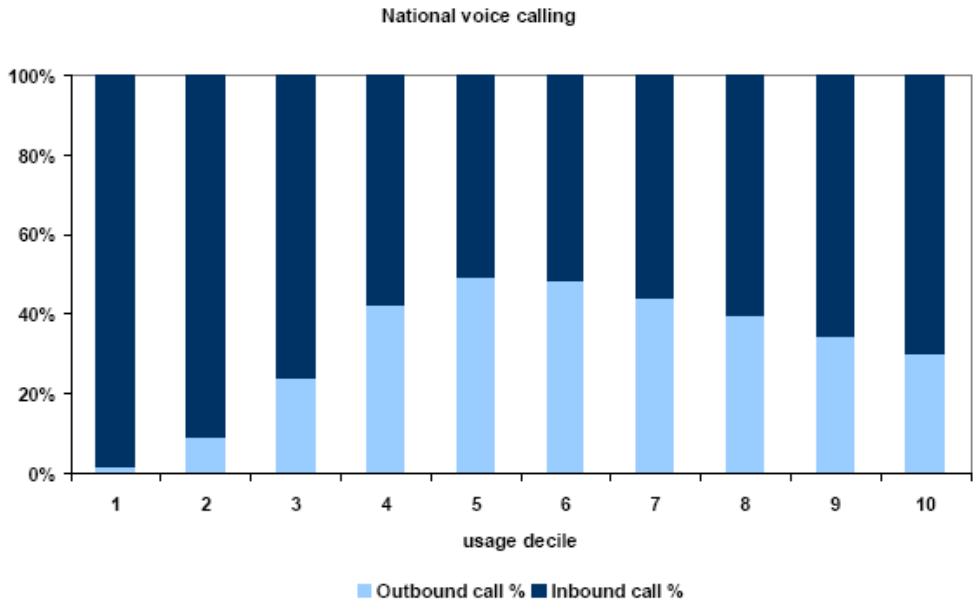
73 Littlechild(2006), page 47: "*The main conclusions here are (a) that price controls on mobile termination charges are an endless, relatively ineffective, expensive and no longer defensible method of protecting users against a problem created by CPP; (b) that RPP is superior to CPP in all respects except the perceived dislike in CPP countries of paying to receive calls; and (c) that 'bill and keep' offers the advantages of RPP without the disadvantage: it represents a solution to the monopoly termination problem that allows competition and customer choice, instead of regulation, to determine how to pay for incoming calls*."

direction on higher usage and lower price per minute by moving to BaK. This would result in a more efficient result of higher welfare.

5.3.3 Effect on low usage for mobile voice

Low usage mobile offers seem to have a input surplus, that is: the users receive more calls than they make. At least this is the case for mobile low (and very low) usage prepay users as was indicated by Vodafone in its response to the Commissions consultation on termination rates (Vodafone(2008)). The Plum-report (Vodafone(2008), annex I) uses customer profiles that are based on Vodafone calling records and that have input-output ratios of 1,7 and 3 for respectively low and very low use with a total combined incoming and outgoing traffic of 40 and 20 minutes per month. The Orange response to the recommendation includes the same indication as is reflected in the figure below.

Figure 5: Percentage of outbound and inbound calls for prepaid offers in France



Source: Orange, response to the draft Commission recommendation on termination rates, 10 September 2008.

Predicted effects

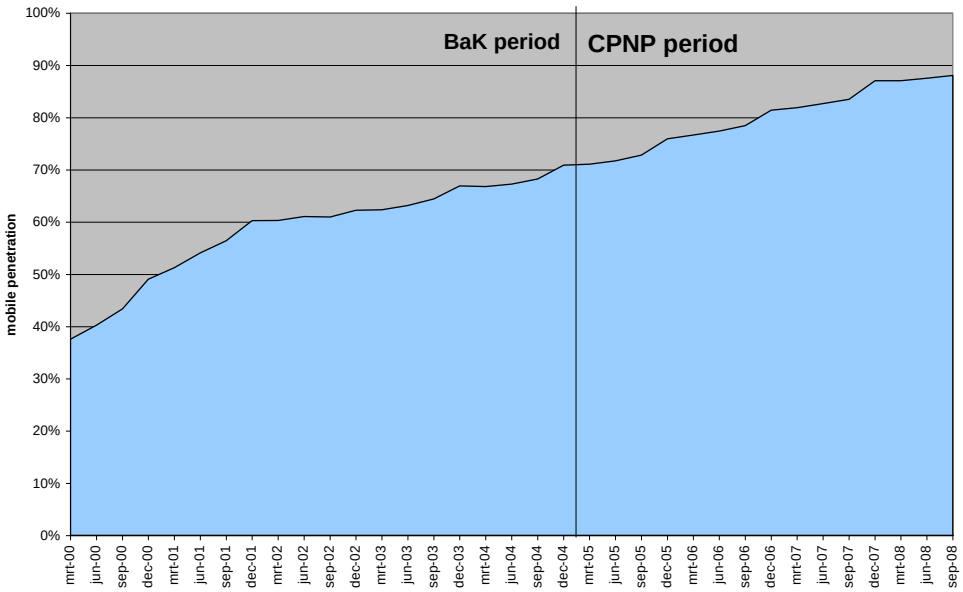
To predict the effect of BaK on prepay we first look at the theoretic effect that would be expected. As explained in the introduction of this section, low usage prepay services have an input surplus and therefore will experience a loss of revenue due to a move from CPNP to BaK. In response to that, mobile operators in theory have an incentive to raise the price of these services. Such a price increase might result in some users dropping their subscription which would probably result in a slightly lower overall mobile penetration. So, in theory, higher prices and lower overall mobile penetration could occur from a move to BaK. The amount of this change however is difficult to predict.

With regard to empiric data, it first is useful to look at the effect of the past decrease in termination rates. This decrease has been significant. Mobile termination rates have come down from above 20 eurocent to the current European average between 8 and 9 eurocents. This significant decrease has not led to higher prices of low usage offers and lower penetration and ownership. This is in contradiction with claims of mobile operators in the past that they would. Also relatively, compared to average usage offers, low usage offers do not seem to have become less attractive. Of course its difficult to filter out other trends here, especially since this was the period in which mobile markets grew to maturity.

A second source of empiric information to predict the effect of BaK are market shocks, i.e., cases where the regime changed from CPNP to BaK, or vice versa.

An example of this is the change from BaK to CPNP in France in 2005. If BaK would be detrimental to low usage offers or penetration, a structural break in the market trends for France should be expected. In other words, the theory that BaK leads to lower penetration would - after the move from BaK to CPNP - predict a stronger growth of penetration. However, a structural break in the growth of penetration does not seem to have occurred. Rise in penetration did not significantly speed up after 2005. Also, the percentage of prepaid use did not change significantly.

Figure 6: Growth of mobile penetration in France (before and after transition to CPNP)



Source: ARCEP.

A third source of information is a comparison of countries that use BaK and CPNP. This information is included in section 4.2. The results of this section can be summarized as that BaK countries on average have twice as much usage per capita at half the retail price per minute. Also there is no clear indication that BaK results in lower mobile penetration and

ownership based on the average result in the BaK countries, although the US has a slightly lower ownership compared to Europe.

Conclusion

Summarizing the above: while theory predicts that BaK (or lower termination rates in general) would lead to higher prices for low usage offers that have an input surplus, the past practice with lowering termination rates in Europe and the change from BaK to CNPN in France do not support a prediction of a significant decrease in the attractiveness of prepaid offers and a resulting fall in penetration. The possible fall in mobile ownership will probably be even smaller than that in penetration. However, a slight increase in prices of low usage prepaid offers resulting in a decrease in overall mobile penetration – or less higher increase thereof – cannot be totally ruled out.[74] This however limited detrimental effect that could occur will be weighed against other effects in the overall assessment at the end of this CP.

5.3.4 Effect on low usage for fixed voice

The question assessed in this section is whether BaK could have the same effect on low usage fixed voice offers as on mobile low usage. This does not seem likely with the current level of FTRs and the current retail pricing structure for fixed voice. FTRs are relatively low and the associated revenue relatively small compared to the total retail bill for fixed voice. For fixed voice the retail pricing structure is far more flat with a relatively large fixed (non-usage) component compared to the minute (usage) based component. Flat rate and partially flat rate offers are already quite prominent for fixed to fixed voice.[75] The impact of going from CPNP at current levels to BAK for low usage fixed offers will probably be negligible.

5.3.5 Effects of retail pricing on different (groups of) operators

The effects on different (groups of) operators first depend on the way the net cash stream related to paying and receiving for termination is affected. Second it is a derivative of the effects on retail pricing. Operators that serve customers that get more attractive offers will benefit from the introduction of BaK. Both these factors are strongly related and tend to go in the following direction:

- Fixed operators will benefit relative to mobile operators due to the fact that currently MTRs are higher than FTRs. BaK will mean the net cash stream from fixed to mobile operators will disappear.

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74 In case such an effect occurs, it is not clear that interconnection is the right instrument to address this concern. Other more specific mechanisms, e.g. low-income schemes, could be considered.

75 Based on a spot check in 7 member states the ERG estimates that within this sample more than 50% of fixed to fixed voice connections where flat rate or partial flat rate.

- Mobile operators serving relatively more high usage and (partially flat rate) customers will benefit relative to other mobile operators at least in the transition phase. As the markets and operators adjust itself to the new interconnection regime these benefits will probably decrease depending on the rate at which users switch to other providers. Some benefits and detriments could remain over longer time because some operators are better positioned to serve low usage or high usage customers. This can be related to branding and reputation that is not easily changed.

- Small operators in general are often said to benefit from BaK. This is because small operators depend more on the termination rates because they have relatively (compared to their total retail traffic) more off-net traffic. This makes it more difficult for them to compete for higher usage users and more difficult to introduce flat-rate packages, because this can result in large net out payments to other (larger) mobile operators. Also, responding to pricing policy with on-off-net differentiation, seems to be difficult for smaller operators if termination rates are set above efficient cost price.

Apart from this it is difficult to draw further conclusions. For example it is difficult to say if and how new entrants (or relative new players) or smaller operators are affected compared to more established and incumbent operators. Some of these new entrants serve relatively more low usage users, other serve relatively more high usage and business users.

Question 8 (Section 5.3.5)

How would your business be affected by a move from CPNP to BaK? Please explain the expected impact on prices, volume of supplied services and profit.

5.4 Cost efficiency issues

5.4.1 Investment incentives

This section assess the effect of BaK on investment incentives. It is important that the termination regime provides the right incentives for efficiency (welfare). The incentives should be right to create efficient prices, efficient routing and efficient investment. It is sometimes claimed that reducing terminating tariffs or bringing them to down to zero, reduces the incentives to invest. Usually this claim is related to issues that are already dealt with under other sections of this CP, like hot potato routing, arbitrage and call back schemes and the general efficiency and effects of the regime on welfare. Apart from these issues, which could be seen as indirect effects on investment incentives and that are assessed in other sections of this CP, there does not seem to be a direct effect of BaK on investment incentives.

Regarding the direct effects on investment incentives it is relevant to note again that revenue from termination fees is not collected directly from end-users but collected from other operators in a zero-sum game on the level of the total fixed and mobile voice services. Cash is

transferred between operators and there is no net revenue collection from end users. Therefore, BaK does not mean the industry as a whole can collect less revenue.

In a recent report for Ofcom Analysys Mason investigated the effects on investment incentives in several BaK countries and did not observe any effects on investment incentives from BaK in countries where it is implemented. Analysys Mason states: "*Industry sources with knowledge of proposed termination regime changes in these countries did not consider that the termination regime adopted has had an adverse impact on the ability of mobile operators to invest in their networks*."[76]

Conclusion

No effects of BaK on investment incentives are likely or are observed in practice apart form the possibly indirect effects assessed elsewhere in this CP.

5.4.2 Hot potato routing

The principle of "hot-potato" routing is one of the most frequently mentioned alleged drawbacks of BaK. Hot-potato routing is the practice in which traffic on a network that is destined for an other network is handed-over at an other network as quickly as possible. It is often claimed that BaK will increase the incentives for hot-potato-routing, i.e. increase the incentive to drop off-net traffic at the first (closest) possible point of interconnection (PoI) on the receiving network, or any other network. This practice is obviously not efficient and would have a negative impact on investment incentives.

However, this alleged drawback is based on the wrong assumption whereby BaK is applicable everywhere and you are allowed to drop any traffic anywhere for free. This is not the case. BaK, as considered and defined in this CP, is only applicable at a defined boundary of the network to which the receiving users are connected. This results in a case where BaK cannot be applied to transit networks. The further details of BaK depend on the involved service and could also depend on the technical implementation. If the service is voice, the further details depend on the mobility of users: is their location known and fixed (non-nomadic users) or not (nomadic users). The routing also depends on whether it is a PSTN or VoIP interconnection. A thorough treatment of the possibility of hot-potato routing therefore asks for an assessment of different situations.

PSTN – non-nomadic

For PSTN voice, BaK is a wholesale billing regime for termination under which terminating traffic destined to users in area A and connected to network B is delivered without payment at a PoI of network B covering that area A. This rule was originally proposed by DeGraba(2000)

76 Analysys Mason (2008), p. 8.

which called this model COBAK, Central Office BaK, the central offices being the intended PoIs. In this system the regulator would have to decide a certain set of PoIs where BaK applies. The cost of routing the call to this PoI must be recovered by the calling party network, either by routing the call to the relevant PoI over his own network or by paying a transit operator or the receiving network to route the call to that point.

Cadman[77] puts this as follows: "*DeGraba(2000) […] neatly removes the hot potato problem by making the originating network responsible for the costs of transport all the way to the terminating network's central office, including the cost of transit if involved. This proposal maintains the incentive for the originating network to build an efficiently sized network and also maintains the customer-supplier relationship between the originating and terminating network and thus the incentive for investment as costs can be recovered from the originating network*."

Under BaK defined as above, there can be no hot-potato routing because BaK is only applicable for the last section of the route to the called user. The incentives regarding the exact routing of the call will therefore not be different relative to the CPNP regime. Therefore, there is no hot-potato routing in this situation.

PSTN – nomadic

When users are nomadic, like in mobile networks, and the boundary of a network to which other networks interconnect consists of several PoIs, it is not possible to link PoIs to certain areas. In this case traffic will be delivered at the PoI that is most convenient for the sender. This practice will not be influenced by whether the regime is CPNP or BaK and is efficient. Therefore, there also is no inefficient hot-potato routing in this situation.

VoIP

When interconnection on the transport level is using IP, the situation will be different. The voice call first has to be set up at service level and the IP address of the called user has to be distributed to the calling network (for example through SIP servers). If this is done, a TCP/IP connection will be set-up. The routing of IP packets and the exact PoI(s) that is/are used will be determined by the IP layer and the protocols that advertise routes to other networks.[78] The way in which this is done does not depend on the voice billing regime and so is neutral to whether this is BaK or CPNP. So the interconnection charging mechanism, whether CPNP or BaK, will not result in less efficient routing or inefficient hot-potato routing in this case.

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77 Cadman (2007)

78 For example the Border Gateway Protocol (BGP). Normally the originating network/router will not hold onto the packets until it is as near to the destination as possible, as is done in circuit switched local interconnection model. This also reflects that in IP-networks in general the location of the IP-address is not known to the calling party.

Conclusion

From the preceding it is concluded that BaK does not set extra incentives for hot-potato routing. The alleged problem of hot-potato routing does not occur if the applicability of BaK is limited to a defined boundary on the receiving network.

5.5 Quality of Service (QoS)

In this section the effect of BaK on QoS is assessed. The direct impact of BaK is that the operator that offers termination can not collect revenue for extra QoS. One could conclude from this that sufficient or extra QoS will not be provided any more. However, regarding voice interconnection the receiving operators have a non-financial reason to deliver the requested QoS because this also serves their own customers that receive the traffic. These customers would not be satisfied in they received poor quality incoming traffic. Therefore, receiving operators have a strong incentive to offer *sufficient* QoS for voice services.

It could be the case that a dominant operator (having a large market share on the retail market) offering termination and being able to discriminate between incoming and outgoing traffic could have an incentive for degrading the quality of incoming traffic. The mechanism behind this would be that users of small networks face the degradation for a larger percentage of their traffic. So users of smaller networks would have an incentive to switch to the larger network in order to get a higher average quality. However, this conduct is independent of the termination regime being CPNP or BaK. When there is a risk of a dominant operator engaging in such conduct, both in CPNP and BaK regimes minimum QoS requirements or generic non-discrimination obligations seem appropriate.

5.6 Carrier (Pre-)Selection (CPS)

CPS operators[79] use the network of the incumbent and currently pay a charge for origination and termination of traffic on the networks they use. CPS operators do not receive termination traffic themselves. Termination traffic destined to CPS users is directly passed to the incumbent network. The introduction of BaK would mean that CPS operators only pay for originating traffic and do not pay for termination any more. This would mean their cost for termination disappears while they would not – like network operators with incoming traffic – suffer a loss of incoming revenue from termination. On the whole they would not pay the total cost of using the networks of other operators any more and this would give them a relative competitive advantage compared to network operators.

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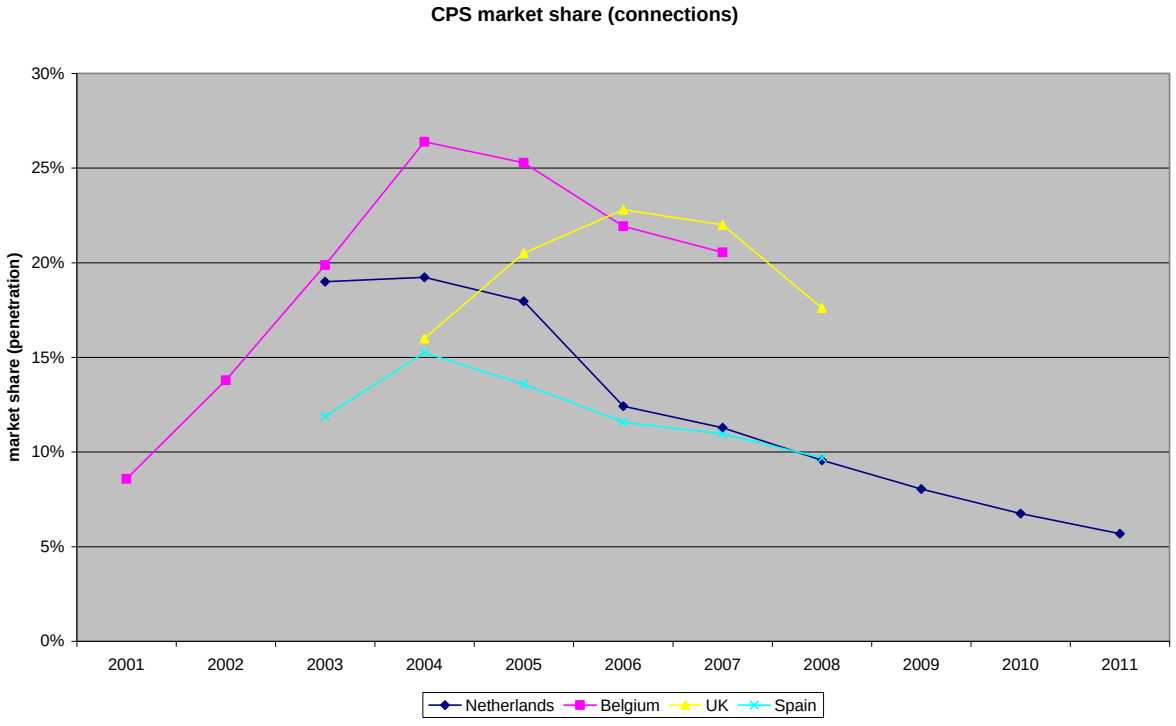
79 In fact, more than purely CPS operators. OAOs that have a mixed business model using different forms of access: some customers are served with own direct access, others with full LLU, and others with CPS. In any case, we will refer to CPS operators to all those operators using CPS to provide final services to a part or all of its costumers.

This potential distortion can be compensated by a mark-up on the originating tariff the CPS operators pays to the incumbent. By applying a mark-up on the originating traffic of the CPS operator, the cash flows between the incumbent, CPS operators and other operators do not change relative to the situation in which terminating rates where charges and the competitive balance remains the same. Intuitively one may think that this favours the incumbent because other operators do not get compensated for the loss of their terminating revenue. However, for these other operators the lost revenue from termination from CPS traffic is balanced by the eliminated cost of paying termination rates to the incumbent for traffic to the CPS users. In competitive balance between several types operators can be summarized by dividing the operators in three categories: (1) the incumbent that offers originating access to CPS operators, (2) the CPS operators and (3) all other fixed and mobile operators. By moving to BaK and applying a mark-up on originating, the net cash flow between each the categories and all the other operators is unchanged. So first, the net cash flow between the incumbent on the one hand and the combined CPS and other fixed and mobile operators on the other hand, is unchanged. Second, the net cash flow between CPS operators on the one hand and the combined incumbent and other operators on the other hand, is unchanged. Third, the net cash flow between the other operators on the one hand and the CPS operators and the incumbent on the other hand, is unchanged.

Figure 7: CPS as percentage of the total market of fixed voice (in number of subscribers)



Conclusion

By applying a mark-up on the regulated rate of originating traffic that CPS operators pay to the incumbent, the net cash flow between incumbent, CPS operators and other operators is

unchanged. Therefore, through such a mark-up the competitive balance in principle is unchanged.

6 Issues on practical implementation

6.1 Traffic from outside the BaK domain and arbitrage problems

A BaK domain is defined here as set of operators or countries where BaK applies, with the operators (or countries) outside the domain using the CPNP regime (the CPNP domain). This would result in the situation that for traffic leaving the BaK domain (outgoing traffic) termination charges are paid while for incoming traffic no termination revenue is received. This would lead to a subsidy from the BaK domain to the CPNP domain. It is likely that this subsidy is passed-through to users, so users in the BaK domain subsidize users in the CPNP domain.

This would be different if it is possible to differentiate within the BaK domain for traffic internal to the BaK domain (internal traffic) and traffic from outside the domain (external traffic). This differentiation would mean the BaK domain could operate under a CPNP regime for external traffic. In other words: incoming traffic from outside the BaK domain would pay a termination fee and incoming traffic from within the BaK domain would not. The possibility for this differentiation has a technical and a legal aspect. From the technical and economic point of view, the question is whether traffic from the CPNP domain can be differentiated from internal traffic and practically and efficiently billed under a CPNP regime. From the legal point of view the question is whether this differentiation would be allowed.

First, the technical and economic aspect is assessed here with the presumption that differentiating between traffic from inside and outside the BaK domain is possible. Technically differentiation could, in principle, be done based on the Calling Line Identification (CLI) that identifies the telephone number of caller. Through the number of the calling user traffic from outside the BaK domain could, in principle, be identified and separately billed. However, the question is if this can practically be implemented or is just too complex. Previous experience with these kinds of situations shows that it is very difficult to differentiate billing of termination traffic based on the source of the traffic. For example in France mobile operators used BaK for mobile to mobile traffic until 2004 but continued to charge fixed operators for terminating traffic, leading to the development of mobile gateways used by some operators to convert fixed-to-mobile traffic into mobile-to-mobile traffic in order to benefit from the BaK agreement.[80] The crucial issue is that when BaK applies in a certain domain, operators in that domain have an incentive to compete for traffic directed to the BaK domain, charge a terminating fee for it and deliver the traffic on to the destination network without cost.

80 See Loutrel (2006).

Therefore, ERG expects that operators in a BaK domain will not be able to efficiently differentiate and charge a significant fee for traffic coming from outside the domain.

This conclusion means that when BaK is introduced in a certain domain (country, or group of countries), while other countries use the CPNP regime, a subsidy from the BaK domain to the CPNP domain can probably not be prevented.

As an isolated[81] effect this would probably result a slightly upward pressure on retail prices inside the BaK domain and slightly downward pressure on prices in the CPNP domain. The size of this effect depends on the percentage of outside BaK domain traffic. For smaller countries, with relatively more outside BaK domain traffic if they are surrounded by mostly CPNP countries, this effect would be more important.

The differential in termination rates is quite substantial under the current CPNP regime. This may change over time with the new termination rates recommendation being applied across Member States. The difference between BaK and low termination rates is likely to be smaller than current differences and therefore the argument of the subsidy becomes less important in the longer run.

As stated before, it is clear that the relative substance of this subsidy from the BaK domain to the CPNP domain increase as the traffic from outside increases relative to the traffic inside the BaK domain. This would probably hinder introduction of BaK in small domains, like smaller countries or fixed or mobile operators in a country. Therefore, the conclusion is that BaK preferably should be introduced at least nation wide for all fixed and mobile voice traffic and also independent of technology like PSTN or NGN. Introduction within a block of adjacent countries would be preferable at least for smaller countries usually having a high proportion of outgoing traffic. To illustrate the substance of this issue, a middle sized country like The Netherlands five percent of all fixed and mobile retail minutes is international traffic. At current price levels for fixed voice retail and termination services, this would mean a cash flow to the CPNP domain that is below one percent of all fixed voice revenue. At current price levels for mobile voice retail and termination services, this would mean a cash flow to the CPNP domain that is a few percent of all mobile voice revenue.

Conclusion

When BaK is introduced in a certain domain (country, or group of countries), while other countries use the CPNP regime, a subsidy from the BaK domain to the CPNP domain can probably not be prevented. However, this effect does not require that BaK is introduced

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81 Isolated meaning purely looking at the effect of this issue and not considering other effects that are assessed in this CP. In other words, other mechanisms will probably lead to *lower* retail prices, but this subsidy mechanism seen in isolation would result in higher prices in the BaK domain. So this mechanism gives an *upward pressure* on retail prices.

simultaneously in all Member States but still allows for different speeds of transition towards BaK.

Question 9 (Section 6.1):

Do you agree with the conclusion that operators/users in the BaK domain will subsidise traffic coming from outside the domain (regardless of the legal aspect)? Are there any mechanisms to prevent this and how will they work in your view, in particular to avoid arbitrage?

6.2 Arbitrage and call back schemes

Arbitrage is the practice of taking advantage of a price differential between two or more products or services. This section also looks to smart or (partly) free riding use of the BaK regime that could have negative impact on welfare, which is seen as a special case of arbitrage.

Since BaK does not provide price differential for terminating services, BaK does not provide an opportunity for arbitrage. Arbitrage could be an issue in a system where BaK would be provided under certain conditions. For example, if BaK would be restricted to traffic originating inside a BaK domain, there would be arbitrage opportunities for rerouting traffic from outside the domain (see section 6.1).

Theoretically, BaK could be used however by service providers to free ride on the infrastructure of network operators. This could be done by a service number located on a central server that calls back the calling party (A number) and connects the call to the called party (B number). In such a "call back scheme" the service provider uses two free terminating calls to make the connection. This problem could be addressed by use of a commercially agreed RPP model that recovers the full costs from the called party. It could also be addressed in a legal way by excluding this kind of free riding use from BaK. For example, BaK could be restricted to 'real' terminating traffic, that is: traffic on the network of the *called* user and not that of the calling user. The latter can probably be implemented since call back schemes can be easily detected by the network operators when a call from number A is directly followed by a call to number A. However, there could be some regulatory cost in assuring compliance with this additional rule.

Analysys Mason recently assessed the use of arbitrage in BaK countries and in a report for Ofcom.[82] Analysys Mason did not find any arbitrage problems related to BaK apart from call back schemes that where used in Singapore by the operator StarHub. Some examples of

82 Analysys Mason (2008)

arbitrage where found related to the still partly used CPNP regime in those countries in case of differentiated terminating fees based on factors such as carrier type.

Regarding call back schemes it can be assumed that with an increasing relevance of retail flat rate schemes call back issues will be less problematic.

Conclusion

Call back schemes seem the only opportunity for arbitrage (or free riding use) use networks due to BaK, although increasing use of flat rate will make this less problematic. This use can be prevented by a rule that says BaK applies to real terminating traffic only, but assuring compliance could have some costs.

6.3 Migration

Regarding migration from the current CPNP regime to BaK, two issues are relevant. First, the question is whether and how this migration should be synchronous (executed at the same time) for different operators or countries. Second is the speed of the migration itself. For example, should the migration be done in a CPNP glide path to zero rates and – if yes – how long should the glide path be.

Regarding the synchronisation, it follows from the section about traffic from outside the BaK domain that introduction should preferably be synchronous within a domain that is sufficiently large. Regarding the speed of migration it is important that the migration should allow retail business models to adapt. The timeframe will depend on the substance of the change that is mainly dependent on height of the termination rates under CPNP at the start of the migration.

Strict application of cost orientation in a CPNP environment in the short term for mobile and/or PSTN networks leading to a reduction of termination rates can be seen as an important step in the migration towards BaK. The length of the migration period can be shorter the lower the absolute level of interconnection rates, the smaller the relative difference between interconnection rates of different networks and the higher the proportion of flat rates at the retail level is.[83]

Considering the migration to all IP-networks it seems plausible to apply the charging mechanism of IP networks (that are *not* phased out as PSTN networks will over time) because a change of charging mechanism cannot necessarily be expected for the unregulated part of IP-networks applying BaK, Peering and Transit.

Question 10 (Section 6.3):

83 See ERG (2008), p. 101

Do you see any implementation problems for a migration period towards BaK? How could such problems be addressed?

7 Summary and overall assessment

In the sections before the effect of BaK related to different individual issues was assessed. In this final section all this individual issues are integrated and weighed together to come to a final assessment. To start, the main results of this assessment are summarized.

Summary

First it was observed that the convergence of networks, the transition to NGN networks and the growth of data services, all cause the costs of voice per minute to fall. This is relevant for the full cost including common and joint cost, but even more relevant for the incremental cost of termination. This is an important fact because the more the costs per minute decrease and come closer to zero, the less the difference between CPNP and BaK in terms of effects will be and the more important the higher regulatory cost of setting a rate under the CPNP regime will become. Regarding the falling costs per minute, it is also important that the absolute difference in cost per minute between fixed and mobile is decreasing.

Second, the effects of BaK on the termination bottleneck where assessed in section 5.1. The conclusion was that BaK reduces regulatory cost and uncertainty (see section 5.1.3). Another conclusion was that moving cost recovery from termination, which is a regulated market, to competitive retail markets increases incentives for efficient cost minimization (see section 5.1.2).

Third, it is assessed how well BaK internalises call and network externalities. Consideration of *call* externalities would lead to the conclusions that – assuming usual plausible cost and utility distribution and bearing in mind their uncertainty - BaK is likely to internalize these effects better than CPNP. There is also not much evidence that network externalities are important when setting termination rates and even if they were important in general, it is not clear that termination rates are a good tool to increase the number of subscribers to telephone networks.

Fourth, the effects of BaK on different retail offers and customer groups are assessed. There are two main probable effects that can be discerned here. The first is that BaK is expected to lead to higher average usage per capita and a lower average price per minute. The second is that BaK could possibly lead to a slightly lower ownership. The prediction of these effects is based on both empiric data as on logical reasoning. From the section on empirical evidence it seems evident that countries that use BaK – or near BaK – regimes have far higher usage and a lower average price per minute. From the adjusted Merrill Lynch data it follows that, on average, usage in BaK countries is more than twice as high and price is half of the price in countries with a CPNP regime. Logical (theoretical) reasoning also predicts these effects. Crucial in the logical reasoning is the mechanism that BaK decreases the marginal costs of traffic and the cost risk related to especially flat-rate offers that drives higher usage. Higher

usage in combination with the large scale effects (economies of scale present in fixed and mobile networks) create lower costs per minute and so BaK feeds a positive feedback loop of higher usage and lower prices.

Overall these two effects suggest that BaK is likely to deliver a material welfare gain to consumers overall. Consumer welfare is mainly determined by usage per capita and price. Total welfare is mainly determined by usage per capita and the cost per minute. For consumer welfare and total welfare the ownership is mainly only an indirect variable that is relevant as far as it drives higher usage per capita. Ownership is therefore integrated in the weighing of aggregate effects by looking at the usage per capita and not at the usage per active user.[84] Weighing the usage per capita, price and ownership effects together, the higher usage and lower price per minute clearly indicate BaK results in a higher consumer and higher total welfare.

On the evidence available, the possibility of slightly lower handset ownership and penetration under BaK is less important than the potential positive effect of higher usage and lower prices. We do not have strong evidence to suggest that the impact of BaK on ownership rates would be significant, and in any case (as noted with network externalities) higher termination rates are a blunt tool for boosting handset ownership. It is further noted that high penetration is generally related in Europe with handset subsidies that drive churn and frequent replacement of handsets, a phenomenon of which the efficiency (in terms of total welfare) is questionable. This higher welfare for BaK is a total, aggregate effect however and at more disaggregated level low usage consumers could possibly face slightly higher prices.

Fifth, the effects on operators are assessed. These effects are mixed. Moving to BaK will influence the competitive strength of groups of operators and individual operators especially in the migration to BaK. It is in general not possible to say which category or group of operators will benefit. What is clear is that mobile operators will lose their current cash stream from fixed operators related to the relatively high MTRs. Thereby the move to BaK and the expected adjustment of fixed and mobile prices will imply an adjustment of the competitive balance between fixed and mobile operators.

It is noted again that predicting in general the effects on other groups of operators is not possible. The effects depend on the traffic balance of the individual operators. By moving to BaK some operators will benefit but others will have a disadvantage especially during the migration in which the industry adjusts to the new regime. Given the falling cost per minute and the expected lower level of terminating rates under a CPNP, these effects are not expected to be very substantial in general. However, a change of regime and the resulting adjustment process could result in some transaction costs and as such this is a negative element of moving from the current regime to BaK.

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84 In formula form: usage per capita = usage per user x ownership = usage per subscriber x penetration

Sixth, the effects on cost efficiencies (or productive efficiency) are assessed. The conclusion is that BaK has no positive or negative impact on investment incentives. These are expected to remain unchanged because termination rates just transfer money between operators and do not change the general ability to raise revenue from the retail market. The assessment of efficiency of cost recovery, externalities and the effect on usage and pricing assessed in other sections, do not indicate BaK leads to a lower efficiency that could negatively impact investment incentives. On the contrary, BaK seems to lead to higher usage and related higher investment levels. The so called problem of hot potato routing does not exist as long as the application of BaK is limited to termination at a specified boundary and does not extend to transit services.

Seventh, the effect on QoS is assessed. Regarding voice termination BaK is not expected to result in lower QoS because the terminating operator has an incentive to deliver reasonable service for his own customer who is receiving the call.[85] At least incentives regarding QoS are not different in CPNP or BaK.

Eighth, the effect on CPS is assessed. Possible distortions by moving to BaK in the competitive balance between CPS and non-CPS operators can be corrected by applying a mark-up on the regulated tariff that the CPS operator pays to the incumbent for originating traffic.

Finally, some practical implementation issues are assessed. This leads to the conclusion that there are no blocking implementation issues regarding BaK, but that there is one negative aspect related to the implementation of BaK in a certain domain (for example a country of group of countries) while the outside world remains at CPNP. This effect results from the fact that there will be cash flow from BaK to CPNP domains, which means users within the BaK domain subsidize users in the CPNP domain. Another conclusion regarding the practical implementation is that if BaK is introduced, it should be done in gradual change requiring a sufficiently long glide path to allow retail business models and retail pricing to adjust slowly.

Overall assessment

The following major effects (pro and con) of BaK were assessed. The most important effect is the expected significant higher usage and lower price per minute that, although with possibly slightly higher prices of low usage offers and slightly lower mobile ownership, overall will lead to higher consumer and total welfare. The ERG assesses this as a primary and big advantage of BaK. The other effects that where identified in this CP are secondary in nature.

Secondary positive effects of BaK are the following: firstly, the shift of cost recovery to the competitive retail domain as such gives better incentives for efficient cost recovery. Secondly, there will be a reduction of regulatory costs and uncertainty.

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85 Possible exceptions regarding dominant operator are outlined in Section 5.5.

Secondary negative effects of BaK are the following. firstly, the transition and adjustment process to BaK could create limited transaction cost of the regime change. Secondly, users inside the BaK domain subsidise users outside the domain. The significance of this effect depends on the percentage of outside BaK domain traffic and the level of termination rates outside the BaK domain.

Some other issues are neither positive nor negative for BaK, but nevertheless are relevant for this final integrated assessment. Firstly, there is some inherent uncertainty in the prediction of effects of different interconnection regimes. Secondly, due to falling cost per minute and especially lower incremental cost per minute, the difference in the effects of BaK and CPNP will decrease. Thirdly, If BaK is introduced it should be done gradually through a sufficiently long glide path. NGNs with lower costs will give an additional incentive to shorten the migration period needed for a shift of the charging mechanism towards BaK.

Weighing the pros and cons summarized above the ERG concludes that the expected higher usage and lower price under BaK outweighs the cons in general if BaK is introduced gradually through a sufficiently long glide path. The lower regulatory cost and uncertainty is an extra benefit of BaK. This is the more relevant in the longer term where the cost per minute decreases, the difference in effects of CPNP and BaK decrease and the cost of determining a cost oriented tariff becomes relatively more important.

However, some of the cons could justify continuation of the CPNP regime at least for the short and medium term. Especially in countries (1) where CPS operators are important for competition (moving to BaK could be more complicated in that case, because of the possibly appropriate mark-up on voice originating), (2) that have a significant percentage of traffic to neighboring countries that use CPNP regime (which means BaK introduces a subsidy to the CPNP domain). Also the uncertainty about the effects could be a reason to be cautions, possibly keep the CPNP regime in place and monitor the effects of lowering terminating rates under the CPNP regime first, before the step to BaK is made.

Therefore, BaK is more promising than CPNP as a regulatory regime for termination for the long term and based on national circumstances (including legal issues) NRAs could set a glide path to BaK within the regulatory period related to the next market analysis they carry out for voice termination. However, for the short and medium term CPNP can also be an appropriate choice based on national circumstances, so NRAs can also continue the CPNP regime at least in the next regulatory period.

Question 11 (Section 7): Does the draft CP miss any other relevant issues?

Consultation questions

Question 1 *(Section 1)*: Do you agree that in a multi-service NGN environment, in which different services use a shared transport layer, different interconnection regimes for different services could create arbitrage problems? If yes, could you describe the problems that you foresee or that have already occurred. If no, what prevents these arbitrage problems in your view?

Question 2 *(Section 1 & 2.2)*: What is the influence of the separation of transport and service for the interconnection regime and in particular the charging mechanism and in what way are NGNs and BaK related?

Question 3 *(Section 3.2)*: How would you define the boundary for the application of BaK and where should it be located (i.e. points of interconnection where BaK is applicable)?

Question 4 *(Section 4.2)*: What is your conclusion on the relationship between the charging mechanism and penetration, usage and price level?

Question 5 *(*Section 5.1.3*)*: How does BaK affect regulatory certainty and the risk of legal disputes?

Question 6 *(Section 5.2.1.3):* How do different wholesale charging mechanisms impact on the number of unwanted calls? Do you expect (other) effects on consumers/consumer groups? Where possible, provide a quantitative assessment of the expected effects.

Question 7 *(Section 5.2)*: How do you assess the quantitative relevance of call and network externalities?

Question 8 *(Section 5.3.5)*: How would your business be affected by a move from CPNP to BaK? Please explain the expected impact on prices, volume of supplied services and profit.

Question 9 *(Section 6.1)*: Do you agree with the conclusion that operators/users in the BaK domain will subsidise traffic coming from outside the domain (regardless of the legal aspect)? Are there any mechanisms to prevent this and how will they work in your view, in particular to avoid arbitrage?

Question 10 *(Section 6.3)*: Do you see any implementation problems for a migration period towards BaK? How could such problems be addressed?

Question 11 *(Section 7)*: Does the draft CP miss any other relevant issues?

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