



Cost modelling in the context of price control under the New Regulatory Framework

Comments by Deutsche Telekom
on the ERG consultation on FL-LRIC cost modelling
September 2003



Contents

Introduction

1. Price regulation under the New Regulatory Framework

- 1.1 Imposition of remedies
- 1.2 Instruments of price regulation

2. The rationale of cost-based price regulation

- 2.1 Theoretical considerations
- 2.2 Difficulties in practise
- 2.3 Is LRIC suitable for mobile markets?

3. Principles of cost modelling

- 3.1 Relevant costing standard
- 3.2 Scorched node versus scorched earth approach
- 3.3 Relevant increment
- 3.4 Cost-Volume Relationship
- 3.5 Common costs
- 3.6 Long run and forward looking
- 3.7 Asset valuation
- 3.8 Depreciation
- 3.9 Reasonable rate of return

Cost modelling in the context of price control under the New Regulatory Framework

Introduction

Deutsche Telekom welcomes the opportunity to comment on the questions raised by the ERG to discuss the necessary adjustments to the Principles of implementation and best practise (PIB) regarding FL-LRIC cost modelling in the light of the New Regulatory Framework (NRF).

However, we would like to point to the short consultation period of just above one month during the summer which made it difficult to carry out a thorough analysis of LRIC-based price regulation in the context of the NRF and which appears very short in view of the complexity of the issue.

Our **main comments** can be summarised as follows:

- LRIC based price regulation should be placed in the context of the New Regulatory Framework (NRF): in comparison to the 1998 regulatory package, the NRF gives NRAs more flexibility to address market problems in a liberalised environment and requires NRAs to closely examine the proportionality of the any envisaged regulatory measure.
- There are different means of price control. Being the most intrusive regulatory measure, cost-oriented pricing for wholesale products should only be considered when dealing with a high degree of market power which is both persistent and cannot be dealt with by other remedies.
- In the context of rapid technological change and parallel networks, setting prices equal incremental costs cannot be a reliable guide for price control in future telecommunications markets.
- Cost orientated price control is in particular not suited for mobile networks.

1. Price regulation under the New Regulatory Framework

Deutsche Telekom encourages the ERG to place its considerations on price regulation firmly in the context of the New Regulatory Framework. In Comparison to the 1998 regulatory package, the New Regulatory Framework (NRF) gives NRAs more flexibility to adequately address market problems in a liberalised environment. The Directives give NRAs the possibility to impose, under certain conditions, obligations relating to price regulation of SMP-operators. Any examination of cost modelling in electronic communications networks should recall these conditions and the objectives of the New Regulatory Framework. The principles of the new Framework will determine the scope and the rationale behind possible future LRIC-based regulation.

1.1 Imposition of remedies

Before regulatory obligations can be imposed on an undertaking, under the NRF NRAs will need to closely examine the proportionality of the envisaged regulatory measure (cf. inter alia Art. 8 § 1 Framework Directive and Art. 8 § 4 Access Directive).

In view of the objectives of the New Regulatory Framework, namely the goal to ensure that users derive maximum benefit in terms of choice, price and quality, proportionality can only be assured if the proposed regulatory intervention leads to a better market outcome, i.e. greater efficiency. Therefore, any regulation should be accompanied by an examination of the costs and benefits of imposing one or more specific obligations. NRAs have to adequately show that expected benefits of regulatory intervention exceed expected costs. A decision on the imposition of sector-specific obligations requires detailed analysis of the market situation, including *inter alia* a thorough examination of market outcome at end-user level.

The Access Directive describes a set of obligations or conditions, which NRAs can impose on different types of network access. The set of obligations in Articles 9-11 and 13 of the Access Directive includes the obligation of Transparency (Article 9), the obligation of non-discrimination (Art. 10), accounting separation (Article 11) and price control and cost accounting obligations (Article 13).

The obligations in Art. 13 relating to price control in wholesale markets and retail tariff regulation under Art. 17 Universal Service Directive constitute the most intrusive of possible measures under the NRF, making them measures of last resort. The Directives therefore stipulate that price control should only apply

“in situations where a potential lack of competition means that the operator concerned might be capable of sustaining prices at an unusual excessive level, or applying a price squeeze, to the detriment of end users (art. 13 § 1 Access Directive).”

Even where an NRA can prove that these conditions are met, all expected costs for society of possible price regulation (for LRIC-based regulation, see in detail 2.2. below) have to be considered when deciding upon the imposition of an obligation relating to price control. E.g., Art. 13 § 1 foresees that NRAs have to take into account the

investment made by the operator and the risks involved in such investment. However, NRAs in many cases will not be able to accurately calculate the risks of investment. Accordingly, the question whether the risks of the regulated operator are duly taken into account is not only a matter of the conditions of price regulation but also of the decision whether to apply price regulation as such.

1.2 Instruments of price regulation

There are different forms of price control ranging from an obligation that prices are reasonable¹ to squeezing tests, price cap regimes and cost-oriented prices of individual services.

Cost-oriented pricing for wholesale products should only be considered when dealing with a high degree of market power which is both persistent and which cannot be dealt with by other remedies.

Price caps constitute an alternative instrument to price control of individual tariffs which in most cases is perfectly sufficient to avoid excessive pricing. It is relatively easy to use and, depending on the conditions, creates more efficiency incentives for the regulated undertaking in comparison to control of individual tariffs. In cases where an SMP operator is not abusing its market power at the time when the market analysis is carried out, imposing a limit to the freedom to increase the existing price level is sufficient. Where applicable, the determination of the X-factor for productivity progress should be based on current price levels.

A **squeezing test** is a usual competition law instrument which should only apply where a margin squeeze is established, i.e. where the SMP-operator is foreclosing competition in a vertically related area by pricing that does not permit efficient entry. Compensating pricing between complementary goods is generally not abusive, since it increases end-users utility.

As a rule, **cost-orientated pricing** should not be applied where network duplication or inter-platform (intermodal) competition is feasible. Consequently, only in cases where network services can not be duplicated by alternative operators in the long-run, i.e. where access to a facility is objectively necessary for any possible competitor in order to compete on a market downstream to the facility ('essential facility', network access at cost-oriented charges may be granted.

¹ Cf. Recital 20 of the Access Directive (22/2002/EC) states that:

"[...] The regulatory intervention may be relatively light, such as an obligation that prices for carrier selection are reasonable as laid down in Directive 97/33/EC, or much heavier such as an obligation that prices are cost oriented to provide full justification for those prices where competition is not sufficiently strong to prevent excessive pricing. In particular, operators with significant market power should avoid a price squeeze whereby the difference between their retail prices and the interconnection prices charged to competitors who provide similar retail services is not adequate to ensure sustainable competition. When a national regulatory authority calculates costs incurred in establishing a service mandated under this Directive, it is appropriate to allow a reasonable return on the capital employed including appropriate labour and building costs, with the value of capital adjusted where necessary to reflect the current valuation of assets and efficiency of operations. The method of cost recovery should be appropriate to the circumstances taking account of the need to promote efficiency and sustainable competition and maximise consumer benefits."

Where cost-oriented pricing of individual tariffs is envisaged, several costing standards can be applied. For a light price control, the Access Directive in Rec. 20 refers to the ONP Interconnection Directive (97/33/EC) where **reasonable** (interconnection) **charges** are defined. The Directive foresees that the level of charges should promote productivity and encourage efficient and sustainable market entry, and should neither be below a limit calculated by the use of long-run incremental cost and cost allocation and attribution methods based on actual cost causation, nor above a limit set by the stand-alone cost of providing the interconnection in question. I.e. access charges are reasonable if they lie within the range between LRIC and SAC of the relevant access service. Also, where evaluating whether prices are excessive, **benchmarking** can play an important role.

2. The rationale of cost-based price regulation

2.1 Theoretical considerations

The logic behind cost-oriented price control in regulation can be taken straight forward from neoclassical economics: according to the model of perfect competition social welfare is maximised if prices equal marginal or incremental costs. From this equation regulators derive their motivation to heavily use cost orientation as a measure to enhance efficiency respectively consumer benefit.

However, because telecommunication networks show substantial economies of scale and scope marginal cost pricing does not provide for cost recovering. Therefore, according to modern industrial economics, regulators must allow for mark ups on incremental costs². Regarding welfare maximisation these mark ups should be allocated in flexible amounts following Ramsey-Boiteux pricing principles. This means, that regulators should not try to set prices equal costs, but may to a certain degree, if at all, assure *cost orientation* of prices.

Furthermore, taking dynamic aspects into account, especially the incentives of firms to entry into a market or invest into their networks, sector-specific risks have to be covered by regulated prices. In the light of converging networks these uncertainties get substantially bigger. For new technologies as mobile or wire line broadband services future demand and technical developments are highly uncertain, which makes reliable cost calculations for regulatory purposes difficult or even impossible.

Another theoretical problem occurs due to network differentiation respectively quality competition. With the development of alternative networks different qualities and different network standards become relevant as it is the case with mobile, IP or ATM-Networks. For example, different qualities in providing mobile calls (deep inhouse) or DSL-services (bandwidth, contention ratio, drop rate etc.) can be hardly judged from an overall efficiency point of view. Instead, the regulator has to rely on the business plans of the regulated firm.

² Laffont/ Tirole (2000), p. 100 ff.

Therefore, from a theoretical point of view it can be summarised that the efficiency standard for setting prices equal incremental costs can hardly be a reliable guide for price control in future telecommunications markets. Even the POTS-networks, which under a stable state monopoly would be a “natural” candidate for cost-orientated price control, are hard to calculate with increasing competitive pressure from other platforms.

2.2 Difficulties in practise

Practical problems should lead to an even more cautious use of cost orientated regulation. In practice the relevant costs cannot be calculated precisely and objectively but are always mainly result of subjective judgements. In consequence there is a risk of errors that lead to unwanted market outcomes. Among these problems with LRIC-based price regulation which for example a study by CASE on the use of remedies³ has identified are :

- Too low costs/ prices can lead to excessive entry by transferring profits and rents to new entrants and weaken the incentives for facility based carriers.⁴ The massive entry by new service provider in Germany, after RegTP had set low entry conditions in 1998, and the lot of bankruptcy at the beginning of this century may be a good example for that. LRIC based pricing does generally not provide for the recovery of
 - a) the opportunity costs of developing unsuccessful services or internally developed inputs, including transaction costs such as search and bargaining costs and
 - b) the installation costs of shifting to new technology.
 This creates strong incentives for SMP operators to (inefficiently) focus business development on unregulated areas and, specifically, on downstream activities which in turn may create a need for additional regulatory intervention;⁵
- Empirically the results of regulators cost estimations often vary to a large extend, so there is a high risk of significantly mis-estimating costs from the markets point of view. E. g., it is reported that US LRIC models of the same network components can differ by up to 70 percent,⁶ while in Australia differences of 30 per cent have been found.⁷ Also, while the weighted average cost of capital (WACC) ap-

³ REMEDIES UNDER EU REGULATION OF THE COMMUNICATIONS SECTOR, CASE June 2003

⁴ J. G. Sidak & D. F. Spulber, *Deregulatory Takings and the Regulatory Contract* (Cambridge University Press, 1997).

⁵ J. J. Laffont & J. Tirole, *Competition in Telecommunications* (MIT Press, 2000) 7-8.

⁶ L. Prosperetti, “Costi Incrementali in Corso di Affondamento, Beltel, November 2001.

⁷ Australian Productivity Commission, *Telecommunications Competition Regulation - Inquiry Report*, (December 2001) 627-630. The Australian Productivity Commission, in a recent assessment of the access regime under Australian competition law, stated that: “A striking premise underlying the TSLRIC is that it presupposes that the regulator knows how to run an efficient network, and may know this even better than the incumbent. This premise is suspect – and the risk of regulatory error is high. NERA’s (1999) modelling of TSLRIC costs associated with the PSTN has relatively wide bands of uncertainty. This uncertainty over efficient costs needs to be accommodated in access pricing determinations. [...] Thus, it would be fallacious to conclude that uncertainty was resolved from the fact that recently published estimates no longer include a range (table D.1). The factors that led to these uncertainties remain unresolved. Indeed, taking the three sources of uncertainty together (call conveyancing costs, line costs and the allocation method for the access deficit) it is plausible that the band of uncertainty around the midpoint estimate of PSTN is approximately plus or minus 30 per cent. [...] As shown above, the cost estimates underlying the TSLRIC are imprecise, so that regulatory error is inevitable. Even if over successive judgements, the regulator generates unbiased estimates of the TSLRIC price, the regulator will sometimes set prices that are too high and sometimes too low. However, the impacts of downward errors may be different to that of upward errors, requiring that the regulator adjust the price to take account of the adverse effect

proved by European regulators for the unbundled local loop lays on average above 13 % the German Regulator approved in its latest decision on unbundled local loop prices 8 % WACC. Likewise, for regulated mobile operators the approved WACC in Western Europe vary from, e.g., 12 % in the UK to 19,5 % in Belgium.

- Due to the described uncertainties, the problem of time consistent cost calculation can hardly be solved in practise. If forward-looking costs of a reasonably efficient operator are used, they may be based on an inappropriate timing of network investment and upgrading leading to inadequate returns and lost options value.⁸ The migration process from 2G to 3G networks is affected by variety of factors, e.g. sharing of network facilities, supply and demand for dual mode 2G/3G hand-sets etc. Undoubtedly, if regulation would force mobile operators to recover 2G cost in a certain mode this has negative repercussions on the rollout of 3G services (s. below 2.3.).

To sum up, cost orientated price regulation is a mainly static concept. It interferes heavily with the business decisions of the regulated operator and always contains the risk of welfare reducing errors. The high informational requirements and the subjective elements of calculating costs can hardly provide for reliable and time consistent prices. Therefore access and interconnection regulation should in general be more in line with economic principles as well as light-handed.⁹ If at all, cost orientation is only suitable for situations, where persistent monopolistic bottlenecks prevail. With increasing technological changes and competitive pressure the role for cost orientation in price control should diminish. It should not apply at all to evolving markets.

This is not to say that regulatory costing may not be useful in certain circumstances. When liberalisation of former state monopolies started, it was difficult to judge on the efficiency of existing networks and – because of “political prices” – on welfare maximising price structures. Under such circumstances regulatory costing may provide a better benchmark for competitive outcomes as other more light-handed instruments¹⁰.

2.3 Is FL-LRIC Suitable for Mobile Markets ?

As a rule, cost-oriented pricing should not be applied where network duplication or inter-platform (inter-modal) competition is feasible. This is clearly the case in the mobile industry.

Mobile markets have been characterised by competition from the outset and relied on parallel networks. From the start of mobile communications different operators have

of errors”. Australian Productivity Commission, Telecommunications Competition Regulation, Inquiry Report, (December 2001) 627-630.

⁸ A. K. Dixit & R. S. Pindyck, *Investment under Uncertainty* (Princeton University Press, 1994).

⁹ see Laffont, J.-J., and J. Tirole. (2000), *Competition in Telecommunications*, Cambridge, MA: MIT Press, p. 6-9

¹⁰ This particular background of LRIC is illustrated by the following statement from the Europe Economics Study commissioned by the European Commission concerning the regulation of mobile markets in comparison to POTS:

“In fixed networks one of the concerns has been that incumbent operators with legacy networks should not receive compensation for inefficiently incurred costs. Such concerns are in our opinion less likely to be a concern in mobile networks. Assuming there is competition between MNOs in the provision of some services, competitive pressure will force the operators to be efficient in the provision of these services...”¹¹

built up their own independent area-wide networks. Mobile markets are dynamic evolving markets subject to rapid and drastic technological changes. Mobile operators and their shareholders incur a particularly high degree of risk arising from the accumulation of substantial sunk costs far before demand emerges, significant uncertainty as to the development of demand, the uncertain pace and direction of technological change and the unclear evolution of the market. Also, mobile markets involve highly complex network design processes.

Due to the described uncertainties and the fact that mobile markets are not yet mature in terms of the network roll-out and may not become mature in the foreseeable future, the problem of time consistent cost calculation does arise. This means for instance that, rather than a risk of overestimating the costs of rolling-out mobile networks, a risk exists that by taking a snapshot of a mobile network in time, the costs of network roll-out is substantially underestimated seriously threatening investment incentives and dynamic market development.

Furthermore, 2G and 3G services are closely interrelated on the demand side as well as on the supply side. Voice calls will be terminated using either 2G or 3G spectrum to dual mode 2G/3G handsets. Therefore, the likely impact of the regulation of 2G services on 3G services is substantial. 3G and 2G services will be supplied using many common elements of network infrastructure and corporate systems. Regulation that reduces the ability of a mobile network operator to recover a proportion of the costs of such elements and systems from 2G services would require that a greater proportion be recovered via higher prices for 3G services retarding the growth of 3G services.

In illustrating the economic risks of applying LRIC to dynamic markets and uncertain investments, Professor Jerry Hausman takes the example of what would have happened if the US Federal Communications Commission (FCC) had sought to impose TSLRIC on the mobile industry:

“Consider the likely outcome if the FCC had used a TSLRIC approach to regulate the price of cellular telephone service. If cellular carriers had been required to sell their services to competitors (resellers) at a TSLRIC cost-based price, it is unlikely that they would have risks the billions of dollars of investment in cellular networks when the future of cellular was highly uncertain and many industry analysts did not forecast much success for cellular. The consumer welfare gains that have been derived from the success of cellular telephone would not have existed; indeed, a TSLRIC-based rule would likely have led to tens of billions of dollars of lost consumer welfare.”¹¹

The ERG document is missing any sign showing that ERG is aware of the differences between individual telecommunication markets. Application of the “technological neutrality principle” must not ignore the existing reality:

¹¹ Hausman, J.A., “Valuing the effect of regulation on new services in telecommunications”, *Brookings Papers: Microeconomics* 1997, p.30.

“ Respect from the principle of technological neutrality need not require that identical policies be implemented in all respects in both the fixed and mobile sectors, whether in terms of the scope of regulatory measures or their timing.”³

3 Principles of cost modelling

If, despite its disadvantages, cost-based price regulation is used, the following should apply:

3.1 Relevant costing standard: No abusive pricing between SRIC and SAC

Long run incremental costs (LRIC) only serves as a basic orientation for pricing. Undoubtedly, in the long run an operator has to recover LRIC since replacement of old assets by new ones requires an equivalent investment. In the short run however, operators need the possibility of flexible direct costing to adapt to unexpected market changes.

In general no abuse of SMP may be presumed as long as prices lie between short run incremental costs (SRIC) and stand alone costs (SAC). A price below SRIC does not even cover the variable costs of the service, so this service is subsidised by other services. A price above SAC however does cover the LRIC of the service as well as all shared and common costs of the regulated operator. A price outside this range is therefore not cost-covering or grants an excessive margin.¹²

As Vogelsang(2002) states LRIC may serve as a starting point of a price control. In evaluating the price level regulators should also take into account that pricing flexibility enables the operator to efficiently utilise its network capacities. LRIC may present a benchmark level for pricing, however, for the short term operators must be able to signal their capacity utilisation via pricing. If demand exceeds embedded network capacity prices above LRIC are appropriate and vice versa. Especially as, these signals are important for the investment decisions of efficient new entrants.¹³ Excess capacity in national and international backbones might be due to pricing rigidities.

3.2 Scorched node versus scorched earth approach: Workable efficiency

The assessment of cost-oriented prices has to be based on the actual costs of the operator concerned. These costs can be checked in the light of achievable efficiency gains. It is therefore important to consider the possible adjustment towards an efficient production.

NRAs should not use a scorched earth approach because prices will then be approved under the theoretical assumption of full efficiency. Thus no competitor can do better than the by assumption fully efficient operator. As a consequence competitors

³ Study for EC DG Information Society, Squire, Sanders&Dempsey L.L.P., January 2000, p. 44

¹² Faulhaber, Gerald R. (1975), “Cross-Subsidisation: Pricing in Public Enterprises”, American Economic Review 65, p. 966-977

¹³ Vogelsang, I., (2002), Die Zukunft der Entgeltregulierung im deutschen Telekommunikationssektor, Boston, April

own infrastructure would require an investment which is higher than the payment for the use of regulated operators infrastructure. As a result no market entry through alternative infrastructure would occur.

The aim of workable infrastructure competition is therefore not compatible with a scorched earth approach. Only the use of a scorched node approach, which adequately takes into account the current infrastructure and costs of the operator concerned, sets incentives to invest in alternative infrastructure by competitors.

Even though a scorched node approach is the more appropriate one, the modelling of mobile networks is particularly complex as several different networks do co-exist. Should in this case one single mobile operator be the basis for the scorched node approach, or should a separate model be developed for each operator? Both approaches have their pros and cons and can lead to completely different results. Furthermore, different models could be conceived for GSM 1800 operators on one hand, and GSM 900 operators on the other, given the differences in roll-out costs required in order to achieve a certain level of quality.

The scorched node approach should use the existing network as a starting point only. As set out above, mobile operators are still continuing roll-out of their 2G networks in order to achieve coverage and improve quality, and hence a cost model should allow the mobile operators to recover their additional investments planned to occur over the regulatory period. In addition, cost-modelling has to consider the specific costs arising due to 3G network roll-out and the transition from 2G to 3G. 2G and 3G networks have a different network structure using different technology and hence do have a different cost structure. Both 2G and 3G networks will exist and be improved in parallel and operating costs for both networks have to be recovered. Furthermore, 3G customers will use 2G networks in areas not yet covered by 3G.

3.3 Relevant increment: Reliance on operators' network planning

It is necessary to draw a distinction between total service long-run incremental cost (TSLRIC) and total element long-run incremental cost (TELRIC): TSLRIC measures the incremental costs resulting from the offer of a complete service on top of other services that a company provides, whereas TELRIC refers to the incremental costs caused by identifiable elements which are necessary to produce a service, such as switching. TSLRIC may therefore be understood as the aggregation of several TELRICs.

Neither alternative operators nor customers demand the use of single network elements. Instead they demand services as a combined use of different network elements. Since there exist only markets for services but generally not for the use of elements the relevant measure in approving cost based tariffs is TSLRIC.

If NRAs use TELRIC instead the operators bears an additional regulatory risk because the aggregation rule underlying TSLRIC may be adjusted as well. Suppose for example that the service x actually consists of the elements a, b and c. The cost of x therefore is a function of a, b and c costs. In the world of TELRIC NRAs may elimi-

nate a, b and c from this function or add a new element d. In addition they may change the aggregation rule contained in the function as well. All these features are needed solely within a scorched earth approach but not within the scorched node approach.

In calculating average LRIC current demand should serve as starting point. Adjustments for efficiency should be based upon the operators demand forecasts and subsequently network planning as long as this is not obviously wrong or misleading. The forecasts by access seekers may also be considered. NRAs may only adjust actual costs in the light of efficiency gains based upon regulated operators and competitors expectations.

3.4 Cost Volume Relationship

The cost volume relationship (CVR) for mobile markets will not be a continuous function, but a step-change, which impacts on the definition of what are common and fixed costs. Essentially this is a debate about how to deal with the fact that productive capacity is 'lumpy' in practice, and therefore capacity increments cannot be precisely matched to demand.

Because capacity must be purchased in indivisible lumps, there will on average be spare capacity available in the long run (sometimes referred to as 'growth spare'). This is most evident when demand is low and the first increment of capacity is added. However, as demand expands and further capacity is added, this cost does not (on average) change, as each increment of capacity inevitably cannot be fully utilised at the time of installation. This is because of the lumpy nature of the capacity itself. Furthermore, networks have to be rolled-out being able to match peak demand. On the other hand traffic flows vary according to day-time and, hence, networks capacity can not be fully exploited. The associated cost (i.e. the cost of the idle capacity) is a fixed and common cost, with the size of the cost being determined *by the minimum size of the capacity unit that must be purchased at exhaust of existing capacity* (and hence the amount of 'spare' capacity that must be carried on average), not by the volume of the service.

3.5 Common and joint costs: Theoretical and practical advantages of Ramsey-pricing

With large economies of scale the optimality of marginal cost pricing no longer holds. Instead, firms can only recover their costs if they can charge mark ups above their marginal or incremental costs. Economic welfare theory states, that these mark ups ought to follow the "inverse elasticity rule" of Ramsey-Boiteux¹⁴. In the context of cost modelling and cost orientation within regulatory price control this implies, that mark ups for common cost should not be fixed but flexible according to the elasticity of demand.

This approach, though its theoretical implications are widely shared, has been criticised as difficult to implement in practice. Especially the informational requirements

¹⁴ Laffont/Tirol (2000), p. 60 ff.

and the necessary monitoring efforts are thought to be prohibitive¹⁵.

Concerning the informational requirements one can easily refer to unregulated, highly competitive markets. There it is common that firms differentiate their prices and adjust them continuously to competitive pressure. There can be no doubt that the structure of competitive prices do in practise reflect Ramsey-Boiteux precepts. As Laffont/Tirole write¹⁶: This observation suggests that the most promising alley for implementing Ramsey prices in a regulatory context is to decentralise pricing decisions to the operator which means to allow for price differentiation and flexible allocation of common costs.

Another concern is that Ramsey pricing on the wholesale level can lead to discrimination and foreclosure of competitors. Again, there are ways to overcome these problems in a relative easy way with other regulatory rules (non-discrimination) without giving up the advantages of Ramsey allocation of common costs. E.g. the range of flexibility can be limited as it is common with price cap regulation, so the risk of disclosure is minimised.

In conclusion, the practical difficulties with Ramsey-Pricing seem to be even lower than with the concept of marginal cost efficiency. It is certainly more suited for the problems of telecommunications networks and can insure better incentive compatibility in regulation. Especially, regarding the implementation of price caps, one has to allow for flexibility in allocating common costs along the lines of Ramsey pricing. Yet, for practicability the operator may use other methods of allocating common costs.

The same holds in the context of joint cost. Joint cost arise when two or more services are produced in fixed proportions and which cannot be uniquely associated with the production of any particular service.

Again, the example of mobile services illustrates the necessity of implementing Ramsey principles in recovering joint costs. As a key cost driver for mobile services, coverage must be taken into account. The key cost involved is the cost of building a national network with the capability to make a single call to or from any location in the network. This cost of 'coverage' is not causally related to either inbound or outbound traffic and, as such, should be treated as a joint cost of inbound and outbound traffic. It is also important to note that coverage requirements can vary considerably in accordance to the specific market conditions. In some countries, a high quality in-building coverage is an important service feature which is expected by the average customer.

The same holds for non-network costs as licence costs, subscriber acquisition costs, marketing, network and business planning, billing at a wholesale or retail level and payment collection. Each non-network cost should be examined to determine whether it is incremental or common to each of the services for which costs are being calculated. However, if it is incurred no matter which service is being supplied, then it is common to those services.

¹⁵ Noam (2002), p. 404.

¹⁶ Laffont/ Tirole (2000), p.132

It is particularly important to recognise that simply because a minority of customers may pay subscription charges, does not mean there is a separate subscription service. Rather acquisition costs are necessary for an operator to sell any of its services and, are therefore, common costs. For instance, an operator cannot earn termination revenues without first acquiring customers. As with common costs in general, the appropriate allocation of these costs should take into account demand elasticities, including the sensitivity of customers to up-front charges.¹⁷

Licences are the prerequisite for any Mobile Network Operator before rolling-out networks and offering any mobile services. Hence, licence costs form a substantial part of non-network costs and should be attributed to all services offered under those licences. Mobile operators have paid very substantial amounts in order to obtain their 3G licences. The mobile operators should be allowed to recover these costs that have been incurred. If these licence costs are not appropriately taken into account within a long-run forward-looking modelling approach this would influence their future investment decisions in an inefficient way.

3.6 Long run and forward looking: Conformity with scorched node approach

We agree with the original PIB regarding the application of current cost accounting (CCA) methodologies as far as it implies the valuation of current infrastructure by replacement costs. The concept of modern equivalent asset (MEA) however implies a scorched earth approach and thereby theoretically achievable efficiency. As it was explained in chapter 2., this approach does not set sufficient incentives to invest in alternative infrastructure by new entrants.

In addition, scorched earth does not take into account the cost of migration from old to new network technology. It does not make any sense to rebuild infrastructure as long as the cost of migration outweighs the savings through the use of newest technology. This break-even however is reached at different points in time for different elements. Therefore efficiency gains are not immediately but continuously realised along a time path which is, by definition, embodied by the scorched node approach.

Suppose an old technology which is not fully depreciated yet: The remaining value of the old technology equals the present value of the still pending depreciations (a). The rational migration to a new technology requires not only a decrease in costs as compared to the old one. Instead the new technology must compensate for the remaining value of the old one as well. The break-even is therefore reached at a point in time at which the discounted decrease in costs due to migration (b) outweighs the remaining value of the old technology, (i.e. $b > a$).

¹⁷ Similarly, a supermarket that advertises to get customers through the door should not necessarily recover its advertising costs through an entry fee rather than in the prices of the products that it sells.

3.73.7 Asset valuation: Only FCM provides appropriate investment incentives

The two approaches of capital maintenance which are discussed in the IRG document reflect different perspectives. Operating capital maintenance (OCM) is concerned with maintaining the physical output capability of the assets of the operator. Capital maintenance therefore requires the regulated operator to have as much productive capacity at the end of the period as at the beginning. In an inflationary market situation with increasing equipment prices this serves perfectly well to maintain initial capital investments in real terms and at the same time to ensure the operating capability. Under OCM profit is only measured after provision has been made for replacing the output capability of regulated operators physical assets.

The second approach, financial capital maintenance (FCM), is concerned with maintaining the real financial capital of the investor. Capital is assumed to be maintained if shareholders' funds at the end of the period are maintained in real terms at the same level as at the beginning of the period. This approach will not discriminate between initial and new investments, at any time financial investors can freely choose to opt out or to reinvest. Under FCM the rate of return is therefore only measured after provision has been made to maintain the purchasing power of initial financial capital.

The implementation of OCM in cost accounting may systematically incorporate insufficient returns on the capital employed. This is not a desirable feature of pricing as it would not provide appropriate investment incentives. Under FCM however the returns to capital investments would equal the required return irrespective of falling replacement costs relative to the general price level. Hence FCM is the preferable capital maintenance concept.

Under FCM, intangible assets like licences are rated on the basis of their economic value. This fact is especially important for mobile operators, because licence costs form a substantial part of intangible assets. The mobile operators should be allowed to recover these costs that have been incurred.

3.73.8 Depreciation: Approximation of economic depreciation ensures FCM

The purpose of any depreciation method is the assessment of value consumption within a specific period. Traditional accounting depreciation thereby implicitly assumes a static environment respectively perfect information because the complete time path of value consumption is fixed at the beginning of the asset's life cycle. It therefore handles future events which influence assets value as perfectly predictable.

Economic depreciation on the other hand measures the period-by-period change in the market value of an asset. It frequently adjusts asset values for unforeseen changes like fluctuations of replacement costs or license valuation. For this reason economic depreciation allows timely adaptation of cost based tariffs to a changed environment.

The application of economic depreciation requires a common position regarding the valuation of assets. It is reasonable to employ the concept of deprival value. An as-

sets value then equals its opportunity costs, i.e. the revenue which is jeopardised by the assets' breakdown or loss as in the case of licences.

A significant aspect in this is the continuous technological change in modern telecommunication networks. It is important that technological obsolescence is reflected when modelling economic depreciation. Investment costs related to the successive introduction of new technologies or new 'versions' is higher than the costs of investing in a previous existing asset. Also, asset life times might be shorter as they become obsolete or are no longer supported by vendors. Hence, if these effects are not taken into account in the economic depreciation, it is likely that the depreciation trend is underestimated.

3.9 Reasonable rate of return: In line with capital market requirements

We agree with the original PIB regarding WACC as the appropriate model of calculating the average cost of capital. In addition however the method for calculating the cost of capital (equity and borrowed capital) should be based upon an objective model regarding in particular the terms and conditions of capital market which the regulated operator is confronted with. This is due to the fact that even regulated operators only hold a small market share on capital markets. Thus, they can not enact any market power to influence capital markets in their favour.

The Capital Asset Pricing Model (CAPM) is an example for market based determination of equity capital costs. The CAPM derives capital costs from investment specific risk and the risk premium as it is granted by the market. It therefore takes into account shareholders risk as well as its valuation by market participants. It reflects the real terms and conditions on capital markets in an adequate manner.

WACC however is not sufficient to compensate shareholders for their opportunity costs of supplying any other firm with capital because cost of capital only provides a minimal return on equity. On average regulated operators have to pay a return on top the cost of capital. This is reflected by so called return on capital employed (ROCE). ROCE equals regulated operators earnings before interest and tax (EBIT) in a given period divided by the capital employed in that period. Thus ROCE contains the cost of capital as given by WACC and an on top return called EVA (economic value added), i.e. $ROCE = WACC + EVA / \text{capital employed} = EBIT / \text{capital employed}$.

At first sight the assessment of a reasonable mark-up on WACC seems to be a difficult task, because it depends directly on shareholders opportunity costs. In practice however it should be adequate to observe the mark-up of firms which operate in unregulated competitive markets. The reasonable level of value added is then a benchmarking result of an appropriate peer group.

It is thereby important to notice that regulation does not make regulated operators

business risk free (so called buffering effect). There are several reasons that regulation does not diminish risks but raises them instead:¹⁸

- a. There exists a lag between regulatory reviews and changes in the environment regulated operators have to face, i.e. costs and demand. The resulting loss in flexibility leads to a higher risk for regulated operators shareholders.
- b. The mechanism of price adjustment may be imperfect. As an example universal services often have to be offered involving losses.
- c. NRAs usually have imperfect information about demand and costs. Regulatory decisions therefore are frequently imperfect as well.
- d. NRAs may act inconsistently because they take the current market situation and political aims into account.

Evaluating the cost of capital NRAs should also take into account that an obligation to make networks available to other operators includes the risk that the infrastructure costs may not be recovered. Since access seekers enjoy considerable flexibility in the decision to buy-in or build. In a market situation with constantly declining equipment prices the LRIC-approach correlates to a positive value on the option of delaying investments. Mandating wholesale access at LRIC prices thereby represents a real option value to the access seeker, because no compensation for the network operator is considered. That is, real asset options must be incorporated into the approval of reasonable capital returns, if efficient make-or-buy decisions should prevail.

¹⁸ cp. Ingraham, A.T./Sidak, J.G. (2003): Mandatory Unbundling, UNE-P, and the Cost of Equity: Does TELRIC Pricing Increase Risk for Incumbent Local Exchange Carriers? The authors empirically find that mandatory unbundling at TELRIC prices increase the incumbents equity costs.