Consultation Paper on a Proposed Bottom Up and Long Run Average Incremental Costs (BU-LRAIC) Costing Methodology for Interconnection and Access Services in the Turkish Fixed Telecommunications sector

The views expressed in this document are solely for the purpose of guiding the relevant parties in order to obtain their views. The statements in this document do not reflect the decisions of the Telecommunications Board and hence they can not be considered as the official view of the Telecommunications Authority and can not be taken as having binding effects.

1 Introduction

1.1 Background

1. Fixed telecommunication market in Turkey has been opened up starting from January 1st, 2004. *Türk Telekom* ("TT"), the incumbent operator, has been privatized at the end of 2005 with the sale of 55% of its shares. After 3 years of liberalisation, some progress has been achieved in the competition over long distance; however the incumbent operator still holds a monopoly at local telephony and broadband services as well.

2. The *Telecommunications Authority* ("TA"), being responsible for all regulatory functions in both telecommunications and radio-communications sectors except broadcast licensing and content regulation, was established with all administrative and financial autonomy under the Telecommunications Law of 2000. The Amending Law to the Telecommunications Law, passed in May 2001, has broadened the responsibilities of TA covering granting licenses. According to the existing structure, the Ministry of Transport retains its macro-level policy making role while all regulatory functions are vested at TA.

3. The fixed interconnection and access regime in Turkey, regulated mainly under Access and Interconnection Ordinance of May 2003 (modified in July 2007), achieved some progress especially in the field of interconnection. The disputes amongst the operators have been resolved and some reductions based on benchmarking have been realized in the interconnection rates. As far as access is concerned, Local Loop Unbundling ("LLU") has become a reality in January 2008, and 10 alternative operators have signed an LLU agreement with TT as of June 2008.

4. The trend is now onwards to a fine-tuned interconnection and access pricing regime which will rely on cost models and cost accounting systems, hereby providing alternative operators in the fixed telecommunications market with non-discrimination and transparency in line with the EU acquis.

5. In this Consultation Paper, TA seeks therefore to identify and comment on internationally recognized costing principles and standards for a Bottom Up and Long Run Average Incremental Costs (BU-LRAIC) Costing Methodology and make appropriate proposals for a BU-LRAIC costing methodology for Interconnection and Access Services in the Turkish Fixed Telecommunications sector.

1.2 Consultation process

6. TA is seeking the views and opinions of the stakeholders, interested parties as well as from the general public regarding the proposals made in this Consultation Paper.

7. Comments should be submitted in writing on or before 09.07.2008 to: Telecommunications Authority Tariffs Department or mailed to: tkilic@tk.gov.tr (Tolga Kılıç) and fgoral@tk.gov.tr (Fatih Göral).

8. In case some comments should be treated confidentially, then those should be marked as confidential.

2 Issues and Choices in Developing a BU-LRAIC costing methodology

9. Article 11 Clause 2 of the ***Access and Interconnection Ordinance*** (Official Gazette, June 14, 2007, n° 26552) indicates that "The Authority may impose operators with significant market power in the related market the obligation of setting their tariffs by cost orientation". As per Article 11 Clause 3, "when the Authority considers that the tariffs have not been set by cost-orientation, it shall determine the tariffs according to cost-orientation. The Authority may set an upper limit for the tariffs by taking into account the other countries' implementations and financial structures of operators in the extent of appropriateness, until it determines the tariffs by cost orientation. Tariffs determined by the Authority shall be binding."

10. According to Article 11 Clause 4, "The following points shall be taken into consideration when the tariffs are determined by cost-orientation:

    a) Cost-oriented tariff for access and interconnection services shall consist of the total of the **long-run incremental cost for efficient service provision including an appropriate return on capital employed for the provision of service and the common costs that can be attributed to the service**.

    b) **When the amount of costs exceeds cost for efficient service provision**, exceeding part shall be assumed superfluous expense and cost in respect of cost of efficient service provision. **Such expenses and costs shall be taken into account as far as they emanate from a statutory obligation or they are justified as being indispensable for other reasons.**"

    Additional guidance for the examination of costs according to paragraph (b) of Clause is provided in Article 11 Clause 5 which specifies that "the costs endured or the tariffs applied by the operators offering corresponding services in comparable markets may be referred for purposes of comparison. In this situation, exclusive features of the reference markets shall be taken into account."

11. TT has been declared as an operator having significant market power in the fixed network markets through a decision of the Board of Turkish Telecommunications Authority dated 21 February 2006 and numbered 2006/DK-10/142 which is published in the Official Gazette dated 17 March 2006 and numbered 26111.

12. In this Consultation Paper, TA seeks to recall why it shall develop a BU-LRAIC cost for fixed interconnection and access services in the context of Article 11 of the ***Access and Interconnection Ordinance***, and hence to collect views from the industry on how to determine the most appropriate BU-LRAIC costing methodology in the specific Turkish context.

13. Access services are provided by TT over its access network and are contained in its Reference Unbundling Offer. Interconnection services are provided by TT over its core network and are contained in its Reference Interconnection Offer.

14. The access network of TT also called "Local Loop" is defined in the ***Access and Interconnection Ordinance*** as "the physical circuit connecting the network termination point at the user's side to the main distribution frame to which the user is connected or an equivalent facility in the fixed telecommunications network". It corresponds to that part of the telecommunications fixed network that is not shared between several end users (as opposed to the core network, comprising of all switching and transmission equipments that are shared between several end users).

2.1 Why Interconnection and Access tariffs should be set by cost-orientation?

15. Economic welfare will be at its greatest where interconnection and access tariffs are set to reflect cost of efficient service provision. This will:

- Encourage alternative operators to use existing telecommunications facilities of the SMP operator where this is economically desirable (i.e. telecommunications facilities which it is not appropriate for new entrants to duplicate);

- Encourage investment in new telecommunications facilities where this is economically justified. These telecommunications facilities may either be a modernisation of existing infrastructures (e.g. to deploy DSLAM equipment in existing sites so as to provide broadband services on the basis of the existing cooper local loop) or the deployment of new infrastructure in Greenfield areas (e.g. to deploy a fibre optic long distance network to connect main cities such as Ankara, Istanbul and Izmir).

16. When interconnection and access tariffs are based on cost of efficient service provision, they do not distort the make of buy decision of alternative operators, as these new alternative operators will be encouraged to use existing telecommunications facilities of the SMP operator if and only if it is economically desirable to do so.

17. When interconnection and access tariffs are based on cost of efficient service provision, they also ensure that investment incentives are retained for the SMP operator, so that he will upgrade or extend its existing telecommunications facilities when new technology becomes available.

18. In a fully competitive market, interconnection and access tariffs will necessarily tend to reflect cost of efficient service provision. If one operator fails to offer tariffs set by cost-orientation, another operator will exploit the opportunity to offer lower tariffs whilst retaining profit. Similarly, if an operator fails to make the most efficient investment decision, it will soon find itself out of the market. It is the responsibility of the regulatory authority to mirror these conditions in a less than fully competitive telecommunications market, such as the Turkish fixed telecommunications market. In deed, as stated in Article 5 Clause 1 of the ***Access and Interconnection Ordinance***, the first fundamental principle that shall be taken into consideration by TA in execution of this Ordinance is "a) Attaining a sustainable competitive environment".

2.2 Which Costing Methodology is mandated by Article 11 Clause 4 of the Access and Interconnection Ordinance?

19. Provisions of Article 11 Clause 4 refers to long-run incremental cost of efficient service provision including an appropriate return on capital employed for the provision of service plus the total parts of common costs that can be attributed to the service.

20. Such a costing methodology is well known and has been used by most National Regulatory Authorities throughout the world, and especially in Europe, for the setting of cost-oriented access and interconnection prices of incumbent operators in the fixed telecommunications market.

21. According to the European Regulatory Group (ERG)[1], the long-run incremental cost (LRIC) methodology "calculates the cost of providing a defined increment of output, on the basis of forward looking costs incurred by an efficient operator". The ERG provides following additional definitions:

    - The term "**Long Run**" means that for the purpose of calculating interconnection and access costs a time horizon is considered in which all costs related to fixed

[1] ERG COMMON POSITION: Guidelines for implementing the Commission Recommendation C (2005) 3480 on Accounting Separation & Cost Accounting Systems under the regulatory framework for electronic communications

telecommunications network capacity are potentially variable or avoidable including fixed costs[2].

- The term "**Incremental**" means "the additional cost a firm incurs in the long run in providing a particular service as a whole, assuming all its other production activities remain unchanged". For instance, in the case of the local access network, the increment is the whole local access network. If the increment was a single unit of input, incremental costs would equal marginal costs. But as the increment is substantial ("a particular service as a whole"), fixed costs (i.e. non volume sensitive costs) related to the service are taken into account, which is not the case with marginal costs. As fixed costs are considered, the term "Average Incremental Cost" is sometimes used instead of "Incremental Cost" (LRAIC instead of LRIC).

- The term "**Forward looking costs**" means the costs that will be incurred by an efficient operator and are the appropriate cost base for LRIC cost calculation. In practice, as forward looking costs are sometimes difficult to estimate, current costs are used as the relevant cost base. In order to compute current costs, each asset is valued at its cost of replacement by a modern equivalent asset that an alternative operator / new entrant in the fixed telecommunications would be expected to use.

- According to the definition of the "Incremental Cost", **common costs** of a company, which are by definition not increment specific costs, are not recovered by LRIC costs. Therefore, the sum of the incremental costs of all products sold by the operator does not equal the total costs incurred and the financial viability of the operator is therefore not ensured. As a consequence, in a regulatory environment, it is accepted that a share of common costs can be attributed to the service. Article 11 Clause 4 a) foresees explicitly common costs that can be attributed to the service shall be taken into account.

22. A LRIC/LRAIC costing methodology mimics therefore the forward looking costs incurred by an efficient telecommunications operator in providing a particular service in the long run. Consequently, it enables National Regulatory Authorities to set "prices that neither encourage inefficient investment nor discourage efficient investment"[3] and to make it neutral for efficient alternative operators in the fixed telecommunications market to decide whether to rent the infrastructure that supports their services (and

2 In the short term, some fixed costs are incurred by companies and these fixed costs provide a productive capacity P much greater than the demand D: P>>D. However, in the long run, D might increase and become greater than P, which forces companies to invest again, and then fixed costs become variable costs.

[3] ERG COMMON POSITION: Guidelines for implementing the Commission Recommendation C (2005) 3480 on Accounting Separation & Cost Accounting Systems under the regulatory framework for electronic communications

paying the corresponding LRIC/LARIC costs) or to build the infrastructure that supports their services ("make or buy" decision).

2.3 Proposed approach for Turkey: a scorched node Bottom Up and Long Run Average Incremental Costs (BU-LRAIC) Costing Methodology for Interconnection and Access Services

23. The determination of LRIC/LRAIC costs for interconnection and access services of a fixed incumbent operator can be achieved by National Regulatory Authorities using two alternative approaches:

- The **Top-Down (TD) cost model approach**, which takes data directly from the accounting system of the operator. Asset revaluations, calculations and allocation processes to determine the incremental costs of the service considered (for example, cost-volume relationship calculations) are applied to the accounting information of the operator ;

- The **Bottom-Up (BU) cost model approach**, which consists in designing a theoretical economic model that assesses the amount of costs (investments and operating costs) required by an efficient operator to "rebuild" a telecommunications network dimensioned to fulfil the demand for the service considered.

24. The choice between these two approaches has an impact on the level and quantity of equipments considered in the telecommunications network. For a similar demand for the service considered, the Top-Down approach may include excessive number of assets while the Bottom-Up approach may exclude inefficient assets. In fact, the term "efficiency" used in the definition of LRIC costs mainly relates to matching the capacity of the telecommunications network to the demand for the service considered.

25. While the main advantages of the TD cost model approach are (i) that its results can easily be audited and traced back to the operator's accounts and (ii) that it ensures that the costs of the operator are recovered, the TD cost model approach suffers from several weaknesses:

- It is difficult to identify the potential inefficiencies of the operator;

- Even if the TD cost model approach is auditable, it is not fully transparent since some cost data requires to be kept confidential. Also, TD accounting systems are

managed by incumbents which gives less visibility for the National Regulatory Authority in comparison with the BU cost model approach (asymmetry of information between incumbent operator and National Regulatory Agency);

- It can take significant time to implement a TD cost accounting system;
- If regulated prices are set at costs of the service using a TD cost accounting system, alternative operators may have to support the uncertainties linked to how and when the incumbent operator is defining its investment strategy.

26. The BU cost model approach addresses most of the weaknesses of the TD cost model approach:

- Potential inefficiencies of the incumbent are excluded as it is the cost of an efficient operator that is indeed modelled. It therefore prevents alternative operators to pay for the potential inefficiencies of the incumbent:
  - the best and most efficient technologies are used;
  - assets in excess of what is required to serve the demand for the service considered are excluded;
  - the incumbent's network architecture may be suboptimal due for example to historic reasons (for example: usage of several small capacity equipments such as ADM[4] as the demand has grown progressively over time till today, instead of having on big capacity equipment dimensioned for today's demand).
- It is fully transparent for the NRA in terms of inputs, engineering rules and other assumptions necessary;
- Few and relatively easily available information is required from the incumbent, mainly relating to:
  - The future demand, which can be extrapolated from the past and actual demand;
  - The engineering rules (capacity of each type of asset for example) used by the engineers building and operating the telecommunications network;

[4] Add Drop Multiplexer

- The current unit cost of assets which can be obtained using open market values (e.g. as available from the procurement department of the incumbent operator).

- As far as the access network is concerned, BU-LRAIC can more easily cater for providing appropriate information on the differences of costs due to geography or demographics.

27. However, one of the difficulties related to the implementation of BU cost model is the determination of the operating costs (as opposed to the capital expenditures) of an efficient operator. While the number of assets and the corresponding capital expenditures can easily be determined from the demand and the engineering rules, the operating costs of an efficient incumbent operator are more difficult to assess. Usually, National Regulatory Authorities rely on the following options:

    - Benchmarking the operating costs with other fixed telecommunications incumbent operators,

    - Use the incumbent's operating costs with an appropriate efficiency adjustment[5].

28. As a consequence, in the Commission Recommendation of 19 September 2005 on accounting separation and cost accounting systems under the regulatory framework for electronic communications (2005/698/EC), the European Commission recommends to use both approaches as complementary tools: "The coordinated use of top-down and bottom-up approaches should be envisaged, where applicable." The use of both approaches is referred as the "hybrid approach" and consists in using a top-down model to determine the costs incurred by an operator and a bottom-up model to check its efficiency.

29. Considering the pros and the cons of both approaches (TD-LRAIC and BU-LRAIC) and given the fact that TT has taken the initiative to present on 31st August 2007 to TA its TD cost model for interconnection services, TA would like industry to comment on whether it should develop a BU-LRAIC cost model to assist in the determination of Interconnection and Access Services Prices in the Turkish Fixed Telecommunications sector in the coming years:

    - This approach will help TA and industry to understand the costs of fixed telecommunications network in Turkey on the basis of a transparent tool and

[5] For an example of such an approach, see: OPTA, Wholesale price cap-decision, - draft -, OPTA/TN/2006/200897, 25 april 2006, Public version. Chapter 6 Comparative efficiency analysis

reduce the current significant level of asymmetry of information with the incumbent operator.

- This approach will enable to identify potential inefficiencies of the incumbent embedded into its TD cost model and prevent alternative operators to pay for them. TA notes in this respect that in the Commission Recommendation of 19 September 2005 on accounting separation and cost accounting systems under the regulatory framework for electronic communications (Text with EEA relevance) (2005/698/EC), the European Commission recommends that "national regulatory authorities take due regard to further adjustments to financial information in respect of efficiency factors, particularly when using cost data to inform pricing decisions since the use of cost accounting systems (even applying CCA) may not fully reflect efficiently incurred or relevant costs."

- This approach is fully compliant with EU acquis.

Do you agree that TA should develop a BU-LRAIC cost model to assist in the determination of Interconnection and Access Services Prices in the Turkish Fixed Telecommunications sector in the coming years? Please explain.

30. BU-LRAIC cost models can be designed following two different approaches:

- The "**scorched earth**" approach (also called "from scratch" approach or "Greenfield" approach), which considers a telecommunications network based on an ideal topology;

- The "**scorched node**" approach, which takes as a starting point the nodes of the incumbent's actual telecommunications network. Between these existing nodes, technologies or paths are optimised to reflect the behaviour of an efficient alternative operator. For example, a BU-LRAIC scorched node cost model for the access network would take into account the location of the existing MDF of the incumbent but would re-evaluate their capacity based on actual dispersion of the demand on the territory so as to minimise the length of copper pair deployed in the main and in the distribution network. Similarly, BU-LRAIC scorched node cost model for the core network would take into account the location of the existing exchanges of the incumbent, but would re-evaluate the need to have

switching equipment as opposed to transmission equipment in each of these nodes.

31. In the document "ERG COMMON POSITION: Guidelines for implementing the Commission Recommendation C (2005) 3480 on Accounting Separation & Cost Accounting Systems under the regulatory framework for electronic communications", the ERG states that the preferred approach is the "scorched node approach", as "designing an optimal network topology is not a straightforward task. For feasibility reasons, it is appropriate to take the existing network topology as the starting point for the cost allocation process. Such a scorched node approach would imply that the existing points of presence are maintained but that technologies are optimised consistent with there being an actual or potential new entrant or efficient competitor."

32. As a consequence, TA would like industry to comment on whether the BU-LRAIC cost models for interconnection and access services provided by TT it should develop should be scorched node.

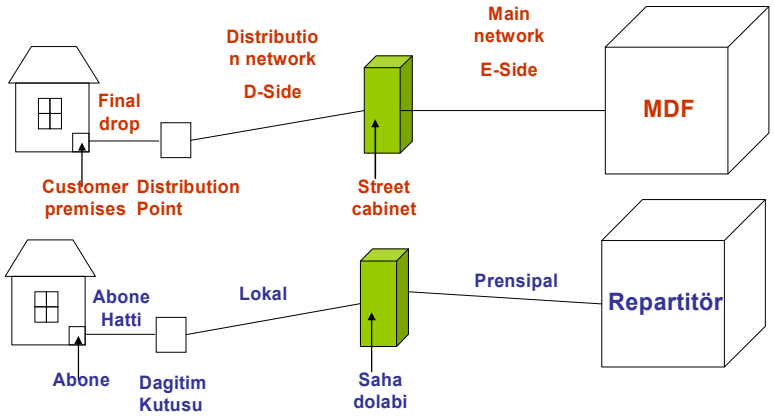
Do you agree that the BU-LRAIC cost models for interconnection and access services provided by TT TA should develop should be scorched node? Please explain.

3 Methodological approach to construct the BU-LRAIC scorched node cost model for the access network of Türk Telekom

33. The access network is comprising of three parts, as illustrated in Figure below:

- The Final Drop, connecting the customer premises to a so-called Distribution Point;
- The Distribution Network (also called D-Side), connecting the Distribution Point to the Street Cabinet;
- The Main Network (also called E-Side), connecting the Street Cabinet to the Main Distribution Frame.

Figure 1 – Structure of the access network



34. From a methodological point of view, constructing a BU-LRAIC scorched node cost model for the access network of TT can be achieved:

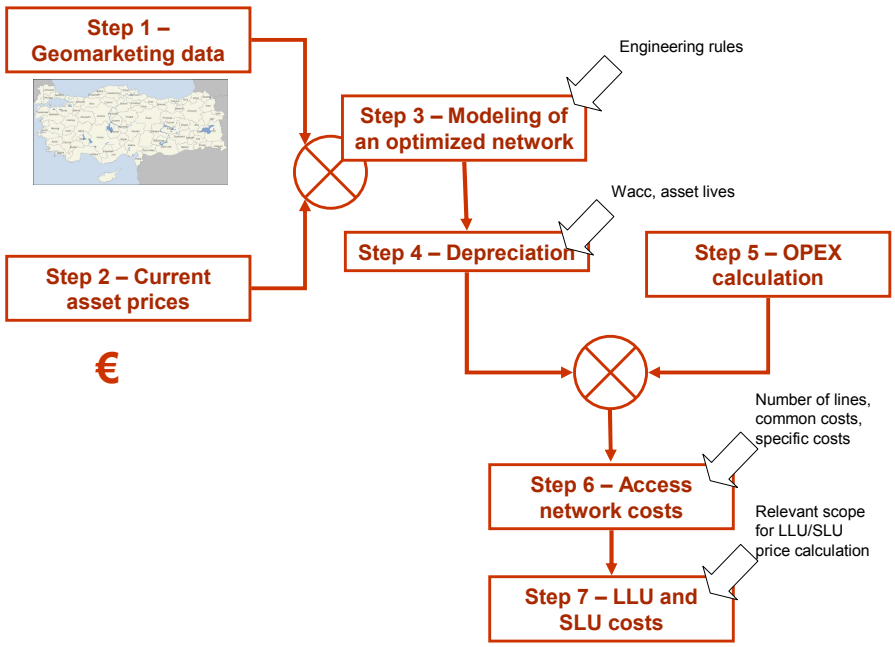
- Either using a sample of access networks in Turkey (e.g. urban dense area, urban area, new housing estates, rural, very rural…). This method consists in measuring the number of cables, of ducts and trenches and their distance for several MDF in each of the access networks selected for the sample, and then expanding these to the whole country.
- Or using geomarketing data about Turkey. This method consists (i) in collecting data about where households and offices are located in Turkey as well as on and where nodes of the access network are located and (ii) in deploying access

infrastructure (poles or trenches and cables) along roads and streets to connect these households and offices to their parent nodes.

35. TA considers that the first method based on sample is the less relevant method in the specific Turkish context. The use of samples may be difficult to implement since it is very difficult to determine to what extent a sample (one MDF area for example) is sufficiently representative in terms of costs. Also, the use of samples does not allow identifying potential network inefficiencies with a sufficient degree of precision. In contrast, the second method based on geomarketing data appears overall more consistent with the approach a new entrant building a new access network is likely to follow. Furthermore, it has the merits to provide much higher granularity as it enables to provide costs of any area in Turkey, in particular for those areas where LLU is likely to be implemented by alternative operators.

36. TA would like industry to comment on whether it should construct the BU-LRAIC scorched node cost model for the access network of Türk Telekom according to the following 7 steps as shown in Figure below:

Figure 2 Methodological approach to construct the BU-LRAIC scorched node cost model for the access network of Türk Telekom



Have you any views on the above described methodological approach to construct the BU-LRAIC scorched node cost model for the access network of Türk Telekom? Please explain.

37. **Step 1 - Collecting geomarketing data**. This involves the gathering of information on where households and offices are located throughout Turkey. The access network connects these households and offices to a MDF with cables running either overhead (on poles) or underground (in trenches): as a result, the costs of deploying the access network will depend on the distance between these households and offices and the MDF. For a given area (a city, a village, a housing area, etc.), the number of buildings, the number of households, the number of businesses, the length of streets, the lengths of road, the number of crossroads, etc. are the typical data that have to be collected.

38. **Step 2 - Collecting information on current unit prices for assets specific to access networks.** Open market values as provided e.g. by manufacturers as well as operators unit costs based on most recent purchases requested through a data request can be used. The access network assets are generally classified into:

    - Infrastructure costs (poles and trenches),
    - Copper cable costs,
    - Node costs (Chambers, Distribution Points, Street Cabinets, Exchanges, etc.).

39. **Step 3 - Modelling of an optimised access network.** This Step 3 takes as starting points the geomarketing data, the unit prices and the engineering rules related to access networks in order to decide what the most efficient way to deploy the access network is. Typical assumptions are:

    - Choosing systematically the lowest cost for each type of assets,
    - Determining the appropriate overcapacity factor required to fulfil the future demand,
    - Deciding whether it is more efficient to deploy poles or to dig trenches on the basis of the maximum charge supported by poles and on the basis of poles and trench costs,
    - Identifying the appropriate number of ducts that are required per trench,

- Deciding whether infrastructure should be shared between the main and the distribution network,

- Determining whether it is preferable deploying one connecting point that aggregates several cables into one or not. The deployment of street cabinets can be completed from scratch on the basis of street cabinet deployment rules or scorched node if the appropriate information is provided by the incumbent operator.

At the end of this Step 4, the most efficient number of units of each relevant asset in the access network requires to fulfil the demand is determined.

40. **Step 4 - Depreciation.** TA proposes the use of the tilted annuity formulae for the calculation of asset depreciation charges. This proposal is described in more detail in Part 5 of this document.

41. **Step 5 - Determining operating expenses.** As explained above, the determination of the operating expenses is a difficult task within a BU-LRAIC cost model. However, two main approaches can be considered:

- Using incumbent operator's operating costs for the access network, with an appropriate efficiency adjustment. These costs are not necessarily the cost of an efficient and new network (the older a network is, the higher its operating costs are likely to be). A sufficient level of detail in operating expenses of the incumbent is required to exclude costs that are not related to the local loop,

- Using benchmark of operating costs in EU countries. However, some National Regulatory Authorities are not using bottom-up model to assess access costs and cannot therefore be considered. Some others on the contrary like the PST in Sweden or the National IT and Telecom Agency in Denmark are publishing operating expenses in percentage of asset prices to be used for their BU LRIC model[6] and could be envisaged.

It is TA's preliminary view that the first approach would be preferable in the specific Turkish case in this initial phase of liberalisation and privatization, provided the incumbent operator is providing appropriate information.

42. **Step 6 - Assessing BU-LRAIC costs for the access network.** In this Step, the cost model shall calculate the sum of depreciated capital expenditures as determined at Steps

[6] See http://en.itst.dk/interconnection-and-consumer-protection/lraic/lraic-hybrid-model-2008-1 or PTS Access model v1.3 PUBLIC.xls

3 and 4 (the efficient number of assets is determined within Step 3 and multiplied by the current price of assets and the result is depreciated using the tilted annuity formula) and operating expenditures within Step 5. The result is divided by the number of working lines and per 12 to provide a local loop cost per month and per line. The cost of the sub loop per month and per line can also be derived from the BU-LRAIC cost model to the extent that infrastructure costs (poles and trenches) are fully allocated to the main network and to the distribution network (for example, the trench cost allocated to the sub loop will be proportional to the number of ducts used by the sub loop). In order to compute local loop and sub loop costs in accordance with Article 11 Clause 2 of the ***Access and Interconnection Ordinance***, common costs and specific costs are added.

43. **Step 7 - Assessing BU-LRAIC costs for Local Loop Unbundling (LLU) and for Sub Loop Unbundling (SLU).** Pursuant to Article 11 Clause 2 of the ***Access and Interconnection Ordinance***, Local Loop Unbundling and Sub Loop Unbundling tariffs shall be cost orientated. Consequently, two decisions have to be taken, based on the outputs of the cost model:

    - Should LLU and/or SLU tariffs be geographically de-averaged?

    - If LLU and/or SLU tariffs are not to be geographically de-averaged, should they correspond to the whole of TT's access network or only to a subset of it, depending on where LLU and SLU are going to be effectively requested in the medium term (i.e. within 3/4 years) by alternative operators?

    TA' preliminary views on these two decisions to be taken within Step 7 are detailed below.

44. Concerning the first decision, though the cost model can provide costs for any particular catchment's area of a MDF within TT's access network, TA would like industry to comment on whether it agrees that neither LLU nor SLU tariffs should be geographically de-averaged. Even if specific LLU prices applied to specific areas in Turkey could in theory provide appropriate signals for efficient investment to alternative operators with possibility to invest in rural areas, geographically de-averaged LLU prices are likely to lead to de-averaged retail prices. For example, it could lead to higher retail broadband prices in rural areas which TA considers not to be desirable. TA also notices that Finland is the only one country in the European Union where there is one different LLU price for each region of the country (and the reason for this is that there are several local incumbents operators in Finland).

Do you agree/disagree to have a single LLU tariff and a single SLU tariff? Please explain.

45. Concerning the second decision, TA notices that alternative operators in Turkey are not able to offer their services and cover the whole territory on the basis of Local Loop Unbundling within 3 to 5 years. TA observes furthermore that LLU is available since 2000 or 2001 in EU15 countries but that no alternative operator has deployed DSLAMs in all the exchanges of the national incumbent. This is due to the fact that:

- Local Loop Unbundling requires **time**: from the 250 exchanges that were initially planned to be open to LLU until 2010 by TT, 48 (which correspond to 1.5 million subscribers) have been effectively open to LLU as of End of February 2008. Moreover, the process set by the incumbent operator to get access to its exchanges is long and it is likely to remain several months for an alternative operator to be operational in a given exchange (even though TA is committed to improve the Reference Unbundling Offer in this respect) ;

- Local Loop Unbundling is **capital intensive**: in addition to specific services paid by alternative operators to the incumbent operator in order to install their equipments in exchanges, alternative operators must connect these equipments to their backbone and the costs related to this connection can be high;

- Local Loop Unbundling is subject to **high economies of scale**: in each exchange, DSLAMs and connections between DSLAMs and alternative operators backbones are fixed costs. As a consequence, alternative operators will choose to access first to largest MDFs to benefit from the highest economies of scale.

46. After careful analysis of several case studies of Local Loop Unbundling and their key lessons for Turkey[7], TA would like industry to comment on whether the approach of the French National Regulatory Agency in 2002 is providing useful guidance with respect to the second decision to be taken within Step 7. In its decision 02-323 in 2002, ART (now ARCEP) ruled that the calculation of the LLU tariff should be based on an average between two types of areas:

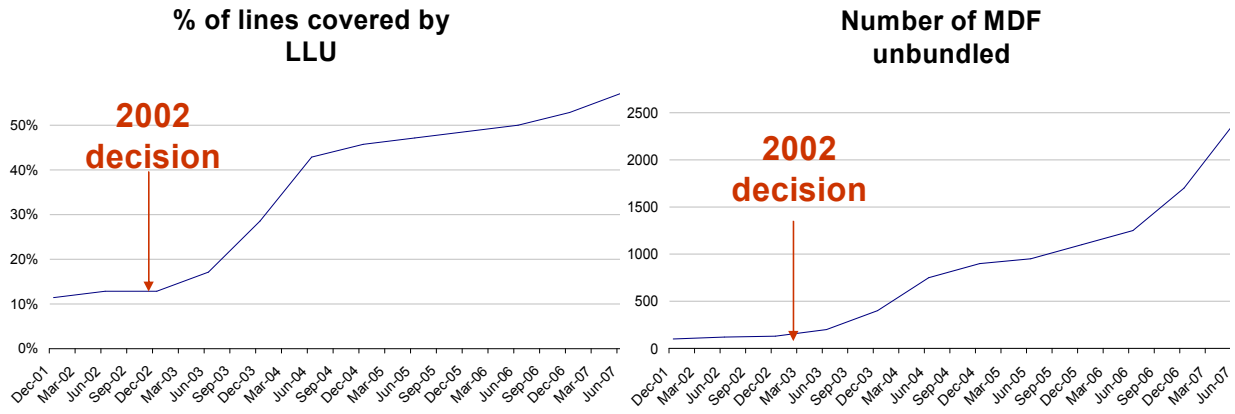
[7] See Workshop organized by TA for the industry on April 4th 2008, "Local Loop Unbundling – EU Benchmarking"

- 1st area "corresponds to relatively dense areas in which it is likely that alternative operators will invest in unbundling within 2 years" (70% of the French incumbent lines were in this area),

- 2nd area "corresponds to less densely populated areas in which it is highly unlikely that a new entrant will invest in unbundling over the same period" (30% of the incumbent lines were in this area)

The French National Regulatory Agency computed the final LLU tariff by considering that 95% of the unbundled lines by alternative operators would be in the 1st area and 5% in the 2nd area. According to ART, this price is consistent with the principle of cost-orientation since it is not possible to cover more than 70% of the lines through LLU within 3 years[8]. The 2002 decision had a significant impact on LLU as shown in Figure below, remembering that deployment constraints result in approximately 9 – 12 months delay between the time of the decision and the time of new unbundled exchange sites.

Figure 3 - Impact of the 2002 decision on LLU in France



47. TA is of the preliminary view that this approach respects the principle of cost orientation as stated in Article 11 Clause 2 of the ***Access and Interconnection Ordinance***, avoids any cost over-recovery or losses for the incumbent whilst making LLU more attractive.

48. TA is therefore requesting industry to comment on how to define two different areas in TT's access network and to compute the final LLU price by considering that 95% of the unbundled lines would be in the 1st area and 5% in the 2nd area. TA has been

[8] In 2005 (decision 05-0834), due to the extension of LLU coverage, ARCEP changed the definition of the 2 areas but kept the same principle of calculation for the LLU price.

considering the following three options for the definition of the 1st area (the 2nd area being the remaining area):

- Option 1: the 1st area covers around 50% of the lines in Turkey and corresponds to the area covered by the 250 exchanges planned by Türk Telekom to be open to LLU;
- Option 2: the 1st area covers 60% of the lines in Turkey and corresponds to the area covered by exchanges with more than 10,000 working lines;
- Option 3: the 1st area covers 70% of the lines in Turkey and corresponds to the area covered by exchanges with more than 5,000 working lines.

49. TA's is especially interested on industry's comments on whether Option 2 could be considered the best option in the specific Turkish context based on the following reasons:

- It is not unrealistic that alternative operators cover more than 50% of the lines in Turkey within 3 years which would require changing the LLU tariff calculation before that time. Furthermore it is preferable that LLU tariff remains stable over a long period (at least 3 years) to provide a clear "make or buy" signal to alternative operators. Option 1 should therefore be rejected.
- Option 3 is also not appropriate since the likelihood that alternative operators will offer their services for lines connected to exchanges with less than 5,000 lines within 3 years is very low and uncertain since economies of scale are lower in small size exchanges.
- As a consequence, Option 2 should be considered as the best option since on the one hand it enables to set stable LLU tariff for the next years subject to inflation, and on the other hand the LLU coverage is achievable in the medium term. However, if TA notices within the next years that LLU coverage is larger than 60% of the lines, TA should be entitled to review its decision with respect to Step 7.

Do you agree/disagree that LLU tariff should be set based on Option 2? Please explain.

50. TA intends to follow in principle the same approach for the setting of Sub Loop Unbundling prices and shall consult at a later stage on its decisions with respect to Step 7.

Have you initial views on TA's intention with respect to SLU cost orientated tariffs? Please explain.

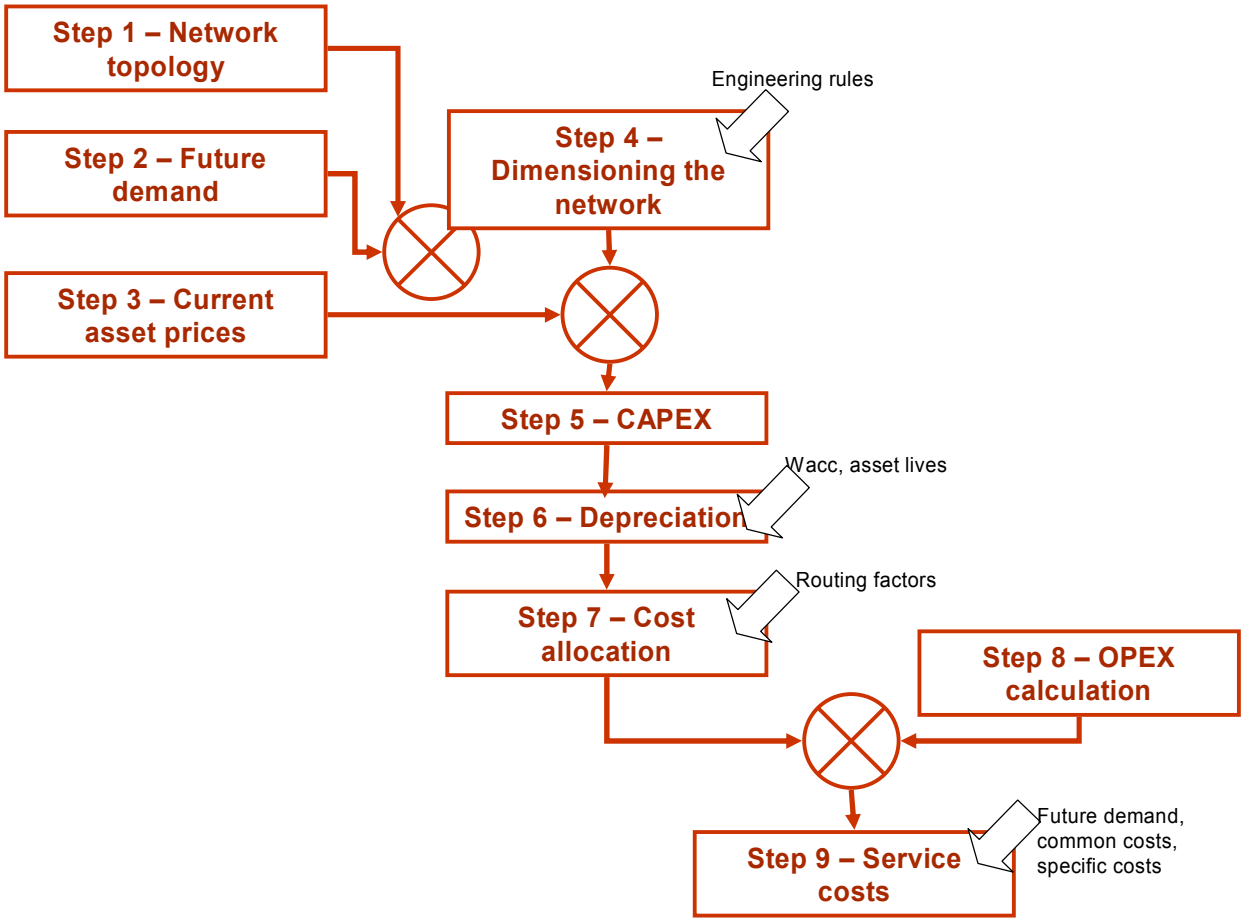
51. For the avoidance of doubts, TA stresses the point that such a BU-LRAIC scorched node cost model for the access network of Türk Telekom is not directly useful for the purpose of setting cost-oriented Shared Access / Line sharing tariffs. Setting cost-oriented Shared Access / Line sharing tariffs requires in deed determining the appropriate methodology to be used for the attribution of common fixed costs between low frequency services (voice) and high frequency services (broadband). TA may consider consulting industry at a later stage on appropriate methodologies for setting cost-oriented Shared Access / Line sharing tariffs.

Have you initial views on appropriate methodologies for setting cost-oriented Shared Access / Line sharing tariffs? Please explain.

4 Methodological approach to construct the BU-LRAIC scorched node cost model for the core network of Türk Telekom

52. TA would like industry to comment on whether it should construct the BU-LRAIC scorched node cost model for the core network of Türk Telekom according to the following 9 steps as shown in Figure below:

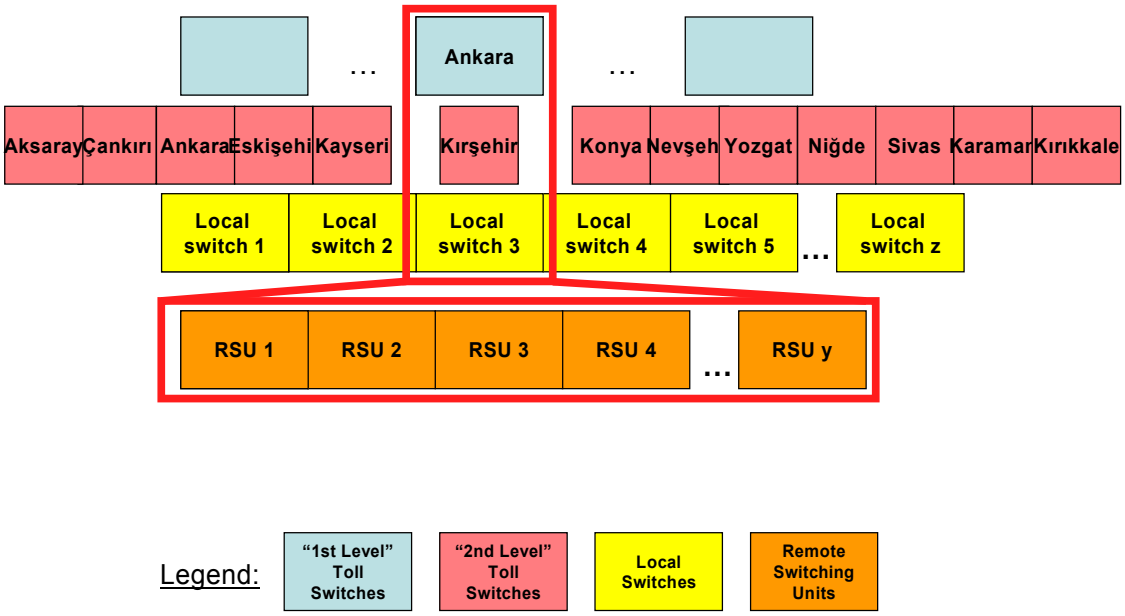
Figure 4 - Methodological approach to construct the BU-LRAIC scorched node cost model for the core network of Türk Telekom



Have you any views on the above described methodological approach to construct the BU-LRAIC scorched node cost model for the core network of Türk Telekom? Please explain.

Step 1 - Determining the network topology. TA is aware that TT is currently optimising its switching architecture and this is planned for completion early-mid 2009. There are currently "**CONFIDENTIAL**" "1st Level" Toll Switches, 81 "2nd Level" Toll Switches (1 in each of the 81 Turkish provinces/cities) and approximately "**CONFIDENTIAL**" Local Switches in Turkey. It is understood that TT intends to have approximately "**CONFIDENTIAL**" Local Switches by 2009, located in the towns/municipalities and biggest villages, and approximately "**CONFIDENTIAL**" Remote Switching Units in smallest towns and villages as shown in Figure below. As a consequence, considering that this new network topology is more efficient, TA proposes to take as a starting point for Step 1 TT's target 2009 network topology subject to appropriate information provided by TT. TA intends also to verify through a data request whether TT has any NGN plans for the medium term, so as to take it into account in determining the network topology if appropriate.

Figure 5 – Current understanding of Türk Telekom's 2009 target switching topology (subject to confirmation by TT)



53. **Step 2 - Estimating the future demand**. This Step consists in estimating the demand in the medium term (3/4 years) for all services supported by the core network and for both retail services (e.g. voice, Internet, TV, VoD) and wholesale services (e.g. local termination, in zone termination, out zone termination, etc). The past and current evolution of services shall be used to assess the future demand.

54. **Step 3 - Collecting unit price of equipments.** Open market values as provided e.g. by manufacturers as well as operators unit costs based on most recent purchases requested through a data request can be used. The core network assets are generally classified into:

- Transmission equipments: trenches, fibres and SDH and IP/Ethernet/WDM sites;
- Routing and switching equipments: exchanges, routers, switch, subscribers units, servers, etc.

55. Step 4 - Dimensioning the network. This Step involves the calculation of the number of assets required (size of transmission equipments, number of switches, etc.) on the basis of engineering rules to ensure as much efficiency as possible. Engineering rules can be obtained from equipment providers and vary from one asset to another: remote subscriber units are in general dimensioned with the number of customers connected to

them while other assets are dimensioned with the traffic they are supposed to handle. The traffic is derived for each service from the demand of the service and is expressed in Mbps or in number of minutes. A "Peak Hour" ratio is then applied to each type of traffic to determine the traffic of the service at peak hour. The core network is indeed dimensioned to support the traffic at peak hour.

56. **Step 5 - Determining capital expenditures.** Capital expenditures are simply derived by multiplying the number of assets (Step 4) and the unit cost of assets (Step 2).

57. **Step 6 - Depreciation.** TA proposes the use of the tilted annuity formulae for the calculation of asset depreciation charges. This Step is described in Part 5 of this document.

58. **Step 7 - Cost allocation.** Core network assets can be divided into assets specific to services (e.g. signalling equipment for the voice service) and assets shared between several services (e.g. trenches). This implies that the cost of latter network assets requires to be allocated to each service it supports. For infrastructure cost like trenches or fibres, this involves the use of an agreed cost allocation method.

    TA intends to use the traditional capacity based allocation method, whereby allocation of shared network assets is based on the required bandwidth at peak hour of each service

    Step 7 involves also isolating the cost of the different voice services: incoming calls, on-net calls, international calls, wholesale calls, etc. This necessitates the use of a routing factor table. The routing factors represent the usage that a unit of each service makes of each network asset. These routing factors have to be weighted by the service volumes.

59. **Step 8- Determining operating expenditures.** As for the BU-LRAIC cost model for the access network, two main approaches can be considered:

    - Using incumbent operator's operating costs for the core network, with an appropriate efficiency adjustment. These costs are not necessarily the cost of an efficient and new network (the older a network is, the higher its operating costs are likely to be). A sufficient level of detail in operating expenses of the incumbent is required to exclude costs that are not related to the core network;

    - Using benchmark of operating costs in EU countries. However, some National Regulatory Authorities are not using bottom-up model to assess core costs and cannot therefore be considered. Some others on the contrary like IPBT in

Belgium or Post & Telestyrelsen[9] in Sweden are publishing operating expenses in percentage of asset prices to be used for their BU LRIC model and could be envisaged.

It is TA's preliminary view that the first approach would be preferable in the specific Turkish in this initial phase of liberalisation and privatization, provided the incumbent operator is providing appropriate information.

60. **Step 9 - Assessing BU-LRAIC costs for the core network.** In this Step, the cost model shall calculate for each wholesale service its cost per unit, common costs included in accordance with Article 11 Clause 2 of the ***Access and Interconnection Ordinance***.

[9] See ""PTS Core model v1.3 PUBLIC.xls" (http://www.pts.se/Archive/Documents/SE/Bottom-uo%20model%20version%202b.zip.zip

5 Depreciation methodologies for BU-LRAIC cost models

61. While straight line depreciation is the standard depreciation methodology in historical cost accounting, economic depreciation methodologies such as the tilted annuity formulae are generally used in BU LRIC cost models. The reason for this common use of economic depreciation methodologies is that BU LRIC cost models assume that a new network is redesigned each year: as a result, only first year depreciation charges are considered. But, straight line depreciation exaggerates cost of capital charges during the first years whereas tilted annuity depreciation makes cost of capital charges more stable over the years.

62. TA observes that in general 3 types of titled annuity formulas are used:

- Titled annuity formulae used in Sweden[10]:

$$A_1 = \mathrm{I} \times \frac{w - p}{1 - (\frac{(1+P)}{(1+w)})^N}$$

- Tilted annuity formulae used in Belgium[11]:

$$A_1 = \mathrm{I} \times \frac{\sqrt{1+P}}{\sqrt{1+\mathrm{w}}} \times \frac{w - P}{1 - (\frac{(1+P)}{(1+w)})^N}$$

- Tilted annuity formulae used in France[12]:

$$A_1 = \mathrm{I} \times \frac{1}{(1-\mathrm{P})} \times \frac{1 - \frac{1}{(1+w)\times(1-P)}}{1 - \frac{1}{((1+w)\times(1-P))^N}} \approx \mathrm{I} \times \frac{(1+\mathrm{P})}{(1+\mathrm{w})} \times \frac{w - p}{1 - (\frac{(1+P)}{(1+w)})^N}$$

- With,
  - A_1, the annual charge is year one
  - I, the investment value of the asset
  - w, the cost of capital (see part 6 of the document)

[10] PTS, Sept 2007, Model Reference Paper (rev B) Guidelines for the LRIC bottom-up and top-down models
[11] Bottom-up model for interconnection description of the methodology, Prepared by BIPT In collaboration with Bureau van Dijk Management Consultants, 08 June 2004
[12] ARCEP, April 2005, Consultation on copper local-loop costing methods

- P, the real annual change in the price of the asset
- N, the useful life of the asset

63. When asset prices are stable, the tilted annuities are constant and independent of the year. This explains the preference for this type of depreciation for BU LRIC cost model. Also, when asset prices are falling, it is economically rational to take a greater share of depreciation in the earlier years, since otherwise a competitor would be able to enter the market and benefit from lower asset prices through lower capital costs.

64. TA would like industry to comment on the use of the following titled annuity:

$$A_1 = \mathrm{I} \times \frac{\sqrt{1+P}}{\sqrt{1+\mathrm{w}}} \times \frac{w-P}{1-\left(\frac{(1+P)}{(1+w)}\right)^N}$$

This formula considers that the operator is paid its cost of capital in the middle of the year while the other ones consider respectively that the operator is paid at the beginning and at the end.

Do you agree with the use of the above mentioned titled annuity formula? Please explain.

65. TA is furthermore of the preliminary view that asset useful lives are not necessarily equal to historical cost accounting asset lives. For that reasons, TA would like industry to comment on whether it should benchmark asset life used by TT with those used by alternative operators in Turkey and with those used by other incumbent operators throughout Europe subject to availability of information.

Do you agree TA should benchmark asset life used by TT with those used by alternative operators in Turkey and with those used by other incumbent operators throughout Europe subject to availability of information? Could you provide information of asset useful lives used within your company?

66. As an example and for information purposes, some asset lives for access networks are provided below:

Asset lives	France[13]	United Kingdom[14]	Sweden[15]	Denmark[16]	Ireland[17]
Ducts	40	40	40	40	20
Poles			20		15
Overhead cables	25	18	20	20	10
Underground cables	25	18	20	20	14

67. TA is of the preliminary view that, unless there are objective reasons for having different asset useful lives in Turkey in comparison with European Union countries, network asset useful lives should be consistent with asset useful lives observed in the European Union.

Do you agree that unless there are objective reasons for having different asset useful lives in Turkey in comparison with European Union countries, network asset useful lives should be consistent with asset useful lives observed in the European Union? Please explain.

[13] ARCEP, Décision n° 05-0834
[14] OFCOM, Valuing copper access – Final statement, August 2005
[15] PTS, Draft Reconciliation Report Differences between the top-down and bottom-up model, September 2003
[16] IT- og Telestyrelsen, Report on the LRAIC Model Revised Hybrid Model (version 2.3), December 2005
[17] Eircom, Current Cost and Long Run Incremental Cost Statements For year ended 31 march 2005 – Accounting documents

6 Cost of capital in the Turkish Fixed Telecommunications sector

68. Article 11 of the Ordinance on access and interconnection states that "Cost-oriented price for access and interconnection services shall consist of long-run incremental cost of efficient service provision including an appropriate return on capital employed for the provision of service plus the total parts of common costs that can be attributed to the service."

69. As explained in Parts 3 and 4 of this document, the appropriate return on capital employed is included in the depreciation charges derived from the tilted annuity formula through the parameter "cost of capital" (WACC).

70. In the document "ERG COMMON POSITION: Guidelines for implementing the Commission Recommendation C (2005) 3480 on Accounting Separation & Cost Accounting Systems under the regulatory framework for electronic communications", the ERG states that the "cost of capital conventionally reflects the following:

    - the (weighted) average cost of debt for the different forms of debt held by each operator;
    - the cost of equity as measured by the returns that shareholders require in order to invest in the network, given the associated risks;
    - and the values of debt and equity".

71. In other words, the cost of capital is a weighted average of two components: the cost of equity (r_e) and the cost of debt (r_d), where the weightings are determined by the relative proportions of debt and equity held by the firm.

    Defined on a pre-tax basis, a firm's cost of capital is calculated according to the following formula:

$$WACC = (r_d \times g) + \frac{[r_e \times (1-g)]}{(1-t)}$$

Where g is the gearing is the gearing ratio,

t is the tax rate which is the marginal rate of corporate tax,

r_d is the cost of debt,

r_e is the cost of equity

72. The weighting used in the WACC formula is the company's gearing. The gearing is a measure of the ratio of debt to company value (the latter being equivalent to the sum of debt (D) and equity (E)) and is defined as:

$$g = \frac{D}{D+E}$$

73. The gearing ratio is company-specific and is calculated using the value of the company's debt and equity. This method can be based on book values and therefore it is a transparent method, easy to check and audit, since the book values are provided. But, based on book values, the gearing ratio does not reflect the true economic value of the company and is subject to accounting policies. As a consequence, the gearing ratio can also be based on the observed market value of the company's debt and equity. The observed market value of the company's equity can be assessed by multiplying the number of shares of the company by their current price. The observed market value of the company's debt can be more difficult to assess. The risk of estimating the gearing ratio on the basis on the observed market value of the company's debt and equity is that the latter can be volatile.

Do you have any views on the use of the book value or on the use of the observed market value to assess the gearing ratio? Please explain

74. TA observes that some National Regulatory Authorities in Europe and elsewhere[18] calculate an "efficient" gearing using gearing data from a group of peers such as other telecommunication companies, which may be available from other countries, or from other national public utilities. TA is of the preliminary view that this methodology could also be appropriate in case the information is not provided by the incumbent within a reasonable time period. Also, TA is of the preliminary view that there is a risk using the current value of the company's debt and equity since this one is volatile and dependent from the firm's short term financial decisions.

Do you have any views on the use of an "efficient" gearing ratio? Please explain

[18] ComReg (Ireland), ANRT (Morocco)

75. According to the IRG[19], "the cost of debt reflects the cost the company has to sustain in order to get capital to finance its activity, either from financial institutions or through loans from other companies". Also "it corresponds to the weighted average of the costs of the various long-run loans of the company and it is strongly correlated to the current interest rate's level, the company's financial capacity and risk and even to the country's fiscal policy".

76. The cost of debt can be calculated using accounting data or the current loan book in order to derive the interest payments made by the company. This method is based on book values and therefore it is a transparent method, easy to check and audit, since the book values are provided. According to the ERG[20], the cost of debt can alternatively be calculated "from the sum of risk free activities and a default spread, based on long term credit rating". TA would like therefore industry to comment on whether it should use the book values for the calculation of the cost of debt.

Do you agree with the use of the book values for the calculation of the cost of debt? If not, what other source or method should be used? Please explain

77. TA notices that the economic literature provides several methodologies for the assessment of the cost of equity: for example, the Capital Asset Pricing Model (CAPM), the Dividend Growth Model (DGM), the Arbitrage Pricing Theory (APT), the Fama and French Three Factor Model. However, TA is of the preliminary view that "the CAPM is the model most commonly used by regulators to estimate the cost of equity given that it has a clear theoretical foundation and its implementation is simple"[21]. As a consequence, TA would like industry to comment on whether it should use the CAPM.

78. According to the CAPM, the cost of equity is calculated is follows:

$$r_e = r_f + \beta \times P_M$$

[19] IRG – Regulatory Accounting, Principles of Implementation and Best Practice for WACC calculation, February 2007
[20] ERG COMMON POSITION: Guidelines for implementing the Commission Recommendation C (2005) 3480 on Accounting Separation & Cost Accounting Systems under the regulatory framework for electronic communications
[21] IRG – Regulatory Accounting, Principles of Implementation and Best Practice for WACC calculation, February 2007

Where r_f is the risk free rate,

β is the risk of the regulated asset relative to market risk,

P_M is the market premium.

79. TA observes that it is normal practice to use the long-term government bond yield (typically 10 years) as the basis for the risk free rate. However, in Turkey, government bond yield are short (5 years with fixed interest rates and 7 years at maximum with floating rates) and high. As a consequence, TA would like industry to comment on either to determine the risk free rate on the basis of a benchmark or by adjusting the Turkish government bond yield to long-term government bond yield on the basis of a benchmark.

Do you have any views about the two possibilities to determine the risk free rate in Turkey? Please explain

80. According to the IRG[22], "The Beta estimates can be obtained through regression analysis of historical evidence of the relationship between the company returns and the market returns". The Beta can for example be published by Bloomberg. However, historical data on TT's company return is not available and TA proposes therefore the use of benchmarks for the determination of the beta.

81. TA would like industry to comment on whether it should assess the market premium on the basis of economic surveys.

Do you have any views about the cost of equity calculation in Turkey? Please explain

82. Finally, TA observes that some regulators in Europe[23] have used a different cost of capital for the access network and for the core network. This can for example be justified by the fact that the local access network has a long useful life and that it is in some countries considered as an essential facility. However, it might be difficult to

[22] IRG – Regulatory Accounting, Principles of Implementation and Best Practice for WACC calculation, February 2007

[23] OPTA (Netherlands), OFCOM (United Kingdom), ARCEP prior 2004 (France)

assess two different costs of capital for fixed network operators. TA is therefore requesting industry to comment on whether or not it should have different WACC for the access and for the core network of TT.

Do you agree with the use of the same WACC for the access network and for the core network? Please explain

7 Glossary of Terms

- **Economies of scale**: Economies of scale exists if the average cost per unit declines as volume of output increases.
- **Economies of scope**: Economies of scope occurs due to the presence of common and shared fixed costs or of joint costs in producing different products or in providing a range of services.
- **Increment**: The output over which costs are being measured.
- **Incremental costs**: The additional costs that would result from a defined increment to demand.
- **Long Run**: The period over which the factors of production, including capital, are variable.
- **Long Run Incremental Costs** (LRIC): The incremental costs that would arise in the long run with a defined increment to demand.
- **Long Run Average Incremental Costs** (LRAIC): The term used by the European Commission to describe LRIC with the increment defined as total service.
- **Scorched earth assumption**: A modeling assumption that optimally-sized switches are employed at locations optimal to the overall transmission design, as if the network was being optimally redesigned on a 'greenfield' site.
- **Scorched node assumption**: A modeling assumption that add up to date technologies are employed to perform existing functions at each existing node. So that, for instance, a small analogue switch would be replaced by a small digital switch and not by the remote concentrator which might, in due course and in and in practice, be its replacement.