PUBLIC CONSULTATION

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Consultation on copper local-loop costing methods

Autorité de Régulation des Télécommunications
www.art-telecom.fr

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Introduction

The coming into force of the "electronic communications" directives as transposed into French law in the electronic communications and audiovisual communication services Act no. 2004-669 of 9 July 2004 has profoundly modified the regulatory framework, in particular as concerns local loop unbundling. Indeed, ART is now responsible for analysing the different relevant markets listed by the European Commission in its recommendation C(2003) 497 dated 11 February 2003, designating, if need be, the operator or operators which have significant market power in these markets and imposing justified and proportionate obligations.

In accordance with the new framework, ART has in particular launched an analysis of market no.11 in the Commission's recommendation covering supply of wholesale unbundled access (including shared access) to metallic local loops and sub loops for the purposes of supplying broadband and voice services.

ART notified the European Commission and other national regulatory authorities of its draft decisions on 12 April 2005: draft decision no. 05-0275 concerning the definition of the relevant market for wholesale offerings for unbundled access to the copper local loop and sub-loop as well as the designation of an operator with significant market power -- the so-called "market scope and significant market power" decision; draft decision no. 05-0277 concerning obligations imposed on France Telecom as the significant market power operator in this particular market – the so-called "remedies" decision.

As concerns the price control remedy, the draft "remedies" decision above indicates that France Telecom is obliged to set tariffs which are cost oriented.

The objective of this consultation is to determine the most appropriate costing method in this respect.

This consultation is open until 31 May 2005. Replies must be sent to the following email address: consultationcuivre@art-telecom.fr
At the end of this phase, which will culminate in drafting of a summary of the contributions received, ART will decide on the method to be used for costing the copper local loop. The decision notified to the Commission will consequently allow updating of the local loop cost calculation rules, which are currently defined in ART decisions 00-1171 and 05-0267.

Implementation of the new decision will subsequently require collection and processing of all relevant data using the method eventually chosen with a planned completion date of autumn 2005.

Warning: This consultation presents a large amount of quantified data. This information, which is provided as a guide, may not all be reliable and should be used with care.

Summary

Local loop

The copper local loop, which is the section between the subscriber and the distribution frame, is referred to as the "last mile" of the network.

This part of the network represents a preponderant part of electronic communications network reconstruction costs and it would therefore be difficult for a competitor to duplicate. Given that in addition, other access technologies cannot be used to provide the same services as the copper pair, this infrastructure is currently an essential facility, in particular for operators wishing to provide broadband offerings.

To safeguard consumer interests and to ensure true non-discrimination between operators, the copper local loop tariff structure must therefore comply with several principles including cost-orientation as developed in the unbundling market analysis.

Costs related to the copper pair can be separated into several categories: capital cost, operating costs, common costs and specific costs for the service in question. This consultation essentially covers costing methods for estimating capital cost.

Costing methods

The costing methods for capital costs are based on accounting or economic principles and are applied either to actual France Telecom investment cash flows or theoretical investment cash flows. The resulting costs may vary significantly; the historical cost method gave a capital cost of 2.8 euros per line per month in 2002, whereas the successive step replacement cost method (also referred to as Asset Replacement Path methodology) currently used by France Telecom for full unbundling gives 7.5 euros per line per month. Hence, the choice of costing method looks to be a major issue for the industry.

For each method there are two cost components: depreciation, which represents the annual reduction in nominal asset value, and the cost of fixed capital.

The historical cost accounting method is based on France Telecom's accounts. Depreciation is therefore equivalent to the accounting amortisation of the local loop network and the fixed capital cost is calculated on net value.

The current cost accounting method is based on similar logic but includes changes in asset prices. Technical progress is therefore taken into account to allow the operator to finance network replacement when necessary.

The economic depreciation method follows similar logic to the current-cost method, but it allows network costs to be booked as annual charges which evolve in line with asset prices.

Finally, successive-step replacement costs, which are currently used for full unbundling tariffs in France, are based on the "make or buy" principle. This method aims to render neutral decisions by client operators on whether to rent or rebuild infrastructure. It is another implementation of the economic depreciation method.

Analysis of the different methods

These methods can be analysed according to several criteria. In particular, they must:
- encourage economic efficiency,
- allow for network replacement,
- safeguard consumer interests,
- respect the principle of non-discrimination,
- ensure tariff consistency between France Telecom offers,
- be relevant and therefore be linked in particular to actual investments,
- allow realistic implementation.

The final result of this analysis is that the different methods are comparable in that they all allow the initial investment to be recovered over time, but that the conditions under which they can be used differ. Consequently, special care should be taken as to which method and which parameters are applied to a particular asset type. Local loop assets have different characteristics: some are destined to be replaced regularly whereas others have a long and uncertain lifespan; in each case the appropriate method must be used.

The historical cost method does not appear to be appropriate for the general case because it does not comply with the requirements characteristic of LRIC methods. However, it could be envisaged for assets which are not destined for replacement.

Successive-step replacement costs have serious disadvantages as this method leads to the establishment of annual payments based solely on network characteristics without any link to actual investments; these disadvantages are particularly sensitive for assets with a long and uncertain economic lifespan.

The other methods (current costs, general economic depreciation) generate annual usage payments consistent with actual investments; of these, the current-cost method appears to be less difficult to implement but both require the reconstitution of actual past investments.

Implementation

ART wishes to set tariffs for the France Telecom copper local loop for the years 2006-2008 by autumn 2005.

Implementation of this mechanism requires analysis of France Telecom local loop investment from several angles:
- reconstitution of previous France Telecom investments,
- consideration of the particular case of fully depreciated assets,
- a forecasting exercise to determine investment requirements over the next few years.

Additional work may be undertaken in parallel:
- valuation of France Telecom assets using the current-cost method,
- determination of the network replacement value,
- assessment of the rate of return applicable to the local loop,
- assessment of the rate of technical progress for the period 2006-2008.

Part one

Context

I. Copper local loop

I.1 Definition

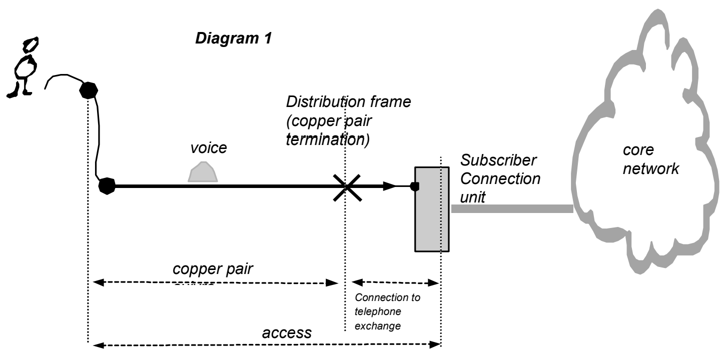
The copper local loop is known as the “last mile” in the network. It is defined in the European local loop access unbundling regulation no. 2887/2000 as a *“physical twisted metallic pair circuit in the fixed public telephone network connecting the network termination point at the subscriber’s premises to the main distribution frame or equivalent facility.”*

The copper local loop was deployed widely by France Telecom in the 1970s and covers the entire country: it represents some 450,000 km of civil works, 18 million poles and 110 million pair-kilometres of cable. Significant economies of scale were achieved in deploying this network.

The local loop network currently comprises over 30 million lines linking 12,000 France Telecom distribution frames to subscribers’ premises. Physically, the lines consist of symmetric cable pairs (copper pairs).

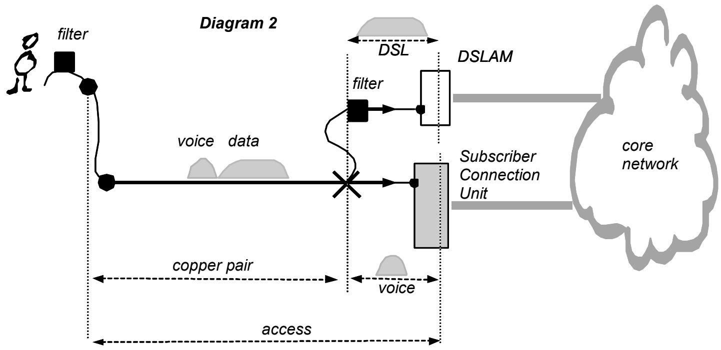
I.2 Different access products

Services provided on the access network were limited in the past to narrowband switched telephony.



The advent of electronic switching and network digitalisation using digital multiplexers and modems (in particular ISDN and xDSL), led to the introduction of data transport services for which bit rates are constantly increasing.

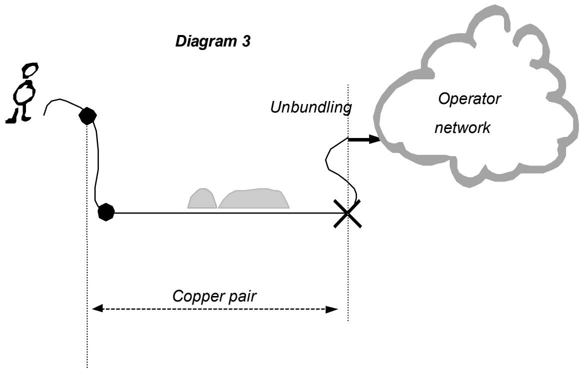
The copper local loop equipped with DSL has consequently become a broadband access vehicle used to provide access to services such as broadband Internet, virtual private networks and all types of data transfer such as TV or voice over DSL. Services conveyed via the copper local loop will increase as electronic communication and signal compression technology develops.



Today, access includes various products marketed in the retail and operator wholesale sectors.

The retail line rental provides subscribers with access to the France Telecom network (subscriber line) and certain specific telephony services. However, it does not include calls, which have traditionally been billed separately on a metered basis. The retail service can also generate a corresponding wholesale offer known as "wholesale line rental".

Local loop unbundling involves making bare copper pairs available to an alternative operator which in turn equips them with its own transmission equipment.



Alternative operators compensate the incumbent for the use of its local network. They install transmission equipment at the end of the local network so that they can connect lines to their own network. If the alternative operator has access to the entire copper pair frequency band this is known as full unbundling. With shared access, only the upper part of the frequency band is available.

Finally, access leased lines belong to a family of services which make direct use of the local loop. They allow customer sites to be connected to an operator's network (partial leased lines) or to another customer site so that data, and possibly telephony traffic, can be transferred between extremities.

I.3 The copper local loop, a key link in electronic communications networks

The copper local loop is a significant part of current fixed-network value. The cost of replacing the network is EUR 28 billion on today's costs of which underground or overhead civil works account for more than half. This cost is significantly higher than the cost of replacing the core network, estimated at EUR 10 billion.

There are also costs involved in maintaining the network to ensure satisfactory ongoing operation. The quality of the copper pairs determines the characteristics of services which can be offered. As a result, the bit rate for services using xDSL technologies depends not only on the length of the subscriber line but also on its quality.

Furthermore, the ability to substitute the copper local loop with other access infrastructure solutions was the subject of a consultation during the broadband market analysis carried out in June 2004. Decision 02-275 confirmed that there are currently no alternative infrastructure solutions capable of providing the same services as the copper local loop to the entire population. Indeed, optical fibre infrastructure is not very widespread in France and is primarily used for the business market. Wireless local loop and cable do not cover the entire population and have persistently low penetration rates. Finally, GSM and UMTS mobile networks do not appear to be copper local loop substitutes due to their high cost and lack of equivalent bit rates.

Consequently, it would appear that it is imperative to maintain the local copper loop in good working condition. France Telecom, must therefore be remunerated sufficiently for carrying out this task and be provided with an incentive for doing so.

I.4 Essential infrastructure

Essential infrastructure is defined as infrastructure without which competitors of the operator to which it belongs cannot provide services to end users.

The theory of essential facilities, originating in American anti-trust legislation, was developed by the European Commission and the CoJEC (see in particular CoJEC –7/97 Oscar Bronner 26/11/98), and adopted subsequently by French courts of law. According to this theory, a company with a monopoly or dominant position that operates or controls an installation that cannot be easily replicated and to which access is indispensable for competitors to be able to exercise their activity, cannot: (i) refuse access to the facility without an objective justification, (ii) grant access under conditions which are discriminatory compared to those it enjoys itself. If this is not the case, the company would be considered as having abused its dominant position.

The European Commission clarified this concept in a communication dated 22 August 1998 concerning the application of articles 85 and 86 of the EC Treaty to access agreements in the telecommunications and audiovisual sector (O.J C 265 dated 22 August 1998). The term "essential facility" in telecommunications law is a *"facility or infrastructure which is essential for reaching customers and/or enabling competitors to carry on their business, and which cannot be replicated by any reasonable means"*

Because the copper local loop cannot be substituted by other infrastructures and given that it would not be economically viable to duplicate this part of the network, it would appear that the copper local loop is an essential infrastructure in France.

Article 6 of European regulation 2887/2000 dated 18 December 2000 concerning unbundled local loop access highlights that *"it would not be economically viable for new entrants to duplicate the incumbent's metallic local access infrastructure in its entirety within a reasonable time. Alternative infrastructures such as cable television, satellite, wireless local* *loop do not generally offer the same functionality or ubiquity for the time being though situations in Member States may differ".*

In its recommendation n°04-A-01 dated 8 January 2004, the *Conseil de la Concurrence*[1] (French competition authority) clarified the definition of an essential infrastructure and confirmed that the local loop fell into this category:

"*30. The telecommunications local loop appears to be an essential facility as defined by the Conseil in its opinion 02-A-08 dated 22 May 2002. The acknowledgement of the existence of an essential facility or infrastructure limits the contractual freedom of its holder. The holder is subject to two constraints: an obligation, without right of refusal, to provide access to the infrastructure in its keeping or under its control to downstream or upstream competitors and, secondly, an obligation to provide access under fair and non-discriminatory conditions. Classification as essential infrastructure assumes that: 1) The infrastructure is owned by a company holding a monopoly or in a dominant position; 2) access to the infrastructure is strictly necessary (or indispensable) for carrying out a competitive activity in a market which is upstream, downstream or complementary to the market in which the infrastructure holder has a monopolistic or dominant position; 3) the infrastructure cannot be replicated under reasonable economic conditions by the infrastructure operator's competitors; 4) access to the infrastructure has been refused or authorised with unjustified restrictions; 5) access to the infrastructure is possible."*

The "essential facility" nature of the copper local loop carries obligations for its holder, France Telecom. The market analysis for unbundling confirmed that France Telecom has significant market power in this market.

Consequently, this infrastructure is used both by France Telecom for its own services and also by its competitors. To allow fair competition in downstream retail markets, it is necessary to ensure all operators have the possibility of accessing the infrastructure under non-discriminatory conditions.

In particular, the tariff structure for copper pairs must give France Telecom's competitors the capacity to compete in markets relying on local loop access and allow the development of effective competition in these markets. Given that the infrastructure is monopolistic in nature, care must be taken to avoid creating a situation that could be likened to a monopoly rent.

In its unbundled local loop market analysis, ART notably proposed imposing cost-oriented tariffs on France Telecom. This tariff structure should however provide the operator with a return on fixed capital*)* and enable it to make the necessary investments in infrastructure maintenance.

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[1] This position was reaffirmed by the *Conseil de la Concurrence* (competition authority) in its recommendation no. 05-A-03 of 31 January 2005 :
« *63.Access to the France Telecom copper local loop, which connects 30 million subscribers to around 12 000 distribution frames is essential for alternative operators. First, other subscriber access technologies (cable, WLL, satellite) cannot be considered as substitutes for the copper loop as observed above. Second, deployment of an alternative copper loop in competition with the France Telecom network, with an estimated cost of EUR 30 billion, is not a reasonable economic alternative. These characteristics have led the competition and sector regulatory authorities to consider that it was an essential infrastructure for which access should be regulated by imposing specific obligations on the operator».*

II. Cost evaluation principles

II.1 General principles

In accordance with article L. 38 I, paragraph 4 of the Post and Electronic Communications Code, ART can impose tariff control obligations aimed at forbidding excessive or predatory tariffs and ensuring that the tariffs reflect the corresponding costs. These obligations must be proportionate to the regulation objectives defined in article L 32-1 II of the code, which include notably the requirement to ensure: *"effective and fair competition between network operators and suppliers of services and electronic communications for the benefit of consumers, development of effective investment in infrastructure, innovation and competitiveness in the electronic communications sector";* the definition of access conditions for public networks which guarantee in particular competition under equal conditions; *"absence of discrimination among operators in analogous circumstances"*.

These obligations are detailed in article D 311:

"The telecommunications regulatory authority ensures that the methods used encourage economic efficiency, sustainable competition and optimise benefits for the consumer. It also ensures that there is a reasonable return on investment given the risks involved."

Furthermore, costing principles are also set out in article D 312 of the code detailing accounting separation obligations.

"The costing and allocation methods used in application of this article are in accordance with the principles of:
- efficiency: the costs taken into account must tend towards an increase in long-term economic efficiency. In this respect ART can base its assumptions in particular on the best technology industrially available and on optimal resource utilisation;
- non-discrimination: the cost-evaluation method used by the operator for interconnection or access services is the same as that used to evaluate tariffs for other services;
- relevance: the costs used must be relevant i.e. there must be direct or indirect causality with the services provided."

By virtue of article D 311 above, which gives ART the possibility of determining the tariff and cost accounting methods, ART considers that the application of these tariff principles to the local loop is justified.

The principles set out in the texts require some comment.

Consumer benefits which by definition benefit end users, are assessed directly through the retail market by analysing the quality and price of services on offer and indirectly through competitive conditions in the wholesale market. Overall, the development of what is called effective competition provides benefits for the consumer.

In the case of local loop access, the optimisation of consumer benefits must take into account the "essential facility" nature of the infrastructure, which as such can be an obstacle to the development of competition. The role of ART is to provide remedies to this constraint by regulating the access tariff taking into account its impact on the consumer.

- the tariff structure must provide sufficient return for France Telecom for it to maintain its copper access network in good working order and in view of this allow higher retail prices than those aligned on short-term marginal costs.

- the tariff structure must also be sufficiently low to allow development of effective competition in downstream markets.

Consequently, while maintenance of an essential infrastructure such as the copper local loop requires regulated tariffs which are higher than the simple short-term marginal costs, thereby, *a priori*, generating disadvantages for the consumer, they are justified by the need to guarantee medium-term quality of a network which currently carries the majority of services, existing or in development, for the consumers welfare.

The principle of efficiency is also an essential concept. It aims to align the operator with the best technological and industrial practices currently available and use the most competitive costs and prices for comparable services as a reference. Strict application of this principle leads to the lowest costs being retained when there are different costs for equivalent services (in terms of functionality, capacity and service quality). In this particular case, it should be noted that if maintaining an existing infrastructure is less costly in the long term than building a new infrastructure, then the existing-infrastructure option should be used as a reference.

The principle of non-discrimination requires not only the use of a single cost-evaluation method for services sold internally (i.e. within an integrated company) or externally (cf. article D 312) but also that the price is equivalent. In other words, the evaluation of the cost of a service and the pricing method chosen are purchaser independent.

Application to the local loop

The central role of copper access infrastructure in electronic communications has already been highlighted. It is therefore in the general interest for this infrastructure to be used under optimal technical and economic conditions. Copper local-loop costing principles and tariff structures can therefore be broken down as follows:

- infrastructure development funding must allow the operator to maintain and develop its copper access network,

- non-discrimination and cost-orientation,

- tariff consistency between local loop access and other France Telecom services should allow a balanced and realistic value-added chain to be established.

Financing infrastructure development

The copper local loop infrastructure is already in a mature state in France. Today, France Telecom investment is essentially devoted to replacing existing infrastructure when necessary and adapting the network to changes in population. Moreover, this infrastructure is quite recent and considered to be of good quality. These two factors have led to a significant drop in France Telecom investment in the copper local loop over the last few years. For instance, at the end of the 1990s, the annual France Telecom investment in this network was 8 times lower than at the end of the 1970s, which was the peak of local loop rollout. Investment in the copper access network is mainly for maintaining an infrastructure in good condition rather than constructing new network.

The selected tariff structure must therefore encourage France Telecom to invest efficiently in network maintenance. Two conditions must be met to achieve this:

- France Telecom must have sufficient financial resources at its disposal to be able to make the necessary investments,

- France Telecom must be encouraged to use these resources for maintaining the copper access network rather than for any other purpose.

The first condition implies that the tariff structure must leave sufficient margin for France Telecom to be able to maintain the existing network and to ensure it remains in a state fit for carrying services satisfactorily.

The second condition implies that the selected tariff structure depends on effective France Telecom expenditure, past or future, rather than the theoretical renewal of a network which will not occur. The conditions also imply that resources generated by the copper local loop can only be justified if used for maintenance and extension.

Non-discrimination and cost-orientation

The principle of non discrimination according to which internal transfer prices are equivalent to external transfer prices, aims to ensure that competitive conditions in the infrastructure operator's downstream market and those for alternative operators in the same market are equivalent.

In operational terms, this principle means setting up accounting separation to ensure that identical use of a copper pair for internal or external services results in identical charges in accounts and tariffs. The equivalence between transfer prices is a necessary but not sufficient condition: indeed it does not remove the requirement of investigating the right level of transfer price, given that an unduly high level would lead in particular to the infrastructure holder generating a monopoly rent at the expense of consumers, whether they are direct customers of the infrastructure holder or an alternative operator.

Tariff structure consistency and investment incentives

During the 2000 regulatory debates, cost-orientation based on the "make or buy" principle was advanced with a view to setting unbundling tariffs based on replacement costs (cost of rebuilding the network for an efficient new entrant). The objective of this principle was to ensure that there would be no difference between the two alternatives for a new entrant operator coming into the access market: i.e. building its own infrastructure or using the France Telecom network. The justification advanced at the time was that such a tariff structure would encourage investment, notably in alternative access networks based on microwave radio technologies for example.

Today, it seems that this approach needs to be put into perspective if not discarded:

- indeed, it appears that the copper local loop will continue to be an essential infrastructure over the long term and will not be challenged significantly in the short or medium term by alternative infrastructures;

- competition depends not so much on the absolute full-unbundling price level as the relative price levels between full unbundling and retail services, particularly retail line rental.

In any case if the incumbent continues to establish retail prices at low levels, alternative operators do not have enough economic space to envisage investing in the same market, whatever the entry technology. Nevertheless, we cannot accept an excessive access tariff level, whether retail or wholesale, if it leads to the local loop holder benefiting from a monopoly rent. Here again, this observation requires evaluation of the actual costs incurred by the infrastructure holder.

In short, an appropriate access tariff should encourage investment through:

- investment in local backhaul networks, i.e. downstream from the local loop;
- equipment development, a source of service innovation and hence growth in demand and usage.

> Q1 : Do the principles as outlined seem relevant to the present case? Which of them should be considered as a matter of priority? Are there other principles that should be stated?

III. Current situation

III.1 Cost value differences

Technical model

From a more technical viewpoint, the costs of activities using France Telecom copper pairs are currently broken down into:

- cost of the actual copper pair comprising a capital and an operating cost,
- costs specific to the service in question (these costs can include capital costs),
- contribution to the company's common costs.

The methods for evaluating these costs can differ:

- copper pair capital cost: several methods, which will be presented later, can be envisaged (historical costs, forward-looking costs: current costs, replacement costs). The objective of this consultation is to call for comments on the most appropriate method;
- operational costs, which correspond in the case of copper pairs to access network upkeep and maintenance: these are generally taken from the operator's accounts;
- costs specific to the service in question can be taken from the operator's accounts, or in the case of new activities, through use of analytical models;
- finally, the contribution to common costs is generally obtained by applying a mark-up.

The mechanism is summarised in the diagram below

Description	Type of cost	Assessment method
Copper pair	Capital cost	Different methods
	Operating costs	Accounting approach
Services	Capital and operational costs	Analytic and accounting approach
Contribution to common costs.	Common costs by type	Equal Proportionate Mark Up

Variations observed in the case of unbundling

The choice of the cost method appears to have a significant impact on market trading conditions. Therefore, the practical consequences of the choice can be important given the current strong development of unbundling.

The differences observed between the cost-assessment methods are entirely due to the capital cost component. The other costs (operation, maintenance, common costs etc.) are barely influenced by the choice of methodology as shown in the following table.

		Estimations (euros per line per month	
Description	**Type of cost**	**Historical costs 2002**	**Replaceme nt costs**
Copper pair	Capital cost	3.00	7.50
	Operating costs	2.06	1.92
Specific unbundling costs	Capital and operational costs	1.62	1.62
Contribution to common costs (10.1%)	Common costs by type	0.67	1.12

Total in euros per line per month on average for the total number of lines and a 10.4% rate of return on capital	***7.35***	***12.16***

Significant differences can be seen in the capital cost part. Consequently, audited France Telecom historical costs were around 3 euros in 2002 for the capital part whereas the replacement costs as used in ART decision no. 02-323 of 16 April 2002 were 7.5 euros.

Historic costs Base : 2002 audit Restated (no. of lines and rate of return on capital)			
	Net value (€G)	Amortisation (€M)	Annual cost (€M)
Civil works	3.8	464	859
Cables	0.8	174	257
Distr. frames	0.3	46	77
Total	4.9	684	1 193
Monthly line costs (€)			**3.0**
No. lines	32.8	millions	
Rate of return	10.4%		

Replacement costs Base : decision 02-323		
	Replacemt cost (€G)	Annual cost (€M)
Civil works	16.5	1 650
Cables	10.2	1 150
Distr. frames	1.3	140
Total	28.0	2 940
Monthly line cost(€)		**7.5**
No. of lines	32.8	millions
Rate of return	10.4%	

Different capital costs

The table below shows two costing methods:

- the historic accounting value comprising two components: the net value (around EUR 5 billion in 2002) and the amount of depreciation expenses (approximately EUR 700 million in 2002). These two components result in an annual payment of approximately EUR 1,100 million using a 10.4% rate of return on capital.

- costing "replacement costs": this costing is based on the cost of building a replacement network. It provides a "new network" value which corresponds to the investment that the operator would have to make to replace its network entirely. The replacement cost technique allows an annual payment to be calculated giving values respectively of EUR 28 billion and EUR 2,940 million.

This observation shows the importance of the choice of assessment method for capital cost assessment, which is the subject of this consultation.

III.2 References

In its Recommendation 98/195/EC of 8 January 1998 on interconnection in a liberalised telecommunications market, the European Commission recommended using long-run average incremental costs (LRIC) as a cost reference to satisfy the principle of cost-oriented tariffs. Moreover, paragraph 11 of the preamble to the European regulation also states that whereas *"the pricing rules should ensure that the local loop provider is able to cover its appropriate costs in this regard plus earn a reasonable return, in order to ensure the long term development and upgrade of the local access infrastructure"*.

Theoretical definition of long-run (average) incremental costs (LRIC)

The incremental cost is the additional cost incurred when there is an incremental increase in production for a product. The increment can be negligible, correspond to a given production quantity or to total production if there was initially no production. The concept of incremental cost is a generalised version of the marginal cost concept, which is the cost of the last item produced.

The incremental cost takes into account the fixed costs specific to the production of the increment but excludes common and joint costs, which by definition are shared with other activities. For this reason, the incremental production cost of an item corresponds to its base price since pricing any lower would not cover direct production costs.

The allocation of fixed incremental production costs to the items produced, determines the average incremental cost.

Finally, the average long-run incremental cost is obtained by spreading the total costs over a sufficiently long period such that the fixed-cost component becomes variable and the operator is obliged to invest or disinvest to increase or diminish the production capacity of the network. Evaluation of long-run average incremental costs therefore requires a forward-looking approach.

There is no single method for implementing long-run average incremental costing and several costing methods can be used. The complexity of this approach certainly lies in the implementation of LRICs.

The Champsaur report[2] recommends choosing long-run average incremental costs (LRIC) on the basis of the economic principles that they are designed to verify:

The Champsaur report retains 5 basic principles for choosing the evaluation and cost-allocation method when determining tariff policy. These principles are a) the principle of economic optimisation, b) the principle of cost relevance, c) the principle of efficiency, d) the principle of fair competition and e) the principle of budget equilibrium. The working group which put together the report recommended long-run average incremental costs as being the most robust method in the light of these principles.

The economic effectiveness of long-run average incremental costs results from both the incremental and forward-looking aspects of the concept. The incremental approach requires consideration of production or activity costs only and satisfies the principle of relevance. The forward-looking approach, which requires all costs to be considered as variable and therefore continually raises the question of infrastructure reinvestment or disinvestment, allows costs to be evaluated from the point of view of the current costs which an operator entering the market would incur to produce the incremental quantity.

As a result, long-run average incremental costs reflect increasingly competitive market conditions by using the market price of the best industrial technologies currently available and assuming that operators' networks are optimised. Consequently, they encourage optimal and efficient investment and technology.

[2]Rapport Champsaur, *« L'interconnexion et le financement du service universel dans le secteur des télécommunications »,* Ministère de la poste, des télécommunications et de l'espace, 1996, La documentation française

The fact that long-run average incremental costs represent the cost that an operator would incur when entering the market suggests that the principle of fair competition or non-discrimination is satisfied by ensuring that all players benefit from the incumbent's economies of scale.

Finally, to satisfy the principle of budget equilibrium, a tariff structure based on the principle of long-run average incremental costs must include a reasonable proportion of common and joint costs. To achieve this, the method most commonly used is EPMU (Equal Proportionate Mark-up), which allocates non-specific costs proportionally to the incremental costs as a function of production levels.

The Independent Regulators Group has published guidelines for implementing long-run average incremental costing.

The IRG published a document on 4 November 2004 entitled "Principles of implementation and best practice regarding Forward-looking – Long Run Incremental Cost modelling" containing guidelines for allocating costs as long-run incremental costs to assist in harmonising practices at European level. In addition to considerations concerning network topology and modelling, definition and identification of the relevant production increment and the method for allocating common and joint costs, the IRG document indicates that the implementation of long-run average incremental costs must be based on current cost accounting (CCA) methodologies.

Indeed, in a situation where technological evolution is driving telecommunications network prices down significantly, the use of forward-looking and efficient costs such as long-run average incremental costs allows operator costs to be assessed on the basis of network element replacement costs consistent with market prices and hence avoid the risk of overestimating asset costs, such as might occur using accounting techniques based on historic cost depreciation (historical costs are based on the purchase price of network elements at the time of purchase). It should be noted that in the case where network element prices increase, the use of long-run average incremental costs allows the increased asset value to be taken into account and be visible to the market. The recovery of operator costs is based on the principle of maintaining the actual future value of the network elements and implies that they should be evaluated using current-cost accounting.

In practice, the concept of forward-looking costs requires assets to be valued using the cost of replacement with the modern equivalent asset (MEA) i.e. the lowest-cost asset providing at least equivalent functionality and output as the asset being valued.

When such a method is implemented, the issue of capital maintenance becomes important. Capital can be dealt with in two ways: the first is called operating capital maintenance (OCM) and guarantees that a company will have sufficient capital to maintain its production capacity; the second is called financial capital maintenance (FCM) and guarantees that a company will have sufficient capital to preserve the initial financial investment.

The draft European Commission Recommendation on accounting separation and cost accounting recommends using the FCM method.

Review of current European practice

The Independent Regulators Group is due to publish in 2005 an overview of regulatory accounting practices in Member States entitled "Report on Regulatory in Practice, Data Collection".

In this report it would appear that the European trend is for implementation of long-run average incremental costing associated with current-cost methods.

	Local loop:	
Country	Assessment method	Cost allocation principles
Germany	Current costs	LRIC
Austria	Current costs	LRIC
Denmark	Economic (tilted annuity)	LRIC
Ireland	Current costs	LRIC
Italy	Historical costs	Distributed costs
Norway	Current costs	LRIC
Netherlands	Mix 2/5 historic – 3/5 current	Distributed costs
Poland	Current costs	LRIC
United Kingdom	Current costs	LRIC + distributed

Q2 : Are there any additional references that should be included?

Part two:

Methodology

IV. Annual payment calculations

A company that invests in an asset (or infrastructure) incurs a cost that must be recovered over the lifetime of the asset concerned. This cost is the initial outlay less the end-of-period recovery value, or residual value. At the beginning of the time period, the residual value must be discounted to take into account the fact that payment is deferred.

This reasoning can be applied for each year the asset is used. Indeed, for any given year during the asset lifetime one can consider, for the purpose of determining the relevant annual cost, that the asset has been purchased at the beginning of the year and resold at the end of the year. This reasoning can be carried over from one financial year to the next and is valid for all cost-calculation methods. The differences between cost-calculation methods reside in the asset values at the beginning and the end of the financial year: in each case, these values can vary depending on factors external to the asset such as changes in price.

In the general case, the annual payment corresponding to the use of an asset is the value of the asset at the beginning of the year (initial outlay) minus its discounted residual value at the end of the year i.e.

$A_t = K_t - \dfrac{\widetilde{K}_t}{(1+a)}$, if we consider that the payment is made at the beginning of the year.

where: A_t is the annual payment

K_t is the value of the asset at the beginning of the period

$\widetilde{K}_t$ the end-of-period value

a the rate of return on capital

This can also be written $A_t = \dfrac{a \cdot K_t + (K_t - \widetilde{K}_t)}{(1+a)}$, which reveals the two components making up the asset cost in the absence of discounting.

The first component is the return on the asset capital $a.K_t$, which corresponds to the cost of capital or the opportunity cost of the sum invested.

The second component is the depreciation $(K_t - \widetilde{K}_t)$: it corresponds to the loss in asset value over the period in question.

For an asset considered in isolation, the end-of-year value $\widetilde{K}_t$ is the same as the value K_{t+1} at the beginning of the year.

The choice of methodology therefore essentially comes down to determining the relevant values for K_t et K_{t+1}. There are two main types of method: those based on an historic approach and those based on a forward-looking approach.

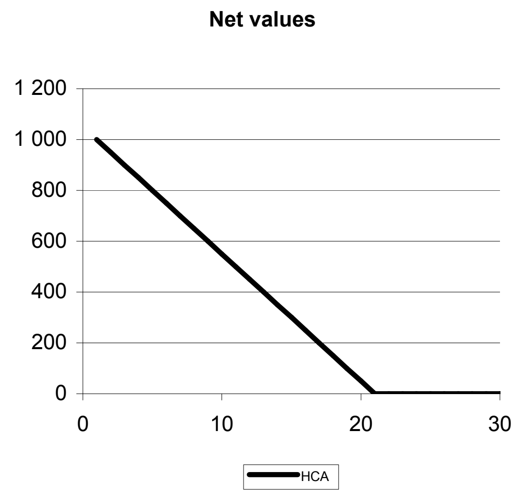
V. Historical cost method (HCA)

The method most commonly used corresponds to historic accounting costs.

In the case of the historic cost accounting approach, amortisation is determined directly on the basis of the initial investment K_0. The price of the initial investment is not subsequently revised, making the historical cost method insensitive to changes in price.

If linear amortisation is used, then the amortisation equals the initial value spread over the accounting lifespan T of the asset i.e. K_0/T. Other amortisation methods can be used in the historical cost category.

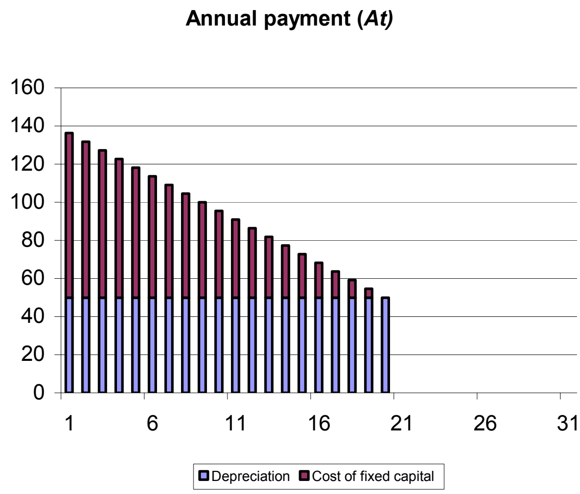
With linear amortisation, the asset value K_t at the beginning of year t is equal to $K_t = K_0.(1 - t/T)$ The value K_t decreases linearly over the accounting lifetime T as shown in the following graph for an asset with an initial value of 1000 and a lifespan of 20 years.



The annual payment At corresponding to the amortisation above and the capital cost of the asset for year t is:

$$A_t = \frac{a \cdot K_t + (K_0 / T)}{(1 + a)}$$ at the beginning of the period and decreases linearly

This is shown in the following graph.



V.1 Advantages of the historical cost method

- Historical cost methods currently ensure that there is genuinely no discrimination between internal and external transfer costs. Indeed, it ensures that costs recorded internally by France Telecom will also be also recorded in comparable fashion externally by alternative operators when purchasing services with tariffs based on historical costs.

- Furthermore, these methods automatically ensure that the investments are indeed covered *in fine*. They therefore allow France Telecom to maintain and upgrade its copper pair network with the guarantee that the expenditure will be taken into account provided it complies with the principle of relevance and efficiency.

- Finally, these methods are easy to verify and audit.

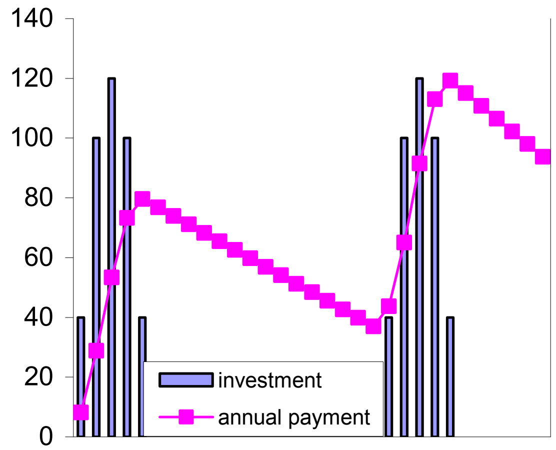
V.2 Disadvantages of the historical cost method

- Historical cost methods do not enable determination of a sector benchmark common to all operators: they provide a specific cost for a specific operator and particular actual investment cash flows. As such, it does not seem logical for alternative operators (and the rest of the sector) to support the uncertainties linked to an investment strategy controlled by the incumbent.

- Moreover, historical costs could mask significant investment requirements in the future. There is in fact a dual problem.

  - On the one hand, these methods are by their very nature incapable of taking changes in prices into account and the company could find it impossible to replace assets for which the cost has increased considerably. Indeed, historical costs do not necessarily allow sufficient provision to be made to renew the investment. Neither does the method give any particular encouragement to careful provisioning, which is necessary for renewal.

  - Also, historical costs cannot anticipate or prepare for increases in future investments brought about either by lack of investment in the past or renewed heavy investment cycles. However this is probably the situation that corresponds to the existing local loop: France Telecom investments over the last few years seem to be historically low and are not necessarily a stable reference over time. Indeed, the level of investment may have to be increased in the near future to guarantee ongoing local loop asset maintenance and upgrade. The following time-series illustrates this situation.



- Finally, these methods do not encourage the operator to be efficient since investment is automatically reimbursed on an absolute cost-plus basis; the absence of competition in the local loop itself (notion of essential facility) reinforces the risks linked to the lack of incentive and efficiency.

For these various reasons, historical cost-accounting methods do not appear to be adapted to access cost assessment.

Q3 : What is your opinion of the historic accounting cost method?

VI. Forward-looking methods

The problems mentioned above have been identified by accountants and economists and ways of improving HCA methods have been examined. There are two main types of improvement:
- they aim to take price changes into account;
- they seek to correct gross-investment time-series, notably to take investment optimisation into account.

Before going into the detail of these improvements, it should be noted that the forward-looking nature of these methods introduces a delay between the cost being incurred and effectively registered *in fine* by the company. This has several advantages.

The company is encouraged to be efficient, through the prospect of being able to keep any productivity gains realised between the time when the forward-looking costs are determined and when they are incurred.

Second, the establishment of a forward-looking cost allows more or less long-term investment requirements to be taken into account. This remark must however be qualified since the notion of time-horizon which is inherent in the forward-looking approach can be a complex question. Indeed, longer term variations must be envisaged with care and are subject to trade-off: improvements in visibility for France Telecom and alternative operators in particular have to be offset against the growing risk of a decorrelation between France Telecom's provisonal and actual costs *in fine*.

VI.1 *Taking price changes into account*

We have seen already that failure to take price changes into account, a characteristic defect of historical cost accounting, means that there is no assurance that future investments can effectively be made.

For short-term investments, company budget items can be used to provide initial information. Thus, integrating validated budget elements into the historical cost accounting calculation means that these elements can in fact be implemented.

This provisional accounting-cost method has already been used in a regulatory context, notably for calculating basic services for the initial France Telecom interconnection reference offers. It does however rely upon budget trade-offs and does not guarantee that amounts planned for renewing certain assets will necessarily be set aside. The company may decide to delay the investment due to lack of resources.

To guarantee long-term survival of the local loop asset, we must seek a method that makes intrinsic provision for asset renewal and ensures it is possible.

Solutions have been provided in both the accounting and economics fields.

The accounting solution to this constraint is derived from accounting rules developed in a high-inflation environment. Indeed, in an inflationary context and likewise in the case in point, asset renewal is anticipated by immediately provisioning the accounts with the amounts required for future investment and in particular for renewal.

VI.2 Current-cost method

The current-cost method does precisely this and is the method recommended by the European Commission. It is used in most European countries.

The key aspect of the current-cost method is that it guarantees long term survival of the company's activity by successively provisioning the equivalent replacement cost of assets instead of, for example, distributing the amount to shareholders. In other words, an asset is amortised such that it can be replaced at the end of its life by an equivalent asset.

Consequently the current-cost method automatically builds up the necessary provisions for future investments required for renewal. At any time, the current cost is derived from the current asset price (replacement value): at the end of its life, it can therefore be replaced.

For calculation purposes (these items are developed in the appendix to this consultation); amortisation in year t is calculated such that the cumulative amortisation of an asset purchased at historical cost p_0 is equal to the theoretical cumulative amortisation if it had initially been purchased at price p_t. This adjustment is carried out each year as a function of changes in price. In other words, the assets in the company's books are treated as if they were purchased at today's prices but are entered in the books at their real age. Consequently at the end of the asset's life, it is completely amortised in the company's CCA accounts at current prices for that asset: the company can therefore replace it.

Similarly, the net asset value at the beginning of the period t is defined as the replacement cost of the asset at price p_t less the cumulative amortisation from previous years (up until $t-1$).

Calculating depreciation and subsequently the annual payment using this method corresponds to the operational capital maintenance (OCM) version of current cost methods, which maintains productive capacity.

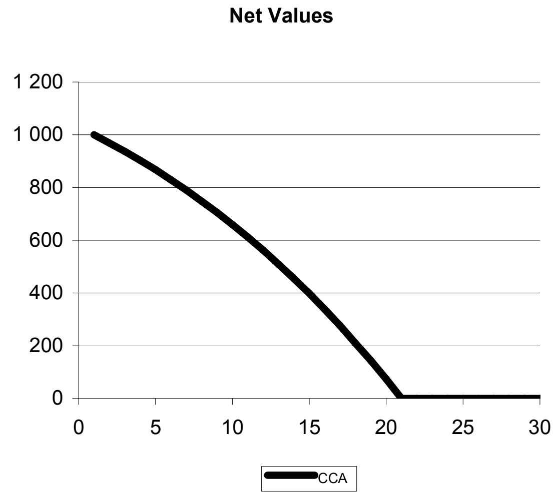
One of the drawbacks of this method is that it does not ensure the cost of a particular asset will necessarily be covered: if prices increase, the company will recover more than the initial investment but conversely, if prices drop, the initial investment will not be covered. Consequently the "shareholder" vision of return on previous investment has been abandoned. The company-asset vision is also contradicted: when prices increase, the "wealth" of the company in terms of assets increases or usefulness of assets appears greater; nevertheless, the OCM concept generates lower results than the historical cost method due to the need for higher provisions.

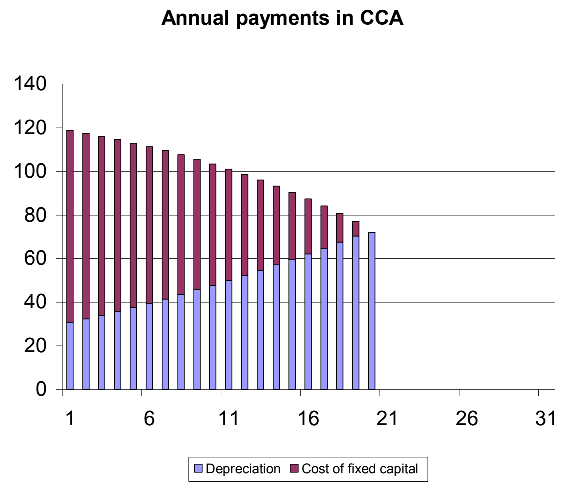
It is possible to resolve this contradiction between visibly lower results and a balance sheet strengthened by assets which are increasing in value (in the case of access for example). To achieve this, the variation in asset value and provisions should be treated in the profit and loss account. Consequently, when prices increase resulting in a positive revaluation of asset value, the provisions will be higher than for historical costs (current-cost logic). At the same time however, the increase in the gross value is taken into account indicating an overall increase in the profit and representing an increase in company "wealth" due to the fact that historic, less costly asset values have been used rather than current asset replacement values. Therefore, the value taken into consideration is maintenance of the value of assets in service and consequently the financial value of the company ("financial capital maintenance" method). In the current-cost category, this variant is called FCM (financial capital maintenance).

For calculation purposes, the amortisation is calculated as before but increased or reduced by the holding gain or loss, this latter being assessed such that the cumulative holding gain or loss exactly offsets the difference between the gross value (historic asset purchase price) and the replacement value of the asset in a given year.

The remuneration of fixed assets is identical to the method used for operating capital maintenance (OCM).

The annual payment *t* corresponding to an asset subjected to a price increase can therefore be represented by:





The FCM current-cost method is the assessment method most widely used in Europe.

Implementation of this method is based on having information about a set of assets at varying stages of their life and therefore assumes availability of a long investment time-series to ensure the greatest degree of relevance.

VI.3 France Telecom successive-step replacement cost method

In France, France Telecom uses a different method based on economic principles to take into account price changes. It is based on successive-step replacement costs also referred to as “asset replacement path” costs.

According to this method the value of an in-service asset is assessed as the difference in the discounted costs of two scenarios:

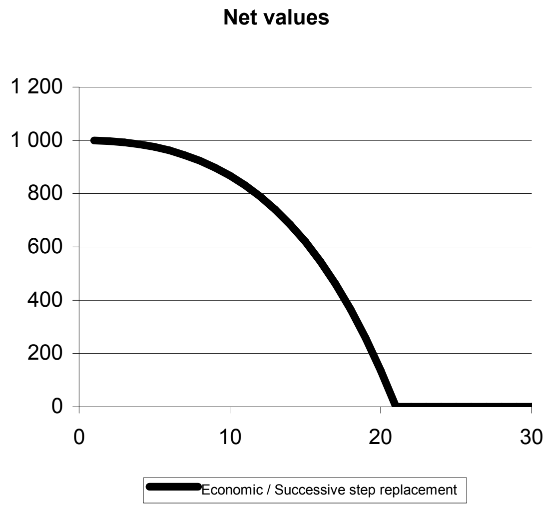
- a scenario whereby the company renews the asset immediately and then every *T* years if *T* is the economic lifespan of a new asset;
- a scenario whereby the company delays renewal of the asset until the end of its residual life span.

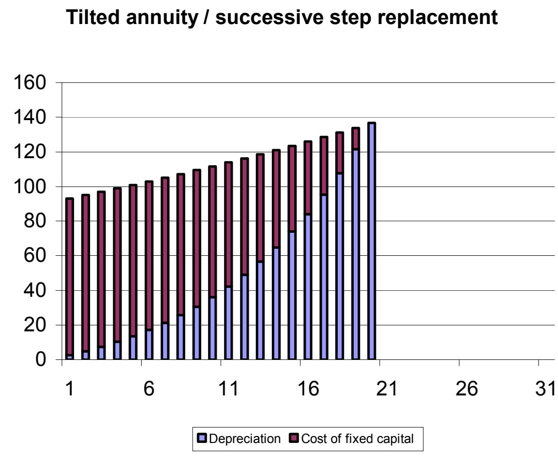
These points are developed further in the appendices.

We can however note two important assumptions linked to this approach.

First, it is difficult to determine the economic lifespan *T*. Indeed, if we know that it is inherently lower than the physical lifetime, we cannot know in advance what technological developments are likely to render the asset obsolete. The emergence of less expensive competitive technology has two consequences: it reduces the value of the asset (which becomes relatively less attractive) and it also reduces the period over which the company can recover its initial investment. Consequently the economic method is particularly sensitive to obsolescence, which in itself is difficult to gauge.

Moreover, the economic value assigned to the asset is determined by comparing the available possibilities. This calculation fits well in the case of a company which does not have a given asset because it indicates the maximum price the company would be prepared to pay if it had to rent rather than buy. However it does not appear to be suitable for local loop assets which are far from being a liquid asset and for which in practice, the owner does not have this choice (i.e. rent or buy).





The following properties can be noted:

- the sum of the discounted annual payments covers the initial investment (no more, no less),
- the annual payments increase as a function of price, which can easily be seen in the graph above.

This economic method can be implemented in two different ways, which are only equivalent under certain conditions.

The first consists of applying the economic annual-payment principle to actual company investment. In this case it relies on knowledge of the actual investment cash flows as in the previous methods and with the same practical implementation difficulties. This is also known as tilted annuity.

The second method is based on the fact that the annual payment is independent of asset age. Since it is mathematically equivalent to calculate the annual payment on an asset of age T paid for T years ago or a new asset bought at current prices, the annual payment is calculated on the basis of a new asset purchased at current prices. This removes the previous problem of knowing actual investment cash flows. But at the same time, it also removes the link between the operator's actual investment and the calculated annual payments. The strict equality between the sum of the discounted annual payments and the initial investment is still valid on paper but not in practice because it is a theoretical investment de-correlated from the reality.

This latter method has been used by France Telecom for setting unbundling and interconnection tariffs.

We note however that the two possibilities for implementing the economic method only coincide when the theoretical investment in the model is not too different from the actual operator investment. However, if this assumption seems to be confirmed for core network assets and interconnection, it seems as if it should be discarded for the local loop and unbundling due to the existence of assets with a long and uncertain lifespan.

Q4 : What is your opinion of the different forward-looking methods that have been presented?

VII. Simulations

VII.1 Description of the simulation tool

A simulation tool has been developed to evaluate the effect of the different methods; it simulates the situation where the operator builds a network then maintains it by making identical yearly investments. The actual lifetime of the investment is D years and the first D investments are production investments (each investment increases the network capacity) whereas the subsequent investments are replacement investments (investment in year D+1 replaces the investment in year 1 which is withdrawn from service). When the network has reached its nominal capacity after the first D years: it is said to have reached the "steady production state".

If K_0 is the value corresponding to the new network (nominal capacity) and the rate of technical progress is g (at today's prices), the successive investments in financial terms are:

- $\frac{K_0}{D}$ the first year (year 0),
- $\frac{K_0}{D}\cdot\frac{1}{(1+g)}$ the second year (year 1),
- $\frac{K_0}{D}\cdot\frac{1}{(1+g)^2}$ the third year etc.

…

$\frac{K_0}{D}\cdot\frac{1}{(1+g)^t}$ the (t+1)th year (year t).

Supposing that this time-series continues indefinitely, the discounted network cost at the beginning of year 0 is (assuming that investments are made at the beginning of the year): $\frac{K_0}{D}+\frac{K_0}{D}\cdot\frac{1}{(1+g)}+\frac{K_0}{D}\cdot\frac{1}{(1+g)^2}+\dots=\frac{K_0}{D}\cdot\frac{1+h}{h}$ where a is the rate of return on capital and h the composite rate obtained as follows $h=(1+a)\cdot(1+g)-1$.

This investment series is particular because it assumes that there is a phase of regular construction (in volume) over a period which coincides with the actual investment period; it is however simple and allows the different costing methods to be assessed.

Indeed, this time-series, which is unchanging in each case, can be applied to several cost assessment methods:

- an historical cost method based on an amortisation period T,

- a current cost method based on an amortisation period T and a price-change formula 1/(1+g),

- a replacement-cost method based on the same parameters as previously and including, among other factors, a rate of return on capital *a*.

We can also assess the implementation of a fourth variant, the replacement-cost method used by France Telecom.

As indicated, these methods use a set of parameters which do not need to be the same as the actual parameters in the time-series.

In particular, the amortisation period *T* is generally different from the actual lifespan *D*:

- it can be calculated according to accounting considerations and as a result be subject to multiple constraints, notably tax-related; it can also be analysed as a function of the return-on-investment period (the asset is recovered after *T* years),

- it can be analysed from the point of view of its economic lifetime (replacement-cost method) and is the result in this case of *ex ante* economic assessments.

The different methods are therefore evaluated using a parameter *T*, distinct from the actual lifespan *D,* which is linked to the time series and is identical in all cases. The other parameters are considered to be equal to the actual parameters.

VII.2 Notion of steady-state production capacity

Full production capacity is the situation in which there is neither acceleration or deceleration in:

- network production capacity: today the France Télécom network is completely stabilised,

or,

- investment: assets are purchased and replaced gradually.

The latter is used here to simulate the different cost methods. For example, for a network comprising 4 telephone poles with a lifespan of 4 years, the steady-state production is:

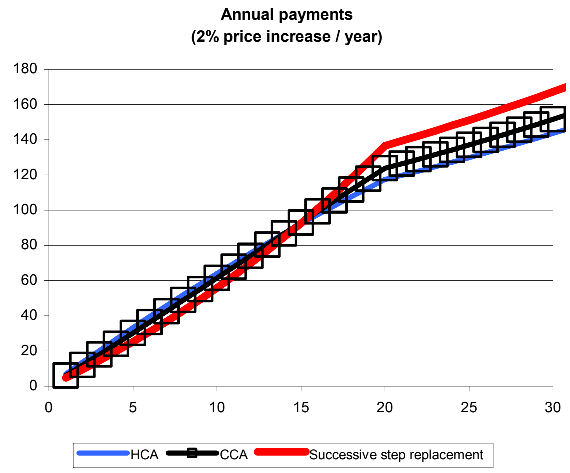
Year	1	2	3	4	5	6	etc.
Purchase (investment)	1	1	1	1	1	1	1
Number of poles in the network	1	2	3	4	4	4	4
Withdrawn from the network	-	-	-	-	1	1	1
➔	Ramp-up			Operational network			

Consequently, when the network is operational, the asset age is homogeneously distributed.

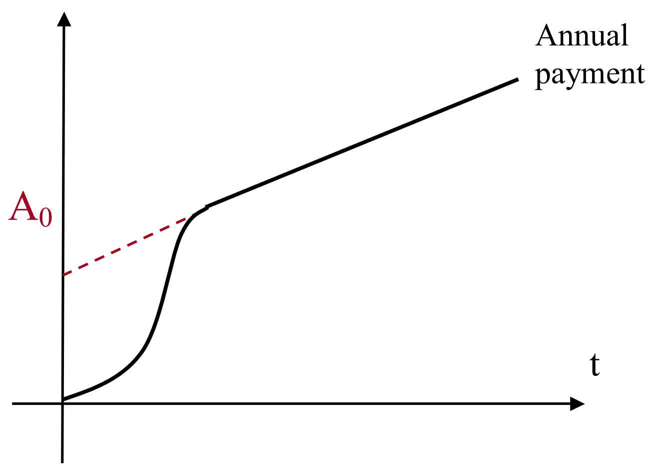
By applying a linear or degressive depreciation method, characteristic of the cost methods previously presented, we can simulate the cost of an operational network and study the properties of the different cost methods.

VII.3 Initial annual payment

The simulations and calculation (Cf. formula –appendix 4) show that rental charges in steady-state conditions follow prices (the inverse of the technical progress rate).



To compare the different methods, we only need to look at the first annual payment A_0 defined using the steady production state as shown in the diagram:



VII.4 Results

The model allows the sensitivity to the different selected parameters to be studied.

The different notions of lifespan

Several references can be used to determine the period over which an asset cost should be considered.

The physical lifespan corresponds to the physical characteristics of the asset. At the end of this period, it is no longer usable and must be withdrawn.

The economic or optimum lifespan is derived from an economic calculation. In this case, the asset-withdrawal date does not depend on technical considerations but results from wear or obsolescence. Wear results in increased equipment operational costs or lower productivity; obsolescence results in the equipment being less useful due to the arrival of a new, more efficient technology and is an indicator of technical progress.

The accounting amortisation period, while in theory taking all these parameters into account, depends *in fine* on choices made by the company. “The amortisation rates are determined by the company manager in compliance with industrial and commercial experience and practice”. (Lamy, Droit du financement, § 130). The lifespan used for accounting purposes can in reality differ from the economic optimum or physical lifespan of the asset even if its objective is to reflect the effective asset lifespan in the company.

Finally the real lifespan is the period before the asset is withdrawn from operation; its withdrawal does not necessarily mean that it is no longer usable or that the associated operating costs have started to increase too much.

In the rest of the analysis, we distinguish between the theoretical lifespan (as used for accounting purposes: it is then called amortisation lifespan) and the actual asset lifespan.

Sensitivity to the amortisation period

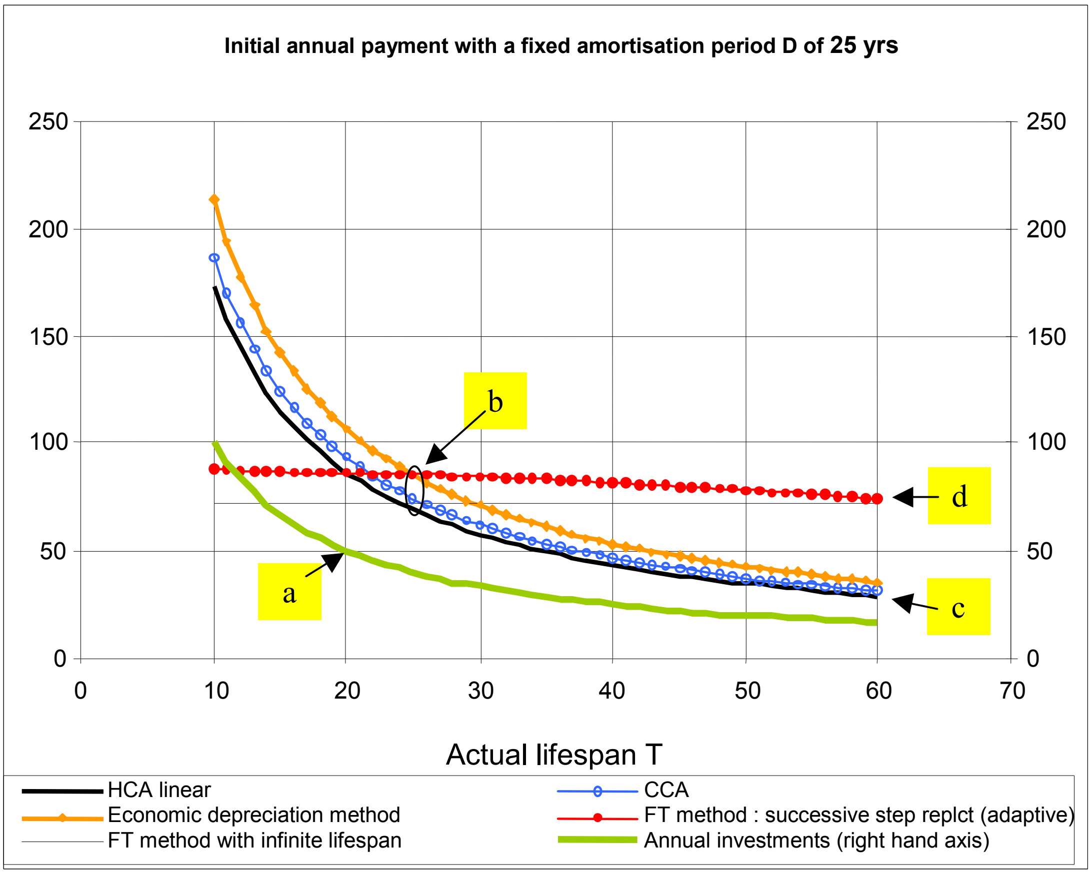
The differences linked to including different amortisation periods vary from method to method.

For a given asset, increasing the lifespan tends to reduce the depreciation recorded in any given year because the total depreciation is spread out over a longer period. On the other hand, the cost of financial assets is increased because the net value of the asset diminishes more slowly.

In the steady state, i.e. excluding the ramp-up period, current-cost and historical cost methods are both sensitive to the chosen lifespan. The overall rental charge depends therefore on the choice of the theoretical asset lifespan. However, in all cases, the methods used cover historic investments. The amortisation period consequently appears as a return-on-investment period: for a given rate of return on capital, the shorter the period, the higher the annual payments and vice versa.

Sensitivity to the actual lifespan

The graph below shows the change in the initial annual payment as a function of the actual network lifespan compared with the theoretical lifespan. It is a measure of the risk of error once the theoretical lifespan has been determined.



Several observations can be made from these curves:

- (a) when the actual network lifespan increases, the annual investment decreases. This is linked to the fact that the model simulates the construction of a fixed-size network: the longer the network elements can be kept, the less the replacement investment;
- (b) when the theoretical lifespan is the same as the actual lifespan (25 years in this example), all methods give similar results;
- (c) historical, current cost and economic depreciation cost (in its general form) methods follow the investment curve: they can therefore be adapted to the situation where actual investments differ from the investments which were planned when the method was chosen;
- (d) on the other hand, the successive step replacement-cost method, in the version implemented by France Telecom, is based on theoretical investment cash flows, which are consistent by construction with the chosen lifespan. Once the theoretical lifespan has been chosen, it no longer takes into account the actual investments and cannot therefore adapt to a real situation which is different from the forecast made when the cost method was established.

Importance of historical information

Simulations show the network ramp-up period and the beginning of the steady state. We can see that each of the methods looked at provide low rental charges for France Telecom during the initial years. In particular, these rental charges are lower than the investment amounts in the corresponding years. To compensate for this initial deficit, France Telecom is obliged to recover a rental charge which is higher than the investment during the steady-state period such that the discounted total of rental charges between the first year and infinity is equal to the discounted total of investments during the same period.

In financial terms, France Telecom accumulates debt during the initial years because rental charges are lower than investment. In the steady state, it must pay for the investment plus interest on the debt which means that the rental charge is higher than the investment.

The influence of the previous network construction period is therefore important: the France Telecom deficit during this period dictates the rental charge for the steady-state period.

Furthermore, the different methods analysed make different trade-offs between the past and the future.

Q5 : What are your comments on these simulations and the results?

VIII. Application to the France Telecom copper local loop

VIII.1 France Télécom asset categories

Not all local loop investments are of the same type:

- certain investments are *a priori* one-off investments corresponding to assets for which renewal is uncertain and a long way off,
- on the contrary, other investments have a shorter lifespan which is relatively well known.

This distinction can be illustrated with an extreme case in which replacement is pushed out almost to infinity: the construction of a tunnel. In this particular example, which is highly simplified, we can distinguish between two types of tunnel construction cost:

- single investment linked to boring the tunnel,
- investments for fitting out the tunnel ready for operation.

The tunnel boring costs will not, in any case, be incurred again. On the other hand, expenses required to fit out the tunnel will recur periodically in the form of new investments for upkeep and maintenance of the completed tunnel.

This distinction is less obvious in the case of the local loop. However, if certain assets have to be replaced regularly as part of network maintenance and upkeep (notably the case for cables, poles etc.), it is probably not the case for all civil works assets.

Local loop assets can therefore also be separated into two categories:

- assets with a lifespan that is reasonably well known,
- assets with a longer lifespan, which is less certain and difficult to quantify, which may not necessarily be replaced.

The distinction between these two asset categories is probably tricky to implement. As a first approximation we can say that the lifespan of the civil works ducts is very long and uncertain.

Another possibility would be to use the France Telecom gross-investment time-series. Analysing this time-series after having modified it with actual data, which is theoretically available from 1993 onwards, should allow the non-renewable part of civil works to be evaluated.

VIII.2 Analysis of the different cost-assessment methods using asset categories.

Costing assets with a relatively short and well-known lifespan, which are effectively renewed.

The HCA presentation showed that historical costs are not suited to this type of asset because price changes and technical progress are not taken into account: they result in a discontinuity in the company books when the asset is replaced.

On the other hand, forward-looking methods seem suitable, notably because they provide the possibility of financing necessary network replacements in the future.

This is true of all the forward-looking methods, even if they lead to different rental charges *in fine*. The difference between the economic method (simple tilted annuity and the France Telecom implementation) and the current-cost method is in the use or otherwise of discounting, illustrated by the more pronounced hump (when prices increase) in the depreciation curve (amortisation rate). Slower asset amortisation using the economic method gives a higher rental charge than that obtained with current costs in particular because its depreciation profile includes a discounting effect. Without prejudging the relevance or otherwise of this effect, which needs to be assessed, it would seem that both approaches (economic and current costing) can nevertheless be used.

It is worth noting however, that the economic method could be implemented in two ways: one based on actual investments and the other, the so-called France Telecom method, based on theoretical investments not correlated with actual investments. We note that the two possibilities for implementing the economic method coincide only when there is a small difference between the theoretical investment used in the model and the actual operator investment. Notwithstanding this point, both methods can be used.

The current-cost and economic-cost methods could be used for this type of asset, provided that for the economic method the utmost caution is exercised in selecting the correct parameters.

Costing assets which have a long and uncertain lifespan with little likelihood of having to be renewed

A priori, the forward-looking character of these methods does not appear to be suitable for assets with an almost unlimited lifespan since it is unlikely that the initial investments will have to be repeated. That being the case, an approach based on a reasonable return on investment over a defined period seems more appropriate.

The replacement-cost method, as implemented by France Telecom and based on a theoretical series of investments, provides for renewal of all assets and does not therefore appear appropriate (for the reasons already outlined above).

The forward-looking methods based on actual investment cash flows (current costs and general economic method: tilted annuity) can be retained at this stage: indeed, they can offset the initial investment outlay.

It should be noted however that given that the economic method includes a significant discounting effect, it appears to be rather delicate for long and increasingly uncertain lifespans.

The current-cost method does not have this problem. It does however include asset price changes as in the economic method. While it appears relevant to take inflation into account, one can legitimately ask what relevance there is in considering asset price changes (due to technical progress) when we know that replacement is not envisaged or is uncertain.

Eventually, it appears that the disadvantages of the historical cost method mentioned above do not apply for this asset category:
- price changes do not influence network maintenance because the assets are not renewed,
- no new investment phase is planned for this type of asset,
- given that most of the investment has already been made, the issue of encouraging France Telecom to invest efficiently in the future seems of minor importance.

Therefore the historical cost method also appears to be valid for this asset category.

VIII.3 Analysis of the different methods from the point of view of regulatory principles

This section looks at the different methods with respect to the principles set down in the first part of the consultation. It has been based on the assumption that prices increase.

Economic efficiency

The principle of economic efficiency covers several important concepts.

The selected method should reflect the best practices currently available; the tariffs must therefore take into account the available technology and changes in asset prices. The historical cost method cannot include any of these and does not appear to suit regulatory requirements in this respect. The current-cost and economic-amortisation methods take price changes into account but not the potential for optimising the network architecture. The replacement-cost method does allow this but the current model does not use all the available optimisation possibilities.

The method chosen must encourage France Telecom to invest in the copper local loop. The first three methods index payments on actual France Telecom investments: if the operator stops investing, payments will diminish permanently. There is therefore a strong incentive to invest. On the other hand, the replacement-cost method as implemented by France Telecom is based on a theoretical series of investments: therefore network remuneration is not governed by actual investment and this method does not encourage investment.

France Telecom must also be encouraged to be efficient: only necessary investments should be made. Methods based on actual investments do not intrinsically guarantee investment efficiency since investments are remunerated completely (cost plus reasoning). To achieve this objective, it is necessary to implement an external mechanism for verifying investment efficiency. On the other hand, the replacement-cost method dissociates investments and remuneration: Therefore, France Telecom is not encouraged to make efficient investments.

Finally, the selected cost-assessment method must encourage alternative operators to invest efficiently. In the first three methods, any advantages France Telecom may derive from using the local loop because of previous circumstances can be passed on to alternative operators; therefore they have little incentive to invest in a new local loop. On the other hand, the attractiveness of conditions for using the local loop encourage them to provide service to a significant number of distribution frames and therefore invest heavily in collection networks. Such investment seems to be efficient because collection networks are currently undergoing significant changes in technology. Competition in this segment allows consumers to benefit from the most innovative services and lowest costs. Opposed to that, there is the replacement-cost method which is based on the "make or buy" principle: the price alternative operators pay France Telecom is such that the decision to rent or build is not influenced one way or the other. In principle, this tariff method encourages investment in the local loop. However, this effect is theoretical and is not observed in reality for a number of reasons indicated in part one:

- the amount of the investment needed by alternative operators is such that they cannot find suitable sources of finance, which is one reason why the local loop is considered to be an essential facility,

- the incentive to invest in the local loop depends more on prices in the retail market where there is competition between operators than on France Telecom wholesale tariffs.

Long-term indications

The first three methods are likely to take into account forward-looking investments in the relatively near future adding a certain realism to the exercise; the fourth method allows network evolution to be taken into account over an almost infinite time frame but the associated forward-looking exercise seems unrealistic and not very credible.

Consumer benefits

The historical cost method gives a low annual rental in the short term, which is beneficial for consumers. However, it does not take into account price changes and does not guarantee the asset replacement required to maintain the network in good order and ensure service continuity for end users: therefore it is unfavourable long term.

The current-cost and economic-amortisation methods correct the effects of price changes thereby allowing the network to be maintained in good condition, which is beneficial to the consumer long term.

Finally the replacement-cost methods allow the network to be maintained in good condition but allow France Telecom to earn a monopoly rent due to the tariff scale being moved up. It is therefore unfavourable for the consumer long term.

Non-discrimination and tariff consistency

The principle of non-discrimination requires that France Telecom internal and external transfer prices be the same. The principle of tariff consistency implies that France Telecom wholesale and retail tariffs are consistent, in other words, they allow alternative operators using wholesale offerings to have sufficient economic leeway in the retail market.

None of the methods need to be ruled out in principle if there are tariff controls to check the consistency between retail and wholesale tariffs, i.e. using squeeze tests.

If however the tests, which by necessity have to be carried out *ex-ante*, show that an increase in retail tariffs is necessary for a given method, then the relevance of the tariff level would have to be examined. In the case of the local loop this would then raise the question of a monopoly rent and, subsequently, where applicable, transition issues.

Consequently, methods which from the outset give a cost level compatible in the medium term with retail tariffs while at the same ensuring a reasonable level of revenue for the operator, appear to be more suitable as far as the principle of non-discriminatory tariffs are concerned.

Relevance

Complying with the principle of relevance obliges France Telecom to ensure that there is causality between the required payment and the actual investment required to provide the product in question. This implies that the selected costing method is based on France Telecom's actual investment cash flows and not a theoretical time-series as used in the successive step replacement cost method.

Practical criteria

The different methods all seem capable of being implemented; however implementation of the current-cost and economic-amortisation methods requires setting up a suitable regulatory accounting system.

The different methods all appear to be verifiable; the first three can also be audited, which is not the case of the replacement-cost method. This is because it is based on a theoretical series of investments which cannot be audited. However, the elements fed into the model can be verified.

On completion of this analysis:

- the historical cost method does not appear to be appropriate;

- successive-step replacement costs have serious disadvantages in terms of implementation given that this method leads to the establishment of annual payments based on the network characteristics alone without any link to actual investments; these disadvantages are particularly sensitive for assets with a long and uncertain economic lifespan;

- the other methods (current costs, general economic depreciation) generate annual usage payments consistent with actual investments; of these, the current-cost method appears to be less difficult to implement but both require the reconstitution of actual past investments and an assessment of a realistic time frame for future investments.

Q6 : What are your comments on this assessment of the different methods; could you please explain and justify your viewpoint?

IX. Implementation mechanisms

Over and above general considerations as to which method should be selected, the time frame and implementation conditions are crucial factors, which allow positive identification of the type of work that will be required.

IX.1 The time frame

ART envisages the following mechanism:

- an assessment of copper pair costs which allows usage tariffs to be established for the period 2006 – 2008 using if need be, a price cap mechanism; in particular, this mechanism should set multi-annual, unconditional tariffs during this period,
- the process will finalised in autumn 2005,
- the operator will be required to report regularly, in particular on actual investments during the period,
- an update in 2007 to define access conditions after 2008.

This will require thorough knowledge of historic investments and an assessment of investments made during the period in question.

In this context, ART will be keeping a close watch to ensure that several objectives are satisfied by:

- ensuring that there is local loop access which favours competition by ensuring parity between internal and external transfer costs,
- ensuring that the remuneration received by France Telecom is consistent with maintaining and developing local network investment,
- ensuring that there is tariff consistency between all services using the copper pair.

ART will endeavour to guarantee an equilibrium between these different objectives. It should be noted that:
- the introduction of these methods will only concern the period 2006 – 2008 and that the procedure will be updated in 2007,
- ART will endeavour to use concrete information.

IX.2 Reference Elements

The proposed methods involve:

a) an analysis of historic investments to:

- establish a current-cost type valuation for asset values in the historic accounts,

- assess whether assets which have a net zero value in the historic accounts need to be renewed or not,

b) a forward-looking assessment of France Telecom investments,

c) evaluating certain parameters, notably those related to price changes (or reciprocally, “technical progress”).

Furthermore, even if the successive-step replacement-cost method is not preferred, a revue of the parameters and underlying modelling (quantity, price, discount factor and technical progress) could be useful to provide an indication of the "new" price.

IX.3 Capital cost

Historic investments

ART has a brief summary of investment amounts for civil works and cable over the period 1973 – 1999. However, this time-series presents some inadequacies:

- there is little documentation,
- it covers investments which are "net of investment withdrawals" such that the oldest investments mask replacement investments[3],
- it stops at the year 1999.

ART will therefore endeavour to obtain complementary information:

- the data required to reprocess the historic accounting values (with a sufficient level of detail); first indications are that the required information concerns asset categories[4], type of capitalised expenditure, end use (production, replacement, maintenance),
- by completing the investment cash flows for the period 2000 - 2004
- but without going as far back as 1973.

Furthermore, it will be necessary to clarify the accounting conventions adopted in the France Telecom "opening balance sheet" when the company was established.

There are *a priori* two types of method for restating the historic asset base:

- assessing whether a fixed asset or expense category is renewable or not; this distinction can determine the method to be applied,
- the accounting restating mechanism to convert to "current costs".

It is too early at this stage to provide details on the method that will be used; ART will do this at the end of the consultation and invite the players, notably France Telecom, to provide relevant technical information.

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[3] this weakness mainly concerns the « cable » entry.

[4] Currently the following: civil works (in ducts, directly buried or overhead), transport cables (in ducts, directly buried or overhead), distribution cables(in ducts, directly buried or overhead), concentration points, sub-distribution frames, distribution frames.

Forward-looking investment assessment

This assessment exercise requires the following data:

- investment volumes and amounts for the period 2005 – 2008 with a similar level of detail as for historic investments,

- a more global indication for the period after 2008.

The recurring processing mechanism

Independently of the setting-up phase, which as mentioned previously requires a re-examination of historic investments as well a forward-looking assessment of future investments, ART is in favour of updating the cost mechanism to reflect actual investment costs.

Such a mechanism is designed to rely on the operator's accounts and be capable of being audited; this does not rule out using asset assessment techniques which aim to provide reliable cost-updating, notably:

- using a price index as advocated by the current-cost method,

- adapting the residual lifespan when justified, as practiced by certain operators which use a rolling basis.

To ensure that these techniques can be verified, they must be based on the best accounting practices.

IX.4 Operating costs

Copper pair operating costs correspond to activities required to operate and maintain the network (as opposed to fixed assets). Included in this category are works required for the upkeep and maintenance of cables or infrastructure for overhead lines. They are therefore associated with the copper pair and are not the same as the operational costs incurred for any given service using the copper pair.

ART has investment cash flows for analogue line costs audited in the context of universal service for 1998 – 2002. In 2005, it will have audited values for 2003 and 2004 and France Telecom is likely to produce forecast values for 2005.

ART will re-examine the cost items used, their level and factors affecting their evolution.

IX.5 Other elements

Assessing the rate of return on capital

ART will assess the return on capital to be used for calculating annual payments. Given that the objective is to set usage costs for 2006 – 2008, ART will endeavour to calculate a value that is not sensitive to economic fluctuations.

Assessment of the technical progress rate

Currently France Telecom assesses the basic technical progress rate using the following method:

$$g = \left(\frac{PB}{I}\right)^{1/Age} - 1$$

PB is the gross asset value in 1999 for the asset category in question. It is audited accounting data for activities linked to this category, which remains after other cost allocations have been filtered out.

I is the 1999 replacement investment for the asset category in question. It is calculated on the basis of real 1999 cost items and unit costs supplied by the France Telecom network department.

Age is the average age of the asset category in question in 1999. It is calculated by the formula:

$$Age = \frac{PB - PN}{Amo}$$

PN is the net asset value in 1999 for the asset category in question.
Amo is the 1999 depreciation expense for the same asset category.
This is audited accounting data.

These methods have led France Telecom to evaluate a technical progress rate of -1.1% for civil works and +2.6% in 2000 based on current monetary values.

ART wishes to update both the method used and the value of these elements; it should be noted that the implementation of a current-cost method will require a robust annual-review procedure.

Evaluating the replacement value

Evaluating the “new” or replacement value of the network provides a useful indication in several respects even if these indications are not decisive:

- they allow this figure to be related to the accounting figures providing an indication of their consistency (consequently, in the long term and for long lifespan assets, the net value in current costs represents half of the ‘new’ value),

- it provides an indication of the ‘new’ or replacement price (if the network were to be renewed completely).

In concrete terms, the determination of the ‘new’ value is based on a technical description of the network (number of cost items) on the one hand and a calculation of investment costs on the other.

It seems useful in this respect to provide the industry with a model that can be compared with the technical characteristics of the France Telecom network.

IX.6 Required resources

The diversity and extent of the work required during implementation requires specialist expertise in technical, economic and accounting fields.

ART alone is unable to muster these resources and without pre-empting the outcome of the consultation, is already calling on industry to reflect upon how these resources could be provided:

- France Telecom is the first concerned in terms of mustering the required internal resources to respond to requests for information; ART is waiting for elements of the methodology and a work programme,
- it will probably be useful for the auditors to become involved to provide methodological support for restating accounting information and for more traditional duties involving certifying certain elements,
- finally, operators are likely to be called upon notably in developing “replacement network” models.

At the end of the consultation ART will endeavour to produce a consistent, sufficiently transparent work programme based on the contributions received. It will also see that expertise in the economic field is called upon whenever required.

Q7 :	What are your comments and observations on the implementation procedures; do you think other work is required and if so, what? Do you anticipate contributing, and if so, how?

Part three

Full unbundling tariffs

X. Background

The France Telecom copper local loop is used for different types of access service. Apart from services offered by the France Telecom group such as retail line rental or ISDN, certain leased-line or DSL access offerings, it is also made available to alternative operators in the form of local loop unbundling.

For this reason, France Telecom copper local network costing has a direct impact on unbundling tariffs. This chapter aims to investigate further the impact of France Telecom copper access network costing on unbundling tariffs.

X.1 Unbundling tariffs and cost of the copper pair

According to European "unbundling" regulation no. 2887/2000, and the market analysis for wholesale unbundled access to the copper local loop carried out by ART, France Telecom is required to propose cost-oriented unbundling services to alternative operators.

Of the two unbundling options only "full unbundling" tariffs are affected by France Telecom copper access network costing.

This is because in the case of shared access to the local loop, only the upper frequencies of the copper pair are used by the operator; France Telecom continues to provide telephone service to the customer and the subscriber continues to pay the retail line rental to France Telecom. The cost of the copper pair is completely covered by this payment. ART therefore considered in the past (and confirmed in its unbundled access market analysis) that the tariff structure for shared access to the local loop should not continue to remunerate France Telecom twice for the cost of the copper pair. Therefore the shared access tariff corresponds solely to specific costs related to unbundling and is independent of the costing exercise concerning the France Telecom copper local loop network.

On the other hand, the tariff for full unbundling, which is designed to provide an alternative operator with complete use of the copper pair for a given subscriber, must cover the usage cost of the France Telecom copper local loop network.

Full unbundling is subject to a cost-oriented tariff structure, which has two main components:

- service access charges, payable when the line is unbundled and which cover the technical and administrative costs of the unbundled line,

- a recurring tariff covering in particular the fixed-asset and operational costs of the copper pair as well as specific unbundling costs.

Consequently the costing level of the France Telecom copper local network has a direct impact on the level of the recurring full unbundling tariff even if this is not the only component.

The rest of this chapter details the different components of the recurring tariff for full unbundling by highlighting the capital cost component due to the copper local network and the part due to other costs –operation, specific costs etc.). The background to full unbundling tariff changes as well as the levels and corresponding methods is outlined in appendix 5.

X.2 Recurring full unbundling tariff components

ART decision no. 00-1171 of 31 October 2000, defined the relevant costs to be used for unbundling tariffs. In the subsequent reference offers, these costs were associated with different tariffs in the reference unbundling offer:

- the non-recurring service-access charge,

- numerous specific tariffs, notably for closely related access services,

- the monthly recurring tariff for full unbundling.

The table below lists the costs which are covered since 2001 by the recurring monthly full unbundling tariff.

<table>
<tr><th>Description</th><th>Type of cost</th><th>Costs taken into account</th></tr>
<tr><td rowspan="2">Copper pair</td><td>Capital cost</td><td>Fixed asset costs (civil works, cables & distribution frames)</td></tr>
<tr><td>Operating costs</td><td>Local network operating costs</td></tr>
<tr><td rowspan="4">Specific unbundling costs</td><td rowspan="4">Capital and operating costs</td><td>After sales service intervention costs</td></tr>
<tr><td>After sales service: management overheads</td></tr>
<tr><td>Invoicing, debt recovery and operator dept.</td></tr>
<tr><td>After sales service platform</td></tr>
<tr><td>Contribution to common costs.</td><td>Common costs by type</td><td>Relevant common costs</td></tr>
</table>

X.3 Operating costs

Local network operating costs are made up of expenditure on human resources and equipment as required to maintain and operate the network.

Evaluation is based on audited France Telecom accounts. The operational cost used is the same as the France Telecom cost for analogue lines: the level retained in 2002 (€ 1.92 per line per month) corresponded to a monthly cost, per line from record no. 4 of the audited 1999 France Telecom accounts.

In the future, the level will have to be updated in the light of more recent regulatory audits of France Telecom accounts. In this respect, ART will have the following in 2005:

- audited costs for 2003 and 2004,

- forecast costs for 2005.

X.4 Specific unbundling costs

These are specific unbundling costs which correspond to costs arising from after-sales service for the unbundled line and to billing and debt collection linked to unbundling.

After-sales service costs

After-sales service costs for an unbundled line can be broken down into three items:

- cost of technician intervention when there is a fault,
- after-sales service management costs,
- after-sales service platform costs for unbundling

Assessment of the first two items has until now been based partly on analytical results and partly on audited France Telecom accounts.

Assessment of field technician *intervention costs* during a fault is based on the technical intervention cost for a traditional analogue line as found in the audited France Telecom accounts. However, these costs are then restated in two ways to take into account aspects specific to unbundling:

- 25% of the cost is removed to take into account erroneous interventions which are billed separately in the case of unbundling,
- the costs are multiplied by a factor which takes into account the absence of diagnostic and remote fault-location tools for unbundled lines. This can generate more technician call-outs (a factor of 1.3 was used in 2002).

The *after-sales service management costs* correspond to personnel costs in the agencies or regional offices which receive fault reports and re-dispatch them to the corresponding field staff. The corresponding costs which have been used until now correspond, on a like-for-like basis, to France Telecom after-sales service management costs for the analogue line network.

The unbundling after-sales service platform corresponds to personnel dedicated to receiving fault reports from operators using the unbundled lines and re-dispatching them to the relevant France Telecom management units. The costs associated with the after-sales platform were assessed in 2000 by calculating the number of man-years required for this activity as a function of the number of planned unbundled lines. Currently however, it seems that the unbundling after-sales platform is not dedicated solely to unbundling and is shared with France Telecom's retail DSL offerings.

Billing and Operator Division (DIVOP) costs

Billing and Operator Division (DIVOP) costs have been assessed on the basis of forecast France Telecom costs for 2000.

These cost assessment methods were defined on a forward-looking basis in 2000 and 2001 and maintained in 2002 whereas hardly any lines had been unbundled at that stage. Given the current growth in unbundling, it seems relevant to revisit the assessment methods and reassess the corresponding costs based on data now available.

The actual after-sales processes used for unbundling and the corresponding France Telecom costs should therefore be used. These costs will be redefined in part in the 2003 and 2004 audits and there may also be a forecast for 2005.

X.5 Contribution to common costs.

This contribution is based on a 10.1% surcharge applied to the cost items described above. This rate is not consistent with the rate used for other interconnection services which is around 7%.

ART will therefore re-examine this value.

Q8 : Do you have any particular comments on the factors to be used for updating the different unbundling cost components?

XI. Unbundling deployment considerations

XI.1 ART decision no. 02-323

The method selected by ART in the above decision no. 02-323 took into account the progressive nature of unbundled operator deployment. The calculation was based on two types of population density each weighted differently.

The decision highlighted two areas in the country: the first, comprising 21 million lines, corresponds to relatively dense areas in which it is likely that alternative operators will invest in unbundling within two years of the decision; the second corresponds to less densely populated areas in which it is highly unlikely that a new entrant will invest in unbundling over the same period.

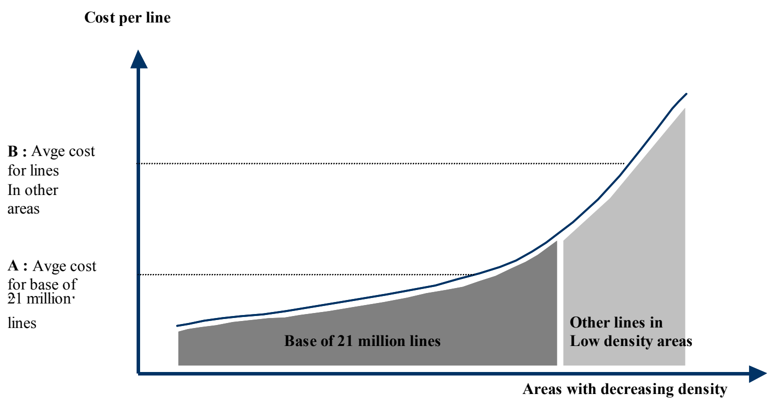
More precisely, ART estimated that the majority (95%) of unbundled lines would be in the first area whereas only 5% would be in the less densely populated areas. Consequently, the average cost used for fully unbundled access corresponds to 95% of the average line cost for the first area and 5% of the average line cost for the less densely populated area.

To take into account the geographic disparity in France Telecom local loop network costs, ART used the cost-per-line distribution used in the model for calculating the universal service geographic cost component. More precisely, this model gave a cost distribution broken down into 35 areas of decreasing density for:

- civil works costs,
- cable costs,
- operating costs.

ART was able to determine that covering a significant part of the country representing a potential base of 21 million lines would result in an average tariff of €10.2 per line per month. The average between this cost, weighted by a factor of 95%, and the cost of the remaining lines in the country weighted by a factor of 5% led to a figure of €10.5 per line per month being established for the recurring fully unbundled line tariff.

The following graph, which is given as a guide only, summarises the steps in the reasoning. an average cost, weighted by the number of lines, is calculated for each of the two areas (cost A in the more densely populated areas, cost B in the others).



The final tariff for all lines is obtained by taking the average of these two costs, weighted by the corresponding probability i.e. 95% A + 5% B = €10.5

XI.2 Cost review factors

Although the underlying logic was confirmed in principle in ART decision no. 05-0267 of 24 March 2005, the question of implementing a cost-update mechanism remains. Updating could be necessary for several reasons.

Continued deployment

Assuming that operators follow similar development strategies corresponding on average to an additional 300 distribution frames per year, unbundling could extend to 1700 distribution frames or around 62% of lines within three years.

Local authority involvement

However there is a new aspect which must be taken into account which modifies assessments of unbundled local loop deployment. Local authority involvement adds a new dimension to the deployment scenario over and above the scenario whereby deployment progresses from the more densely populated towards the less densely populated areas i.e. deployment on a per *département* basis to provide coverage to the whole *département:* this is the case for the Pyrénées-Atlantiques (south west France) for example. Local authority involvement therefore puts the question of geographic extension of unbundling in a different light.

Taking into account universal service compensation

Finally, a last constraint concerned with the geographic aspect of unbundling tariffs must be taken into account. France Telecom is compensated under the universal service provisions for the costs of its least profitable lines. Consequently, taking into account all lines when determining unbundling tariffs, without weighting as a function of the population density for a given geographic area, could lead to France Telecom being paid twice for its least profitable lines:

- first as part of universal service compensation,

- second, as part of unbundling tariffs.

XI.3 Options

In this context, ART considers that it is necessary to assess the relevance of three different bases for determining unbundling tariffs:

The 21 million lines used in 2002

The basis of 21 million lines used in 2002 corresponds to a coverage of around 67%, or 2,250 distribution frames equipped in the most densely populated areas.

The basis used for this calculation has still not been achieved today and would require an additional 1,350 unbundled distribution frames in more and more less densely populated areas if it is to be met.

However, local authority involvement could revive unbundling deployment and extend it beyond distribution frames located in the less densely populated areas; this could lead to a larger number of lines and re-examination of the weighting factors (95% and 5%) used in 2000.

Lines corresponding to profitable areas under the universal service provisions

A more sustainable basis could be used, which would avoid problems with double counting. Unbundling tariffs would be calculated on the basis of lines corresponding to the profitable universal service areas (around 90% or 28 million lines).

With this approach, the weighting factors would be 100% and 0%. This would not exclude the non-profitable unbundling areas but would mean that they would be taken into account in the calculation on the basis of an average line cost equal to the line cost for profitable areas; the universal service mechanism would finance the difference.

All lines

Such an option would have the advantage of being simple and stable but implies restatement of the accounts to eliminate double counting due to universal service compensation.

Q9 : What are your comments on the different options mentioned above?

April 2005

Consultation on copper local-loop costing methods

Appendices

(1)

(2) Appendix 1
(3) Current costs

European Union framework concerning regulatory accounting practices recommends operator costs to be evaluated at current costs.

Two approaches can be used: the OCM approach, which aims to maintain the company's production capacity and the FCM method, which aims to preserve its financial capacity.

The OCM and FCM methods have a different impact on the company balance sheet and the profit-and-loss account.

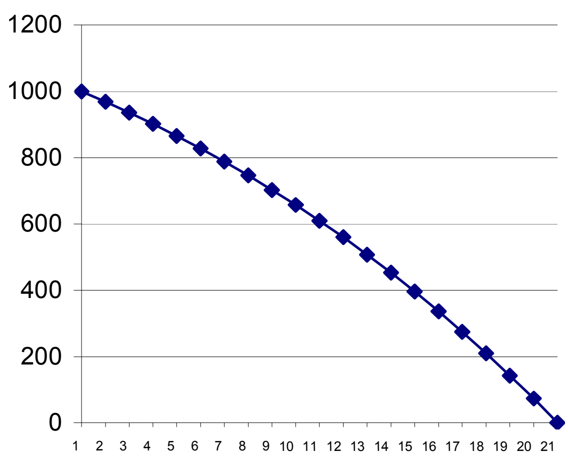
The following pages describe each of these methods in more detail.

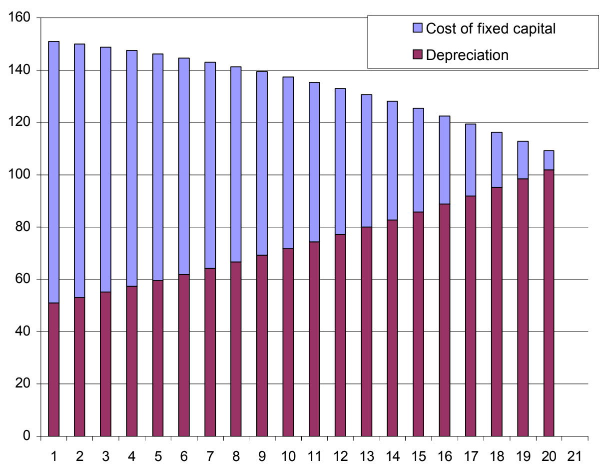
XII. 1. The OCM method

The objective of the OCM method is to maintain the production capacity (physical output) of the operator's assets. The approach implies that the company maintains the same production capacity over the whole period. Consequently, the company amortises its historical assets at a current price p_t rather than at their historical price p_0.

Therefore, depreciation charges depend directly on asset-price changes. If prices increase, the depreciation charges increase also and the profit and loss account deteriorates.

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Replacement investment (year end)	**1000**	1020	1040	1061	1082	1104	1126	1149	1172	1195	1219	1243	1268	1294	1319	1346	1373	1400	1428	1457	**1486**
Historical-cost linear depreciation		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Annual replacement-cost depreciation		51	52	53	54	55	56	57	59	60	61	62	63	65	66	67	69	70	71	73	74
Required cumulative depreciation		51	104	159	216	276	338	402	469	538	609	684	761	841	924	1009	1098	1190	1285	1384	1486
Current-cost depreciation																					
Historical-cost depreciation		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Additional annual adjustment		1	2	3	4	5	6	7	9	10	11	12	13	15	16	17	19	20	21	23	24
Backlog correction			1	2	3	4	6	7	8	9	11	12	14	15	17	18	20	22	24	26	28
Total annual depreciation		**51**	**53**	**55**	**57**	**60**	**62**	**64**	**67**	**69**	**72**	**74**	**77**	**80**	**83**	**86**	**89**	**92**	**95**	**99**	**102**
Net value		1000	969	936	902	866	828	788	747	703	657	609	560	507	453	396	336	275	210	143	73
Fixed capital cost (10%)		**100**	**97**	**94**	**90**	**87**	**83**	**79**	**75**	**70**	**66**	**61**	**56**	**51**	**45**	**40**	**34**	**27**	**21**	**14**	**7**
Total cost		**151**	**150**	**149**	**148**	**146**	**145**	**143**	**141**	**139**	**137**	**135**	**133**	**131**	**128**	**125**	**122**	**119**	**116**	**113**	**109**





Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Profit and loss account																				
Income	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Sales (example)	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*
Expenses	151	150	149	148	146	145	143	141	139	137	135	133	131	128	125	122	119	116	113	109
Depreciation	*51*	*53*	*55*	*57*	*60*	*62*	*64*	*67*	*69*	*72*	*74*	*77*	*80*	*83*	*86*	*89*	*92*	*95*	*99*	*102*
Cost of fixed capital	*100*	*97*	*94*	*90*	*87*	*83*	*79*	*75*	*70*	*66*	*61*	*56*	*51*	*45*	*40*	*34*	*27*	*21*	*14*	*7*
Result	-1	0	1	2	4	5	7	9	11	13	15	17	19	22	25	28	31	34	37	41
Balance sheet																				
Assets	1019	1039	1061	1085	1111	1138	1168	1199	1233	1270	1309	1351	1395	1443	1494	1549	1607	1669	1734	1804
Assets (network)	1020	1040	1061	1082	1104	1126	1149	1172	1195	1219	1243	1268	1294	1319	1346	1373	1400	1428	1457	1486
Cumulative depreciation	*51*	*104*	*159*	*216*	*276*	*338*	*402*	*469*	*538*	*609*	*684*	*761*	*841*	*924*	*1009*	*1098*	*1190*	*1285*	*1384*	*1486*
Current net value	*969*	*936*	*902*	*866*	*828*	*788*	*747*	*703*	*657*	*609*	*560*	*507*	*453*	*396*	*336*	*275*	*210*	*143*	*73*	*0*
Liquid assets	50	103	159	219	283	350	421	496	576	660	749	843	943	1047	1158	1274	1397	1526	1661	1804
Liabilities	1019	1039	1061	1085	1111	1138	1168	1199	1233	1270	1309	1351	1395	1443	1494	1549	1607	1669	1734	1804
Owners equity	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Debt	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Current cost reserve	20	40	61	82	104	126	149	172	195	219	243	268	294	319	346	373	400	428	457	486
Net cumulative result	-1	-1	0	3	7	12	19	28	38	51	66	82	102	124	148	176	207	240	277	318

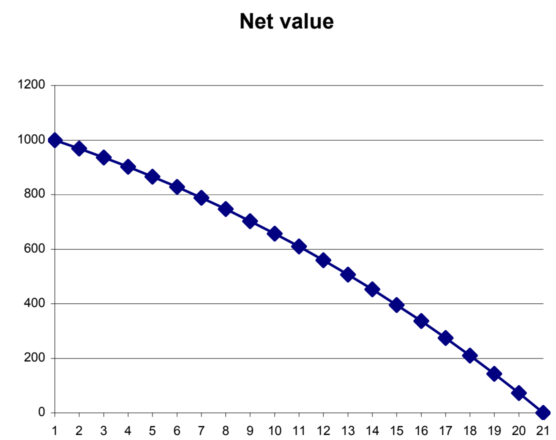
The OCM method implies that the balance sheet is adjusted to include observed variations in the asset value.

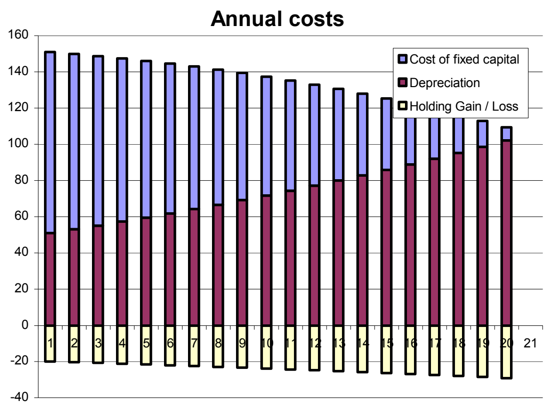
XIII. 2. The FCM method

The FCM method records this distortion and reintegrates the adjustment described previously into the profit and loss account.

The FCM method takes into account the capital holding gain or loss that has cumulated in the company assets and the necessary entries are made upstream in the profit and loss accounts.

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Replacement investment (year end)	**1000**	1020	1040	1061	1082	1104	1126	1149	1172	1195	1219	1243	1268	1294	1319	1346	1373	1400	1428	1457	**1486**
Historical-cost linear depreciation		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Annual replacement-cost depreciation		51	52	53	54	55	56	57	59	60	61	62	63	65	66	67	69	70	71	73	74
Required cumulative depreciation		51	104	159	216	276	338	402	469	538	609	684	761	841	924	1009	1098	1190	1285	1384	1486
Current-cost depreciation																					
Historical-cost depreciation		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Additional annual adjustment		1	2	3	4	5	6	7	9	10	11	12	13	15	16	17	19	20	21	23	24
Backlog correction			1	2	3	4	6	7	8	9	11	12	14	15	17	18	20	22	24	26	28
Total annual depreciation		**51**	**53**	**55**	**57**	**60**	**62**	**64**	**67**	**69**	**72**	**74**	**77**	**80**	**83**	**86**	**89**	**92**	**95**	**99**	**102**
Holding gain or loss		**-20**	**-20**	**-21**	**-21**	**-22**	**-22**	**-23**	**-23**	**-23**	**-24**	**-24**	**-25**	**-25**	**-26**	**-26**	**-27**	**-27**	**-28**	**-29**	**-29**
Net value		1000	969	936	902	866	828	788	747	703	657	609	560	507	453	396	336	275	210	143	73
Fixed capital cost (10%)		**100**	**97**	**94**	**90**	**87**	**83**	**79**	**75**	**70**	**66**	**61**	**56**	**51**	**45**	**40**	**34**	**27**	**21**	**14**	**7**
Total cost		**131**	**130**	**128**	**126**	**124**	**123**	**120**	**118**	**116**	**114**	**111**	**108**	**105**	**102**	**99**	**96**	**92**	**88**	**84**	**80**





Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Profit and loss account																				
Income	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Sales (example)	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*
Expenses	131	130	128	126	124	123	120	118	116	114	111	108	105	102	99	96	92	88	84	80
Depreciation	*51*	*53*	*55*	*57*	*60*	*62*	*64*	*67*	*69*	*72*	*74*	*77*	*80*	*83*	*86*	*89*	*92*	*95*	*99*	*102*
Holding gain or loss	*-20*	*-20*	*-21*	*-21*	*-22*	*-22*	*-23*	*-23*	*-23*	*-24*	*-24*	*-25*	*-25*	*-26*	*-26*	*-27*	*-27*	*-28*	*-29*	*-29*
Cost of fixed capital	*100*	*97*	*94*	*90*	*87*	*83*	*79*	*75*	*70*	*66*	*61*	*56*	*51*	*45*	*40*	*34*	*27*	*21*	*14*	*7*
Results	19	20	22	24	26	27	30	32	34	36	39	42	45	48	51	54	58	62	66	70
Balance sheet																				
Assets	1019	1039	1061	1085	1111	1138	1168	1199	1233	1270	1309	1351	1395	1443	1494	1549	1607	1669	1734	1804
Assets (network)	1020	1040	1061	1082	1104	1126	1149	1172	1195	1219	1243	1268	1294	1319	1346	1373	1400	1428	1457	1486
Cumulative depreciation	*51*	*104*	*159*	*216*	*276*	*338*	*402*	*469*	*538*	*609*	*684*	*761*	*841*	*924*	*1009*	*1098*	*1190*	*1285*	*1384*	*1486*
Net book value	*969*	*936*	*902*	*866*	*828*	*788*	*747*	*703*	*657*	*609*	*560*	*507*	*453*	*396*	*336*	*275*	*210*	*143*	*73*	*0*
Liquid assets	50	103	159	219	283	350	421	496	576	660	749	843	943	1047	1158	1274	1397	1526	1661	1804
Liabilities	1019	1039	1061	1085	1111	1138	1168	1199	1233	1270	1309	1351	1395	1443	1494	1549	1607	1669	1734	1804
Owners equity	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Debt	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Net cumulative result	19	39	61	85	111	138	168	199	233	270	309	351	395	443	494	549	607	669	734	804

(1) Appendix 2
(2) Successive Step Replacement costs
(Asset replacement paths)

(3) I. Introduction

XIII.2 I.1 Principles

The value K_t of an asset is the difference between the discounted costs (at time *t*) of two options:

- an option where the asset is used until the end of its economic life,
- an option where it is replaced with a functionally equivalent asset.

XIII.3 I.2 Main parameters

- *a* is the discount rate,

- *g* is the technical progress rate; it corresponds to the drop in the "new" asset price in current monetary value: if K_0 is the gross replacement value or "new" price at the beginning of year 0, the gross replacement value of the asset at the beginning of year *n* is $K_n = K_0 / (1+g)^n$;

- the composite rate *h* is defined as $(1+a).(1+g) = (1+h)$

(1) II. Applications

II.1 Costs for option 1 (maintaining the asset in service)

This option corresponds to a normal asset lifespan, with renewal every *T* years. The corresponding discounted cost, at time *t,* is given by the following formula:

$$\Gamma_{1,t} = \frac{K_0}{(1+g)^T} \cdot \frac{1}{(1+a)^{T-t}} + \frac{K_0}{(1+g)^{2\cdot T}} \cdot \frac{1}{(1+a)^{2\cdot T-t}} + \cdots$$

This sum corresponds to the asset cost in year *T* discounted at time *t* then to the asset cost in year *2.T* discounted at time t and so on every *T* years. It becomes:

$$\Gamma_{1,t} = K_0 \cdot (1+a)^t \cdot \left(\frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots \right)$$

$$\boxed{\Gamma_{1,t} = \frac{K_0 \cdot (1+a)^t}{(1+h)^T} \cdot \left(1 + \frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots \right)}$$

II.2 Costs corresponding to option 2 (replacing the asset)

In this option, the asset is replaced immediately, then replaced again every T years. The corresponding cost, discounted at time *t,* is given by the following formula:

$$\Gamma_{2,t} = \frac{K_0}{(1+g)^t} + \frac{K_0}{(1+g)^{t+T}} \cdot \frac{1}{(1+a)^T} + \cdots$$

This sum corresponds to the asset cost in year T discounted at time t then to the asset cost in year $t+T$ discounted at time t and so on every T years. It becomes:

$$\Gamma_{2,t} = \frac{K_0}{(1+g)^t} \cdot \left(1 + \frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots\right)$$

$$\boxed{\Gamma_{2,t} = \frac{K_0 \cdot (1+a)^t}{(1+h)^t} \cdot \left(1 + \frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots\right)}$$

II.3 Replacement value calculation

By definition, the replacement value for an asset in service at time t is the difference in cost between the following two options: $K_t = \Gamma_{2,t} - \Gamma_{1,t}$ This formula becomes:

$$K_t = K_0 \cdot (1+a)^t \cdot \left(\frac{1}{(1+h)^t} - \frac{1}{(1+h)^T}\right) \cdot \left(1 + \frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots\right)$$

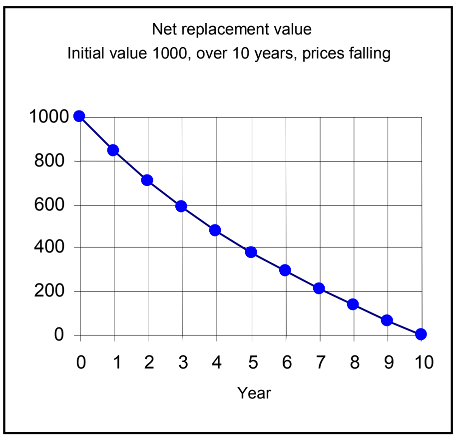
$$K_t = \frac{K_0}{(1+g)^t} \cdot \left(1 - \frac{1}{(1+h)^{T-t}}\right) \cdot \left(1 + \frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots\right) \quad K_t = \frac{K_0}{(1+g)^t} \cdot \frac{\left(1 - \frac{1}{(1+h)^{T-t}}\right)}{\left(1 - \frac{1}{(1+h)^T}\right)}$$

because: $\left(1 + \frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots\right) = \frac{1}{\left(1 - \frac{1}{(1+h)^T}\right)}$

If we make:

$$\boxed{\varphi(h,x) = \frac{1}{h} \cdot \left(1 - \frac{1}{(1+h)^x}\right)}$$

$$\boxed{K_t = \frac{K_0}{(1+g)^t} \cdot \frac{\varphi(h,T-t)}{\varphi(h,T)}}$$



II.4 Annual payment

If we equate the discount rate and the rate of return on capital, the general relationship between annual payment and asset value is:

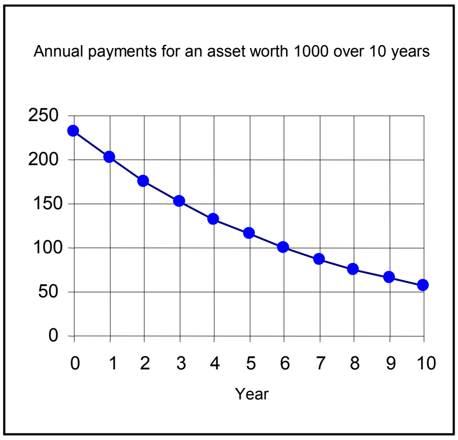
$$A_t = \frac{a \cdot K_t + (K_t - K_{t+1})}{(1+a)} = K_t - \frac{1}{(1+a)} \cdot K_{t+1}$$

Using the values of K_t this formula becomes:

$$A_t = \left[\frac{K_0}{(1+g)^t} \cdot \left(1 - \frac{1}{(1+h)^{T-t}}\right) - \frac{K_0}{(1+a)\cdot(1+g)^{t+1}} \cdot \left(1 - \frac{1}{(1+h)^{T-t-1}}\right)\right] \cdot \left(1 + \frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots\right)$$

$$A_t = \frac{K_0}{(1+g)^t} \cdot \left[\left(1 - \frac{1}{(1+h)^{T-t}}\right) - \frac{1}{(1+h)} \cdot \left(1 - \frac{1}{(1+h)^{T-t-1}}\right)\right] \cdot \left(1 + \frac{1}{(1+h)^T} + \frac{1}{(1+h)^{2\cdot T}} + \cdots\right)$$

$$\boxed{A_t = \frac{K_0}{(1+g)^t} \cdot \frac{1}{(1+h)\cdot \varphi(h,T)}}$$



Annual payment is a function of prices.
In the example shown in the graph, prices are going down.

(2) III. Table of values

The following table gives the values of the annual payment <u>in the first year</u> for an investment of 1,000. It should be noted that this assumes that annual payments are received at the beginning of the period.

		T												
		3	5	7	10	12	15	20	25	30	35	50	70	1000
	5.0%	350	220	165	123	107	92	76	68	62	58	52	49	48
	10.0%	366	240	187	148	133	120	107	100	96	94	92	91	91
	12.0%	372	248	196	158	144	131	120	114	111	109	108	107	107
	15.0%	381	259	209	173	160	149	139	135	132	131	131	130	130
	18.0%	390	271	222	189	177	166	158	155	154	153	153	153	153
	20.0%	396	279	231	199	188	178	171	168	167	167	167	167	167
h	22.0%	401	286	240	209	199	190	184	182	181	180	180	180	180
	25.0%	410	297	253	224	215	207	202	201	200	200	200	200	200
	27.0%	415	305	262	234	225	219	214	213	213	213	213	213	213
	30.0%	424	316	275	249	241	235	232	231	231	231	231	231	231
	35.0%	437	334	295	273	267	262	260	259	259	259	259	259	259
	40.0%	450	351	316	296	291	288	286	286	286	286	286	286	286
	45.0%	462	368	335	318	314	312	311	310	310	310	310	310	310

XIV. Appendix 3
XV. Formulae

XV.1 I. - Background

We investigate the effect of using the different assessment methods on a regular series of annual investments with a value of $\frac{K_0}{D} \cdot \frac{1}{(1+g)^t}$ where K_0 is the network replacement value, D, the actual lifespan of the assets making up the network and g the technical progress rate (current monetary value).

All calculations are carried out using current monetary values and the variables are defined as follows:

A_t : annual payment in year t, assuming that it is received at the beginning of the year.

K_t : network value at the beginning of year t

$\widetilde{K}_t$: network value at the end of year t

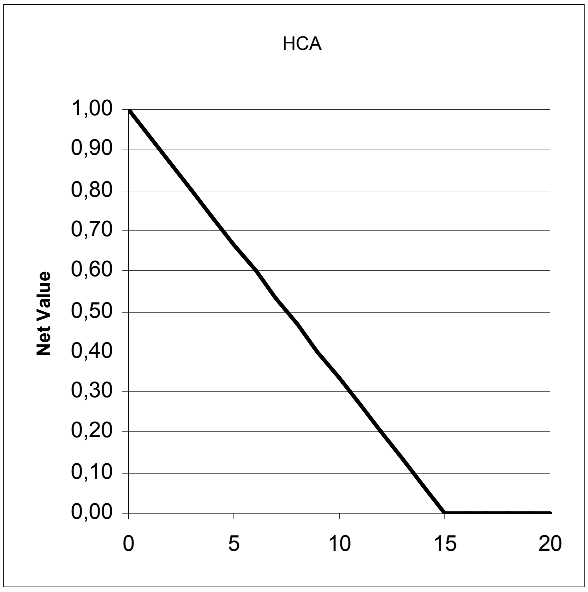
a : discount rate

These variables are related by the formula:

$$A_t = \frac{a \cdot K_t + \left(K_t - \widetilde{K}_t\right)}{(1+a)}$$

II. Different types of depreciation

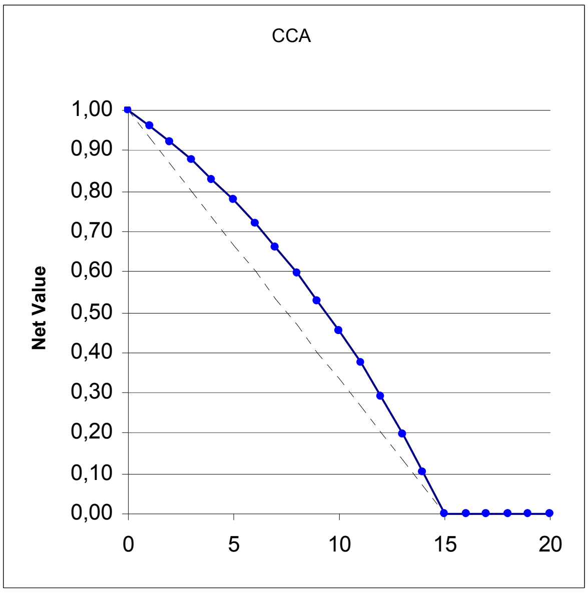
For a given asset with a purchase price when new of 1 at the beginning of year 0, the net value of this asset at the beginning of year t is provided in the table below:



Classic amortisation formula used for historical costs: straight-line depreciation is applied to the gross asset valued at its original cost.

This method uses an amortisation period T (15 years here)

$$K_0 \cdot \left(1 - \frac{t}{T}\right)$$

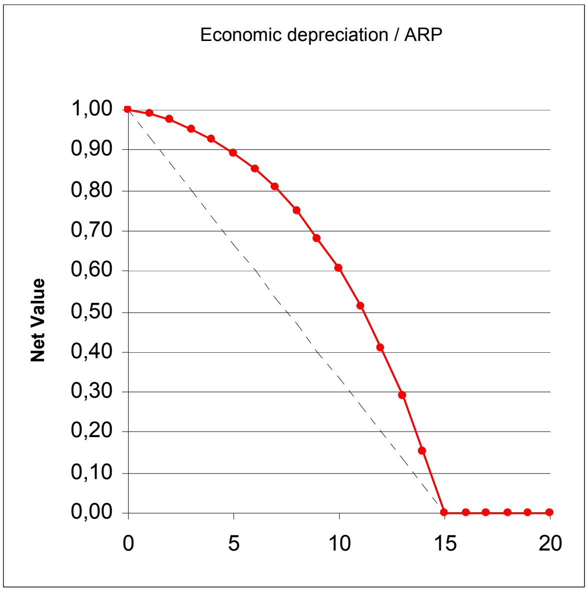


Current costs: straight-line depreciation is applied to the "current" and not the historical gross value i.e. price changes have been taken into account.

A price increase has been assumed here.

This method uses an amortisation period T and a price index g

$$K_0 \cdot \left(1 - \frac{t}{T}\right) \cdot \frac{1}{(1+g)^t}$$



Asset replacement paths: the asset value is defined as the value saved by not renewing the asset immediately.

This method uses a time period T (in theory the economic life of the asset), a price-change index g and a discount rate a.

$$K_0 \cdot \frac{\varphi(h, T-t)}{\varphi(h, T)} \cdot \frac{1}{(1+g)^t} \quad \text{where:}$$

$$\varphi(h, x) = \frac{1}{h} \cdot \left(1 - \frac{1}{(1+h)^x}\right) = \sum_{i=1}^{x} \frac{1}{(1+h)^i}$$

and: $(1+h) = (1+g) \cdot (1+a)$

III. - Steady-state production evaluation

We select a sufficiently distant point in the time-series so that the different methods "see" all past investments. This point occurs at the end of period T, furthermore, the network is built to its nominal capacity at the end of period D. The different methods can be compared by selecting a reference point beyond the greater of the two values.

Evaluation of the net value

The net value is written as:

$$K_t = \sum_{age=0}^{T-1}\left[\frac{K_0}{D}\cdot\frac{1}{(1+g)^{(t-age)}}\cdot\Phi(age)\right]$$

This is the sum of the net values of T investments, each of which was purchased new at time (t – age) for a value $\frac{K_0}{D}\cdot\frac{1}{(1+g)^{(t-age)}}$; the term $\Phi(age)$ corresponds to the residual value. This can be written:

$$K_t = \frac{K_0}{D}\cdot\frac{1}{(1+g)^t}\cdot\sum_{age=0}^{T-1}\left[(1+g)^{age}\cdot\Phi(age)\right] \text{ or:}$$

$$K_t = \frac{T}{D}\cdot\frac{K_0}{(1+g)^t}\cdot\frac{1}{T}\sum_{age=0}^{T-1}\left[(1+g)^{age}\cdot\Phi(age)\right]$$

The net value can be expressed as a function of three terms:

- $\frac{T}{D}$ represents the difference between the amortisation period and the actual lifetime,
- $\frac{K_0}{(1+g)^t}$ is the "replacement value" of the network at t
- $\frac{1}{T}\sum_{age=0}^{T-1}\left[(1+g)^{age}\cdot\Phi(age)\right]$ is a term that is independent of t and is purely a function of the parameters of the chosen depreciation formula[1] (historical, current, replacement).

We can therefore summarise as follows:

$$\boxed{K_t = \frac{T}{D}\cdot\frac{K_0}{(1+g)^t}\cdot\Pi\left(T,g,[a]\right)}$$

We see that the net value at time *t* is proportional to the "new" or replacement value at time *t*.

a) III. - 2. Evaluation of the depreciation

[1] Strictly speaking, the parameter g is "real" whereas its equivalent in the current-cost formula is standardised.

The depreciation Δ_t corresponds to the net loss in value of K_t at the beginning of year *t*; it is not the same as the difference $K_t - K_{t+1}$ in so far as K_{t+1} includes the value of the investment made at the beginning of year *t*+1; therefore, we have to evaluate the net value of $\widetilde{K}_t$ at the end of year *t* as $\widetilde{K}_t = K_{t+1} - \frac{K_0}{D} \cdot \frac{1}{(1+g)^{t+1}}$ where the second term corresponds to the investment made at the beginning of the year t+1.

This is written therefore as $\Delta_t = K_t - K_{t+1} + \frac{K_0}{D} \cdot \frac{1}{(1+g)^{t+1}}$

Taking into account the formula for deriving K_t, we finally obtain:

$$\Delta_t = \frac{T}{D} \cdot \frac{K_0}{(1+g)^t} \cdot \frac{(1 + g \cdot T \cdot \Pi(T, g, [a]))}{(1+g) \cdot T}$$

Once again, the depreciation generates three terms comparable to those for the net value.

(1) III. - 3. Annual payment evaluation

The annual payment is derived from the two previous evaluations since $A_t = \frac{a.K_t + \Delta_t}{(1+a)}$

It becomes:

$$A_t = \frac{T}{D} \cdot \frac{K_0}{(1+g)^t} \cdot \frac{(1 + h \cdot T \cdot \Pi(T, g, [a]))}{(1+h) \cdot T}$$

(i) IV.- Limit case

In the case where prices increase ($g < 0$) and assuming very long actual lifespans and similar amortisation periods, we obtain the following table.

	Historical costs	Current costs	Replacement costs
Coefficient	0	1/2	1
Net value	Zero	Half the replacement value	Equals the replacement value
Depreciation	Zero	$1/2 \cdot g/(1+g)$ times the replacement value	$g/(1+g)$ times the replacement value
Annual payment	Zero	$1/2 \cdot h/(1+h)$ times the replacement value	$h/(1+h)$ times the replacement value

Summary

I. – General expressions

Net value $K_t = \frac{T}{D} \cdot \frac{K_0}{(1+g)^t} \cdot \Pi\big(T, g, [a]\big)$

Depreciation $\Delta_t = \frac{T}{D} \cdot \frac{K_0}{(1+g)^t} \cdot \frac{\big(1 + g \cdot T \cdot \Pi\big(T, g, [a]\big)\big)}{\big(1+g\big) \cdot T}$

Annual payment $A_t = \frac{T}{D} \cdot \frac{K_0}{(1+g)^t} \cdot \frac{\big(1 + h \cdot T \cdot \Pi\big(T, g, [a]\big)\big)}{\big(1+h\big) \cdot T}$

II. - Expression of the coefficient $\Pi\big(T, g, [a]\big)$

The coefficient $\Pi\big(T, g, [a]\big)$ is in the general case equal to $\frac{1}{T}\sum_{age=0}^{T-1}\Big[(1+g)^{age} \cdot \Phi(age)\Big]$ where $\Phi(age)$ is the "standard" form of the depreciation curve corresponding to the selected method (historical costs, current costs, successive step replacement costs). This coefficient can be evaluated for each of the methods.

II. - 1. Historical-cost case

$$\Pi\big(T, g, [a]\big) = \frac{\big(1+g\big)^{(T+1)} - 1 - \big(T+1\big) \cdot g}{g^2 \cdot T^2}$$

II. - 2. Current-cost case

$$\Pi\big(T, g, [a]\big) = \frac{1}{2} + \frac{1}{2 \cdot T}$$

II. - 3.Successive step replacement-cost case

$$\Pi\big(T, g, [a]\big) = \frac{1}{h} \cdot \left[\frac{1}{\varphi\big(h, T\big)} - \frac{1}{T}\right] = \frac{1}{1 - \frac{1}{(1+h)^T}} - \frac{1}{h \cdot T}$$

b) Appendix 4

c) Method selected for calculating the rate of return on France Telecom capital

I. Definition

The “normal” or standard rate of return on capital invested in regulated activities.

Over the long term, it is equivalent to the cost of capital. Indeed, in a competitive market, a company cannot have a long-term level of profitability higher than the cost of capital (excessive profitability would necessarily attract new entrants which would increase competitive pressure and thereby reduce profitability); similarly if a company has a long-term level of profitability which is lower than the cost of capital, it will be unable to raise new capital to finance new investments and grow the business. When the profitability and the capital cost are the same, the company makes “normal” profits.

It is used to calculate the rental charge (calculated at the beginning of the period) **which offsets the cost of investments,** once lending institutions and shareholders have been reimbursed at a “normal” rate.

$$\text{Rental charge} = I - \frac{I-\Delta I}{1+k} = \frac{kI+\Delta I}{1+k}$$

XVI. The rate of return on capital k generated by the company’s activities is used to remunerate its various financial resources: owners’ equity and debt and make tax payments.

XVII.
XVIII.
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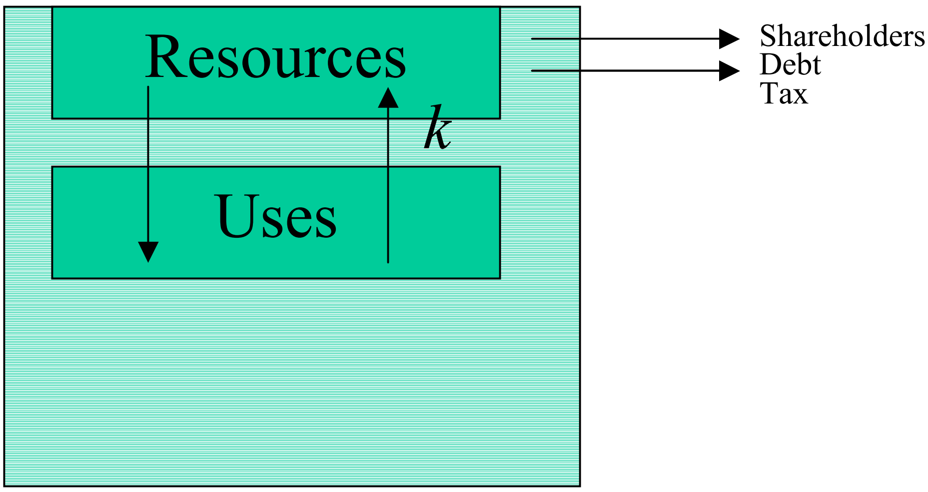


II. Using the rate of return on capital

France Telecom tariff levels for certain access services such as unbundling are based on cost-orientation principles. However, the tariff-setting principle must allow, “a reasonable level of return on capital employed given the risks involved” according to article D. 311 of the Post and Electronic Communications Code.

To achieve this, it is necessary to assess the fixed capital necessary to provide the service as well as the rate of return on capital taking into account the level of risk associated with the activity. The method for setting the rate needs to be stable over time to provide a reassuring environment for investment in the industry.

(1) III. A precise legal framework

European Commission recommendation no. 98/322 of 8 April 1998 stipulates that:

“The cost of capital of operators should reflect the opportunity cost of funds invested in network components and other related assets. Usually it reflects the following:
-the (weighted) average cost of debt for the different forms of debts held by each operator,

-the cost of equity, measured by the returns that shareholders require in order to invest in the network given the associated risks,
– the values of debt and equity.

This information can then be used to determine the average weighted cost of capital (WACC)

in accordance with the following formula:

$$WACC = re . E/(D+E) + rd. D/(D+E)$$

where re is the cost of equity, rd is the cost of debt, E is the total amount of equity and D is the total amount of interest-bearing debt.”

The recommendation also indicates that this calculation can be differentiated for different company activities if the global cost of company capital is not appropriate for regulated activities. This can occur notably when regulated activities are considered to carry less risk than the group's overall activities.

Article R. 20-37 of the Post and Electronic Communications Code, on universal service funding states that:
“To evaluate the costs mentioned in articles R 20-33, R 20-35 and R 20-36, the rate of return on capital is set by the telecommunications regulatory authority taking into account the weighted average cost of capital for the operator in charge of universal service and that which an investor would be required to bear when investing in electronic communication activities in France.”

(2) IV. Principles applied by ART

Measuring the cost of equity therefore seems to be a complex subject. ART has called upon external expertise on several occasions and in particular, ordered a study from a firm specialising in finance.

Based on this work, ART decided on a financial and accounting approach using stock-market data. Not only does this method appear to be more robust from a theoretical viewpoint but it is also the method generally used internationally by regulatory authorities and telecommunications companies alike.

The regulatory cost of capital was calculated as the weighted average of:
- the cost of equity, corresponding to the rate of return required by company shareholders for the activity in question,
- the cost of operator debt for the activity in question.

This weighting is based on a target gearing taking into account the situation of the incumbent and that of a telecommunications operator in France.

(3) V. Measuring the cost of equity

To assess the cost of equity, ART has until now used the Capital Asset Price Model. This method is based on the following formula:

$$re = R_f + \beta\,(R_m - R_f)$$

which is a function of:

- the risk-free rate $R_{f,}$ which represents the rate of return of a stock or a portfolio of stocks which carries absolutely no risk and is not correlated to any other rate of return used for economic purposes.

- the market premium $(R_m – R_f)$ which corresponds to the premium an investor can rightfully expect when investing in a market portfolio with respect to the risk-free rate.

- the risk specific to the investment β (beta), which measures the sensitivity of the stock to overall movements in the stock market.

(4) VI. Measuring the cost of debt

ART has determined the cost of debt used for the calculation of regulatory capital cost using the risk-free rate defined previously with the addition of a risk premium corresponding to company debt.

VII. Cost of capital

The cost of capital is the weighted average of these two values.

Appendix 5
Unbundling tariffs

I. Method used by France Telecom in November 2000

Cost of capital

France Telecom has based its local network cost assessment on the following method. The corresponding figures can be found in a table at the end of this section.

First, the different relevant-cost items or types were identified for the France Telecom local network in the following three categories:

- civil works (2 cost items),
- cables (8 cost items),
- distribution frames (2 cost items).

France Telecom has specified cost units / quantities for the different items (number of distribution frames, cable lengths etc.). These quantities are derived from the actual network and result either from a detailed evaluation (for poles and distribution frames), or from a statistical study (for civil works distances). For concentration points, the actual network has been adapted to comply with new standards leading to more but smaller concentration points compared to the current network.

France Telecom then estimated the corresponding unit costs / quantities based on 1999 data derived from its management accounting systems.

France Telecom deducted 15% of civil works costs for ducting to take into account no-cost acquisitions; the rate of 15% corresponded to the average observed since 1997 for the ratio of no-cost acquisitions to km of civil works during the same period.

France Telecom then assessed the annual cost per line for each of the identified cost items using the successive-step replacement method, i.e. using the replacement-cost formula with a capital cost of 12.1% and a technical progress rate of 0%.

This method led to local loop assets being costed at €9.3 per line per month (capital costs).

XXII.2 ***Operating and specific unbundling costs***

For local network operating costs and after-sales service for lines (both the administrative i.e. fault handling in agencies and technical i.e. technician intervention aspects), France Telecom has used assessments derived from the cost-price base in the 1998 audited regulatory accounts. The costs are based on the parallel with the per-line operating and after-sales costs of its own telephone lines.

For the "after-sales intervention" part, these amounts have been restated to take into account aspects specific to unbundling. 25% of the cost is removed to take into account erroneous interventions, which are billed separately in the case of unbundling. Furthermore, France Telecom estimated that not having access to remote fault location tools in the case of full unbundling meant that two interventions instead of one would be required.

Using analytical techniques, France Telecom estimated specific unbundling costs, whether they are commercial, after-sales platform or billing related, as the number of additional man-years required for the forecast number of unbundled lines in 2001.

These estimations are summarised in the following table.

(November 2000, France Telecom)

(1) Cost units	Per line per month		b) Comments
	FF	€	
Local network			
Cost of capital (civil works, cables & distribution frames)	62	9.3	ARP costs, cost of capital 12.1% and technical progress rate 0%.
Dropwire costs	5	0.8	
Operating costs	15	2.4	from 1998 audited cost prices
Service costs			
After-sales service 1013 processing	5	0.8	from 1998 audited cost prices
After-sales service: Intervention	10	1.5	See note (1)
Invoicing and Operator Department costs.	1	0.1	Provisional France Telecom costs
After-sales service: unbundling service platform	3	0.4	Provisional France Telecom costs
Contribution to common costs.			
Contribution to common costs.	10	1.6	10.1% of previous costs (EPMU)
Total	**112**	**17.1**	

(1) from restated 1998 audited cost prices: -25% (erroneous fault reports invoiced elsewhere) with a complexity factor of 2 (specific to unbundling: no remote diagnostics)

XXII.3 II. ART decision no. 01-135

ART decision no. 01-135 of 8 February 2001 required France Telecom to modify its full unbundling tariff based on the following analysis.

XXII.4 Capital cost of copper access network

For the local network capital cost, ART considered that in view of a study carried out by the consulting firm BIPE, France Telecom's unit costs for civil works were overestimated. The BIPE range of costs was therefore used instead of France Telecom's estimate (368 FF per metre in built-up areas and 203 FF per metre in rural areas, plus 15% engineering and supervision costs compared to an average of 376 FF per metre used by France Telecom).

For dropwire costs, ART noted that they corresponded to France Telecom operating costs, which are paid by the subscriber when a line is connected; it was therefore not relevant to include them again in the unbundling costs if the line exists already. The exclusion of dropwire costs from the scope of relevant costs has also led to a reduction in the number of poles used for calculating the capital cost of the local network – from 18 to 10 million – since 8 million poles are dedicated to dropwire.

These were the only modifications made to the France Telecom calculation, bringing the capital cost of the copper pair to €8.3 instead of €9.3 per line per month (excluding common costs).

XXII.5 Other recurring costs

ART also considered that the "intervention" component of the after-sales cost provided by France Telecom was overestimated. The estimation of 2 fault interventions due to the difficulty inherent in full unbundling, which prevents France Telecom from using remote fault-location tools, was reduced to a factor of 1.3 by ART.

All these adjustments to the capital cost of the copper pair and to the other cost items led to a tariff of 95 FF or €14.4 per line per month as shown in the following table:

(decision no. 01-135)

(1) Cost items	**Level**		**b) Comments**
	FT	ART	
Local network			
Cost of capital (civil works, cables & distribution frames)	9.3	8.31	Replacement costs with BIPE civil works costs
Dropwire costs	0.8	0,0	Excluded from scope
Operating costs	2.4	2.35	No change
Service costs			
After-sales service 1013 processing	0.8	0.83	No change
After-sales service: Intervention	1.5	0.99	See note (1)
Invoicing and Operator Department costs.	0.1	0.14	No change
After-sales service: Unbundling service platform	0.4	0.41	No change
Contribution to common costs.			
Contribution to common costs.	1.6	1.32	10.1% of previous costs
Total	**17.1**	**14.35**	

(1) from restated 1998 audited cost prices -25% (erroneous fault reports invoiced elsewhere) with a complexity factor reduced to 1.3 (specific to unbundling: no remote diagnostics)

XXII.6 III. ART decision no. 02-323

ART decision no. 02-323 dated 16 April was cancelled by the *Conseil d'Etat* effective from 2 May 2005 on formal grounds. However it was not criticized as regards its content, which is remains effective today. The decision was not cancelled for the period prior to this date.

In its decision, ART considered that the recurring unbundling tariff should be reviewed to align it with the principle of cost-orientation. The method used by ART in 2002 comprised two steps. First, the levels of the different cost items were reviewed by ART in particular with respect to the 1999 audited France Telecom accounts. Following that, ART took the geographic aspect into account in the full unbundling tariff calculation.

In 2002, ART checked the cost orientation for operations and after-sales cost items on a per-line basis (excluding platform and billing costs) by comparing France Telecom's audited 1999 regulatory accounts. More precisely, ART used the costs per line captured from "record 4" of the audit of France Telecom's 1999 accounts, containing the France Telecom copper local network costs. This method highlighted the following costs:

- operating cost per pair: € 1.92 per month,
- cost of after-sales intervention per pair: € 0.92 per month using the same adjustments for the intervention costs as described in decision no. 01-135,
- 1013 costs: € 0.15 per month, contested at the last minute by a France Telecom email which estimated this cost to be € 0.60 per month.

Subsequently, ART took into account the revised capital cost for 2002 i.e. 10.4% instead of 12.1% in 2001, all things being equal.

(decision no. 02-323)

(1) Cost items	**Level**		**b) Comments**
	2001	2002	
Local network			
Cost of capital (civil works, cables & distribution frames)	*8.31*	7.50	Change in capital cost from 12.2% to 10.4%
Connection costs	-	-	
Operating costs	*2.35*	1.92	Record 4 from the 1999 accounts
Service costs			
After-sales service: 1013 processing	*0.83*	0.15	From audited 1998 cost prices
After-sales service: Intervention	*0.99*	0.92	See note (1)
Invoicing and Operator Department.	*0.14*	0.14	No change
After-sales service: Unbundling service platform	*0.41*	0.41	No change
Contribution to common costs.			
Contribution to common costs.	1.32	1.12	10.1% of previous costs
Total	**14.35**	**12.16**	

(1) Restated France Telecom estimation: -25% (Erroneous fault reports invoiced elsewhere) x1.3 (specific to unbundling: no remote diagnostics)

(a) Taking into account geographical factors when deploying lines

The tariff of € 12.16 per month shown in the previous table was calculated on the basis of all France Telecom lines without taking into the account the gradual aspect of unbundling deployment by operators. The tariff therefore implies that all copper pairs have the same likelihood of being unbundled.

This is in contrast with the method selected by ART in decision no.02-323, which takes into account the gradual nature of (see above) unbundled operator deployment. The calculation was based on 32.8 million lines and distinguished between two types of population, each weighted differently.

The decision highlighted two areas in France: the first, comprising 21 million lines, corresponds to relatively dense areas in which it is likely that alternative operators will invest in unbundling within two years of the decision; the second corresponds to less-densely populated areas in which it is highly unlikely that a new entrant will invest in unbundling over the same period.

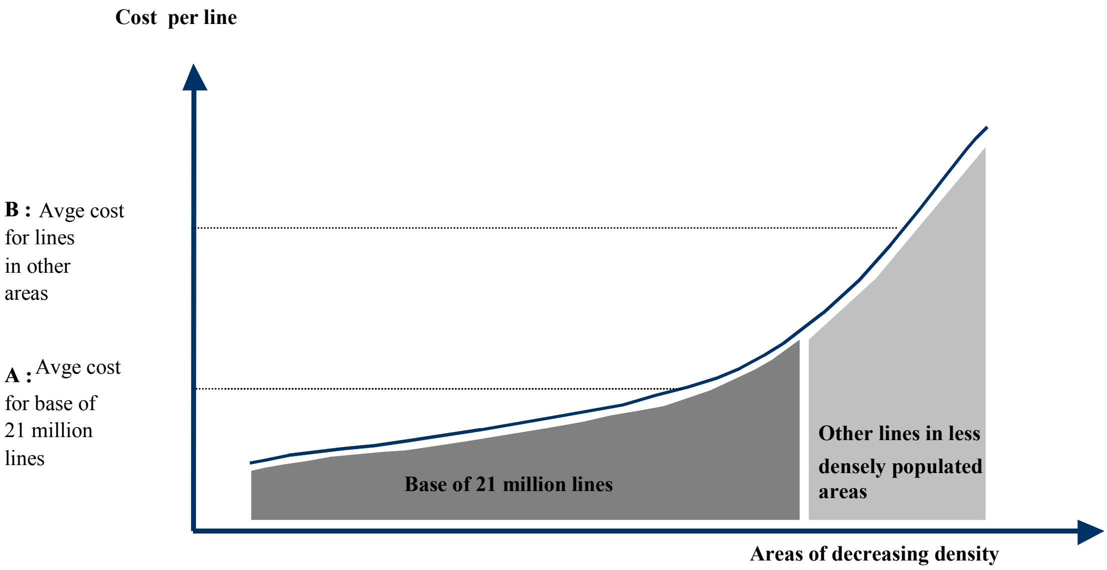
More precisely, ART estimated that the majority (95%) of unbundled lines would be in the first area whereas only 5% would be in the less-densely populated areas. Consequently, the average cost used for fully unbundled access corresponds to 95% of the average line cost for the first area and 5% of the average line cost for the less-densely populated area. The calculation of the unbundling tariff, which is valid countrywide, sought to ensure that the principle of cost-orientation was respected. This assumes in particular that the operator only pays for the service to which it has access.

To take into account the geographic disparity in France Telecom local loop network costs, ART used the cost-per-line breakdown used in the model for calculating the universal service geographic cost component. More precisely, this model gives:

- a civil works cost distribution broken down into 35 areas of decreasing density country-wide,
- a cable-cost distribution,
- an operating-cost distribution

By applying this distribution to the different costs in the table above, ART was able to determine that covering a significant portion of the country with a potential base of 21 million lines would result in an average tariff of € 10.2 per line per month. By calculating the average between this cost, weighted by a factor of 95%, and the cost of the remaining lines in the country, weighted by a factor of 5%, the cost of the recurring fully unbundled line tariff was established at € 10.5 per line per month.

The following graph, which is only a guide, summarises the steps in the reasoning. An average cost, weighted by the number of lines, is calculated for each of the two areas (cost A in the more densely populated areas, cost B in the others).



The final tariff for all lines is obtained by taking the average of these two costs, weighted by the corresponding probability of occurrence i.e. 95% A + 5% B = € 10.5

Costing the local loop using France Telecom replacement costs (capital cost)

Number of pairs used for distribution and for transport (million)	32.7

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Civil works	Thousands of km	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters		Total annual cost EUR million	Monthly cost per line (€)
					Composite rate h	Lifespan T		
Civil works (duct)	359	57 321	15%	17 491	12.1%	30	1 951	5.0
Civil works (trenches)	89	15 855		1 411	12.1%	20	170	0.4
Total civil works				18 903			2 121	5.4

Cables and overhead infrastructure	Pair km (million) or poles	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters		Total annual cost EUR million	Monthly cost per line (€)
					Composite rate h	Lifespan T		
D side cable (duct)	23.0	107		2 454	12.1%	20	295	0.8
D side cable (buried)	2.4	88		212	12.1%	20	26	0.1
Aerial D side cable	8.2	165		1 350	12.1%	15	178	0.5
Poles (millions)	18.0	127		2 278	12.1%	15	300	0.8
Distribution points	8.6	59		509	12.1%	20	61	0.2
E side cable (duct)	66.0	56		3 723	12.1%	20	447	1.1
E side cable (buried)	7.4	64		474	12.1%	20	57	0.1
E side cable (overhead)	1.5	165		247	12.1%	15	33	0.1
Total cable				11 247			1 396	3.6

Distribution & sub-distribution frames	Quantity	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters		Total annual cost EUR million	Monthly cost per line (€)
					Composite rate h	Lifespan T		
PCP	114 000	6 250		713	12.1%	20	86	0.2
Main distribution frames	12 041	48 479		584	12.1%	20	70	0.2
Total distribution frames				1 296			156	0.4

Total				**31 446**			**3 673**	**9.3**

References — *France Télécom, 28 November 2000 in euros*

Comments

(1) & (2) are input values
(4) obtained by taking (1) * (2) * (1- (3))
(5) is the composite rate h = (1+a) * (1+g) - 1 where a is the rate of return on capital and or 1 / (1+g) - 1 is the annual change in asset price in current value
(6) is the economic lifespan
(7) is the first annual replacement payment corresponding to (4), (5) and (6)
(8) is the amount (7) on a per-line-per-month basis

Costing the local loop using France Telecom replacement costs (capital cost)

Number of pairs used for distribution and for transport (million)	32.7

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Civil works	Thousands of km	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters		Total annual cost EUR million	Monthly cost per line (€)
					Composite rate h	Lifespan T		
Civil works (duct)	359	50 009	15%	15 260	12.1%	30	1 703	4.3
Civil works (trenches)	89	13 720		1 221	12.1%	20	147	0.4
Total civil works				16 481			1 849	4.7
Cables and overhead infrastructure	Pair km (million) or poles	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters		Total annual cost EUR million	Monthly cost per line (€)
					Composite rate h	Lifespan T		
D side cable (duct)	23.0	107		2 454	12.1%	20	295	0.8
D side cable (buried)	2.4	88		212	12.1%	20	26	0.1
Aerial D side cable	8.2	165		1 350	12.1%	15	178	0.5
Poles (millions)	10.0	127		1 265	12.1%	15	167	0.4
Distribution points	8.6	59		509	12.1%	20	61	0.2
E side cable (duct)	66.0	56		3 723	12.1%	20	447	1.1
E side cable (buried)	7.4	64		474	12.1%	20	57	0.1
E side cable (overhead)	1.5	165		247	12.1%	15	33	0.1
Total cable				10 235			1 263	3.2
Distribution & sub-distribution frames	Quantity	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters		Total annual cost EUR million	Monthly cost per line (€)
					Composite rate h	Lifespan T		
PCP	114 000	6 250		713	12.1%	20	86	0.2
Main distribution frames	12 041	48 479		584	12.1%	20	70	0.2
Total distribution frames				1 296			156	0.4
Total				**28 013**			**3 268**	**8.3**

References *ART decision no.01-135 of 8 February 2001*

Comments

(1) & (2) are input values
(4) obtained by taking (1) * (2) * (1- (3))
(5) is the composite rate h = (1+a) * (1+g) - 1 where a is the rate of return on capital and or 1 / (1+g) - 1 is the annual change in asset price in current value
(6) is the economic lifespan
(7) is the first annual replacement payment corresponding to (4), (5) and (6)
(8) is the amount (7) on a per-line-per-month basis

Costing the local loop using France Telecom replacement costs (capital cost)

Number of pairs used for distribution and for transport (million)	32.7

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Civil works	Millions of minutes	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters: Composite rate h	Discount parameters: Lifespan T	Total annual cost EUR million	Monthly cost per line (€)
Civil works (duct)	359	50 009	15%	15 260	10.4%	30	1 515	3.9
Civil works (trenches)	89	13 720		1 221	10.4%	20	133	0.3
Total civil works				16 481			1 649	4.2

Cables and overhead infrastructure	Pair km (million) or poles	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters: Composite rate h	Discount parameters: Lifespan T	Total annual cost EUR million	Monthly cost per line (€)
D side cable (duct)	23.0	107		2 454	10.4%	20	268	0.7
D side cable (buried)	2.4	88		212	10.4%	20	23	0.1
Aerial D side cable	8.2	165		1 350	10.4%	15	164	0.4
Poles (millions)	10.0	127		1 265	10.4%	15	154	0.4
Distribution points	8.6	59		509	10.4%	20	56	0.1
E side cable (duct)	66.0	56		3 723	10.4%	20	407	1.0
E side cable (buried)	7.4	64		474	10.4%	20	52	0.1
E side cable (overhead)	1.5	165		247	10.4%	15	30	0.1
Total cable				10 235			1 155	2.9

Distribution & sub-distribution frames	Quantity	Unit investment in euros	Deduction	Replacement value (EUR million)	Discount parameters: Composite rate h	Discount parameters: Lifespan T	Total annual cost EUR million	Monthly cost per line (€)
PCP	114 000	6 250		713	10.4%	20	78	0.2
Main distribution frames	12 041	48 479		584	10.4%	20	64	0.2
Total distribution frames				1 296			142	0.4

Total				**28 013**			**2 945**	**7.5**

References *ART decision no. 02-323 of 16 April 2002*

Comments
(1) & (2) are input values
(4) obtained by taking (1) * (2) * (1- (3))
(5) is the composite rate h = (1+a) * (1+g) - 1 where a is the rate of return on capital and or 1 / (1+g) - 1 is the annual change in asset price in current value
(6) is the economic lifespan
(7) is the first annual replacement payment corresponding to (4), (5) and (6)
(8) is the amount (7) on a per-line-per-month basis

(i)
(ii)

(2)