

**Costing and Financing Universal Service  
Obligations in a Competitive  
Telecommunications Environment  
in the European Union**

Study for DG XIII of the  
European Commission

**Final Report**

Bad Honnef, October 1997

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European Commission

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**Final Report**

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## **Preface**

This report presents the results of a study on the costing and financing of universal service obligations in a competitive telecommunications environment. The study was carried out by Wissenschaftliches Institut für Kommunikationsdienste (WIK), with the assistance of DETECON Deutsche Telepost Consulting GmbH, Bonn, for DG XIII of the European Commission.

The study results were obtained through interviews with interested parties, the analysis of responses to questionnaires and, most importantly, original research on relevant costing methodologies and financing approaches.

Contributions were received from numerous representatives from regulatory authorities, network operators and from independent experts, to whom we would like to extend our appreciation and thanks.

Werner Neu  
Project Director

Bad Honnef, October 1997



*Costing and Financing Universal Service Obligations  
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- Study for DG XIII of the European Commission -  
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## **Executive Summary**

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## I Background, general approach, issues not further covered in the report

### *Background and general approach*

With the establishment of a competitive regime in the telecommunications market in the European Union, it has become necessary to put the objective of universal service on a new basis as otherwise the provision and financing of telecommunications services at affordable prices to everyone may in the future no longer be assured. For this purpose, the EU has established a framework of special rules and safeguards that comprise the (proposed) Voice Telephony Directive, the Interconnection Directive and the Full Competition Directive.

The Voice Telephony Directive provides a series of measures aimed at ensuring that all reasonable requests for access to the fixed public telephone network and provision of telephone service at a fixed location are met. Specific Universal Service Obligations (USOs) imposed on organisations designated by Member States as USO providers concern the provision of a connection to the fixed public telephone network, the provision of directories and directory enquiry services and the provision of public pay phones.<sup>1</sup>

Under the Interconnection Directive and Full Competition Directive, in cases where specific USOs result in a justified net cost to the USO provider, Member States may allow the net cost to be shared with other organisations operating public telecommunications networks and/or publicly available telecommunications services, under a Universal Service Fund (USF). This framework for costing and financing of USOs is interpreted in detail in the Communication of the Commission on USO assessment criteria of 27 November 1996.

Respecting the principles laid down in the Directives and interpreted in the Communication, the task of this report is to further clarify the principles and practices of costing and financing of USOs, in particular to develop

- criteria by which to identify the costs of efficient delivery of USO services;
- concrete procedures by which such costs can actually be measured;
- a methodology to assess the revenues to be set against the cost of USO service delivery to obtain its direct net cost;

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<sup>1</sup> Universal Service is defined in the Interconnection Directive as: "a defined minimum set of services of specific quality which is available to all users independent of their geographic location and, in the light of specific national circumstances, at an affordable price". The term "Universal Service Obligations (USOs)" refers in this report to the obligations, put on a voice telephony operator or service provider by a National Regulatory Authority (NRA), to provide Universal Service in a specific geography.

- approaches to a methodology for assessing the value of indirect benefits;
- a methodology for deriving the net cost of the USO by avoiding double counting;
- whenever possible, benchmarks for the values of the various elements in the net cost calculations; and
- the design of a funding mechanism that meets the requirements of non-discrimination and proportionality.

The criteria and procedures proposed should be practical and allow the determination of the relevant figures in a transparent and objective manner.

Beyond that the report aims to carry forward the debate about the proper costing of telecommunications services in general.

Of particular relevance in this context is the assumption, maintained throughout most of the study, that USO services will in the beginning be delivered exclusively by the incumbent network operator.

The net cost of providing universal services in a given financial year, in most general terms, consists of:

- |     |   |  |
|-----|---|--|
| (1) |   | Costs of service delivery avoidable if there were no universal service |
| (2) | - | Revenues forgone from these services                                   |
|     |   |  |
| (3) | = | Direct net cost  |
| (4) | - | Value of any indirect benefits that flow from being a USO provider     |
|     |   |  |
| (5) | = | Overall net cost   |

The difference generated by lines (1) and (2) is the *direct* net cost because it is the directly measurable result from the USO activities in question. Deducting from (3) the indirect benefits of USO provision to the USO provider leads to the *overall* net cost of universal service.

**The summary of our analysis and findings regarding the various costing, financing and methodological issues listed above is given in the following sections. Detailed methodological and practical issues including the concepts of avoidable costs, revenues forgone, direct net costs and overall net costs, as well as the proper and appropriate financing of net costs are dealt with in the Main Report. In addition, sample calculations for the various stages of the costing and financing process are presented. This Executive Summary**

**highlights the information required by National Regulatory Authorities (NRAs) to undertake the various costing and financing calculations.**

*Special issues not further covered in main body of report*

We start the summary with a résumé of aspects relevant in the context of the cost of the USO and its financing that are addressed in the introductory chapter of the report but are not covered any further in its main body. These issues are:

- provision of universal service through the current USO provider as part of its competitive positioning,
- competitive bidding,
- requirement to "play"<sup>2</sup> for emergency services, operator assistance services, and directory enquiry services,
- the funding of network modifications required for the provision of specialised services for disabled users and users with special needs,
- specially targeted funding schemes (voucher and (virtual) voucher schemes), and
- access deficit contributions (ADCs).

We believe that *relying on the current USO provider* to continue offering USO services as part of its competitive positioning and designing regulations to support such a competitive provision has a high chance of proving successful. This would mean that in those instances where this approach is used, setting up a net-cost/compensation regime may prove unnecessary. A regulatory provision following this approach seems so far successful in Germany.<sup>3</sup> As a corollary to this follows that, as long as the incumbent operator dominates the market and competitors have only small market shares, or, as long as competition is not really flourishing and other operators are actually not also involved in the business of providing USO services, there may be little point in establishing a USO cost sharing mechanism. Such a mechanism could, as

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<sup>2</sup> In the terminology used in the discussion on universal service and the USO, the obligation to "play" means that the USO in question is placed on market entrants as well as on the incumbent, whereas the obligation to "pay" refers to the situation in which the incumbent operator is the only USO provider and entrants pay their share of the burden, say, by contributions into a Universal Service Fund.

<sup>3</sup> The German approach essentially postulates that the requirements of universal service will be fulfilled through the competitive process. The incumbent operator is seen currently to provide a satisfactory level of universal service. If it wished to discontinue part of this service unless it is compensated for its net cost, it would have to announce this one year in advance. The regulator would then check whether the provision of universal service could not be ascertained by competitors of the incumbent without any compensation. If this failed competitive tendering would be contemplated. Only if these approaches would not prove feasible or successful would compensation of the incumbent operator be taken into consideration.

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negative side effects, inhibit market entry of new, particularly smaller competitors and, in addition, cause substantial administrative costs that one should not incur unnecessarily.

When there is to be a USO net cost sharing mechanism, using a *competitive bidding* approach may be attractive in terms of achieving efficiency goals in respect of both determining the USO provider and determining the net cost of USO services. In our opinion, however, for reasons listed together with Recommendation 2 below, the conditions necessary for its application do not yet exist in most Member States, except perhaps in those with still incomplete roll-out of their networks. As long as the conditions for competitive bidding do not exist, one needs to rely on the approach of determining the net cost of the USO that the provider incurs, seeing to it that these costs correspond to those of efficient delivery.

The Voice Telephony Directive requires that each provider of telephone services offer *emergency services, operator assistance services, and directory enquiry services*, which means that in respect of these services all competitors are under the *obligation to "play"*<sup>4</sup>. We believe that their provision will in fact be assured under the competitive process so that *a priori* there is no need to provide for them in a USO net cost sharing mechanism. The NRA's important task in respect of these services consists in providing for interconnection arrangements to assure access to bottleneck resources required for these services by new competitors. This applies in particular if the new competitors are small players for which setting up their own facilities (e.g. emergency call centres) required for these services would be beyond their capabilities.

We suggest that the *network modifications required for offering specialised services for disabled users and users with special needs* should not simply be included within the scheme handling standardised USO services, as the measures needed for them will require special initiatives both for setting them up and financing them.

While *specially targeted funding schemes*, in particular so-called (virtual) voucher schemes, may be legitimate policy options for governments to bring telecommunications services to disadvantaged groups of people, special care must be exercised that their financing is appropriately taken care of as part of the USO net cost calculation and net cost sharing mechanism. Such schemes, which typically reduce the revenues that would otherwise be obtained for the same amount of services, should enter into the USO net cost determination through their effect on revenues. They should not be considered to cause a USO cost to the extent of the nominal value of the scheme (for example in the case of (virtual) vouchers the full amount of the value of the vouchers) because, as reasoned in some detail in Recommendation 5 below, this would almost certainly risk determining a USO net cost in excess of what is required. It would also not be consistent with Community Law. It is worthwhile to point this out at the outset as it appears to have been suggested that one should proceed otherwise.

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4 For a discussion of the terms "play" and "pay" see footnote 2.

It follows from the definition of the USO net cost that the *access deficit* is not one of its components. The USO net cost equals the net cost of serving customers that would not be served if there were no USO. The access deficit, in contrast, is the difference between the totality of costs of subscriber lines minus the totality of rentals received from the users of these lines. The majority of these users are customers that, despite an access deficit they may give rise to, provide a surplus over all the services they purchase. They are therefore not customers falling under the USO generating any deficit in need of compensation. The remedy for the possible problems due to an access deficit is a restructuring of tariffs, as called for in the Full Competition Directive. If this causes hardship with certain customer groups, this negative impact should be neutralised through targeted special tariff packages; any net cost of these would be picked up by the USO net cost calculation.

Our position on these issues, as summarised above and derived in detail in Section 1.3 of the main text, leads to the following recommendations:

#### **Recommendations 1 to 6**

1. As regards the possibility of assuring the provision of universal service through the current USO provider as part of its competitive positioning and without submitting a claim for compensation, there is value for the NRA to consider designing regulations that advance such a solution. This would circumvent the necessity of setting up a mechanism for the sharing of USO costs.  
The NRA is urged to consider in this context as a general matter that setting up such a mechanism is called for only at such a time when competition is already flourishing and competitors have already had an opportunity to enter themselves the business of providing USO services. As we argue farther below (see Recommendation 32), the incumbent operator is in the meantime more likely to benefit from the status of USO provider than to actually incur a net cost due to it. Installing a USO cost sharing mechanism under these circumstances could well act as an entry barrier and cause unnecessary administrative costs.
2. Using competitive tendering to determine USO providers has attractive efficiency features. Unsolved problems regarding information asymmetries, potential strategic bidding behaviour due to small number of bidders, and in general insufficient information about the scope of the overall net cost of the USO - especially if it confers substantial indirect benefits on the current (incumbent) provider - mitigate against its application at the present time in Member States with fully developed networks. There would be scope to use the procedure in Member States with still incomplete roll-out of their networks as the caveats apply there with less force.  
There are, however, good arguments for the NRA to keep abreast of the developments regarding the potential of using competitive tendering for allowing the provision of USO services through the competitive process, and to contemplate using the approach once the conditions for it are ready.

3. While the Voice Telephony Directive requires that each telephone service provider provide for

- emergency services,
- operator assistance, and
- directory enquiry services,

there does not appear to be a need for including these services in a USO net cost compensation scheme. The reason is that each telephone service provider will normally include these services as part of its basic offering thereby automatically fulfilling the requirement.

The real task of the NRA in the context of the above three services consists of arranging for interconnection agreements that would enable new competitors, in particular if these are small players, to access resources under the control of the incumbent operator that are needed to offer these services.

Emergency call centres belong to the resources that facilitate the provision of emergency calls. Since maintaining jointly such centres is in the interest of all network operators, one could rely on voluntary agreements to settle the sharing of their costs. If the intervention of the NRA is required for bringing about such an agreement, this should be accomplished outside the USO compensation mechanism. Again, the NRA should take care that small players also have access to the services of these centres at a commensurate share of their costs.

4. Since special efforts need to go into the organisation of providing and funding network modifications needed for the offering of specialised services to users with disabilities and users with special needs, the NRA should consider installing a special USO fund to cover the cost of such efforts (e.g. in form of projects supported by most competitors).

5. The financing of specially targeted funding schemes (for example (virtual) voucher schemes) should strictly be accomplished within the confines and on the basis of the standard USO net cost determination. To proceed otherwise would be contrary to Community Law. It would also risk to lead to an amount of the cost of the USO which is higher than required as not all beneficiaries actually cause a net deficit, for example when their cost of service is particularly low and they generate enough (outgoing and incoming) call revenue to cover that cost.

6. The NRA is urged to allow that the incumbent operator restructure its tariffs in order to eliminate any existing access deficit. It would be inconsistent with the concept of the USO to make an access deficit a part of the USO net cost. The NRA should convince itself that making the operator offer targeted special tariff packages is an effective and efficient way of neutralising the negative impact of a restructuring of tariffs on certain user groups.



## II The approach to cost in the net cost calculation

### *The problem to be solved*

As stated above, the overall net cost of the USO to be compensated under a USO net cost sharing mechanism consists of the cost of service production avoidable if there were no universal service *minus* revenues forgone from these services *minus* the value of indirect benefits that flow from being a USO provider. Of these three components the avoidable production cost component is the most essential one and its determination is also the most demanding.

When carrying out the production cost determination we find that a separate costing exercise has to be accomplished for the provision of the following services:

- access to the network (subscriber lines),
- telephone services, and
- public pay phones.

These services would be the main sources of USO costs under a standard compensation scheme.

A set of criteria by which to determine the relevant costs of service provision has to be identified. That this is not a straightforward matter lies in the fact that most if not all telecommunications network operators do not possess cost accounting systems that are in a position to provide the needed information. In particular, the systems that are in place often generate cost data that do not properly reflect cost causation.

The first objective is therefore to clarify a number of conceptual and methodological issues, in particular regarding the cost standard to be used. Following that, practical issues regarding implementation of the cost standard have to be discussed, in particular regarding a situation where the data base that can be supplied by the network operator exhibits the mentioned deficiencies. In addition questions regarding network structure that have implications for the allowable level of costs are to be addressed in this context.

Finally, a methodology for cost determination will be presented and a list of steps that should be followed by the NRA to obtain the necessary information to carry out the cost determination.

### *The Long-Run Incremental Cost standard and the requirements to be met by costing procedures*

Firms facing vigorous competition in their markets must adhere for their pricing on the cost standard of Long-Run Incremental Cost (LRIC) in order to survive and prosper. This is the standard set by an efficient operator using current technology, and which

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assures that a firm cannot be out-performed by its competitors in terms of its prices and quality. From the point of view of the competitive standard, implying the efficiency of the market process, the proper standard for the costing of USO services is therefore that of LRIC.

The EU regulations require that the costing of USO services must comply with the principles of non-discrimination, transparency and objectivity. Further achieving economic efficiency is a major objective of any regulatory provision. It is for this reason that the Interconnection Directive requires the application of forward-looking costs, a requirement which the LRIC standard fulfills. At the same time, another important objective is, however, the practicability of the approach to cost determination.

The objectives underlying the above requirements are as follows:

*Efficiency and non-discrimination:* Requiring determination of the cost of USOs on the basis of a cost standard reflecting efficient operation assures that this cost corresponds to the cost under a competitive standard. If compensation payments for the cost of USO provision are calculated using a standard that does not fulfill the efficiency requirement, the contributors to the compensation will effectively subsidise the USO provider. Therefore, to avoid discrimination between market participants in the financing of USOs, contributions into a USF (by "paying only"<sup>5</sup> contributors) must be required to be based on costs of USOs that correspond to efficient provision. As pointed out already, this implies the application of the proposed forward-looking LRIC cost standard.

*Practicability:* For determining the cost of USO services, the NRA must have at its disposal the proper instruments of evaluation, and proper information and data bases. The proper cost accounting approach for the purpose is current cost Activity-Based Costing (ABC) but so far European telecommunications network operators have only implemented such systems very occasionally. This should, however, provide no justification to rely on data from existing Fully Distributed Cost (FDC) accounting for reasons of practicability. Instead of using FDC data, it is more consistent with regulatory objectives - and at the same time more practical - for the NRA to require data from special studies and in particular use analytical cost modelling of its own.

*Transparency and objectivity:* In the process of determining proper cost measures for the costing of USOs the aims of transparency and objectivity should be ensured. Transparency means that the procedures followed should not be too complex. Objectivity in determining USO costs means that the best available approach is used when approximations to unobservable realities have to be made. Since such approximations always involve judgements which may not be completely free of subjective bias, it should be the aim to make the process of costing as visible and transparent as possible in order to discover and eliminate such bias.

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5 For a discussion of the terms "play" and "pay" see footnote 2.

Despite the general acceptance of the goals of the liberalisation process and despite the fact that the above requirements have always played a substantial role in all policy issues regarding telecommunications, it would be safe for the NRA to prepare itself regarding upcoming questions in the present context on the basis of the following recommendations. The detailed discussion and the arguments supporting these recommendations are found in Section 2.2 of the main text.

#### ***Recommendations 7 to 10***

7. There is a need for the NRA to familiarise itself thoroughly with the implications of the requirements of efficiency, non-discrimination, transparency, objectivity and practicability on the costing of USO services. In this context, the applicability of the cost standard of Long Run Incremental Cost (LRIC) proposed in this study should generally be established as the correct one. The NRA should uphold in particular the forward-looking character of the LRIC concept (in agreement with the Interconnection Directive).
8. Non-discrimination requires that contributors into the USF for the financing of USO services are not paying more for these services than would be payable if the services were provided under competitive conditions. The NRA's goal should therefore be to apply a standard for the costing of USOs that meets this demand. The cost standard best suited for the purpose is that of LRIC.
9. One prerequisite for ensuring the legitimacy of necessary compensation payments is a complete transparency of the process of USO cost determination. It should be one of the aims of the NRA to install a procedure that assures this condition.
10. The NRA would need to have the expertise at its disposal to set itself in the position to judge - objectively, by itself and using only criteria that correspond to the NRA's mission - the justification of presumed cases of uneconomic services and the size of the deficits submitted by the USO provider with the claim for compensation.

#### ***Cost accounting issues***

Cost accounting procedures with regard to the costing of USO services should command prime regulatory attention. Cost accounting involves the handling of issues which have substantial impact on the level of costs eventually measured. The following are the main issues on which the NRA must itself form an opinion and establish appropriate rulings:

*Cost accounting practices:* The traditionally used Fully-Distributed Costing (FDC) approach is increasingly criticised for its inadequacy for managerial as well as regulatory purposes as FDC data generally are not based on the underlying cost causation processes. Rigorously applied Activity-Based Costing (ABC) is the right approach for

applying the standard of Long-Run Incremental Cost (LRIC) as it not only reflects cost causation but also picks up only those costs that correspond to efficient provision. A large majority of incumbent USO providers are, however, as of the present, still far away from having installed such an ABC system. Even in those cases where operators report being in the process of establishing ABC costing, it is doubtful that their efforts will already have gone all the way toward setting up what above is called *rigorous* ABC costing. In such cases, it may be necessary to reject cost figures even if they come from ABC systems, for example if they still reflect inefficiencies. Also in such cases, in lieu - or as an extension - of the existing ABC systems, analytical cost models can offer valuable assistance. Such cost models determine the costs of service provision bottom-up, including only those cost components that are necessary under conditions of efficient service provision.

*Current vs. historical input prices:* Traditionally, network operators have based their costing systems on the historical prices of the inputs used in the production process. In the past years with emerging competition and new operators using modern equipment with much lower costs, the inadequacy of historical cost accounting with regard to pricing decisions has become obvious. At the same time there has been an increasing regulatory requirement to apply the competitive efficiency standard to prices and costs, which means that according to a forward-looking concept, pricing decisions should be based on the current replacement costs of assets. From this follows a need for network operators to move from Historical Cost Accounting to Current Cost Accounting (CCA).

*Network costs due to depreciation:* In a capital-intensive sector like telecommunications the method to determine an appropriate amount of depreciation is one of the central strategic parameters in the area of cost accounting. From a regulatory and efficiency point of view and especially with regard to the determination of USO costs, a depreciation method is preferable which is as closely as possible in line with the method of economic depreciation. This method takes into account changes in the prices of the equipment invested as well as expected changes in the demand for the output generated by the equipment.

*The cost of capital:* The cost of capital (CC) - or rather the rate of return on capital employed - that the network operator will be allowed to earn on account of the services it supplies under the USO has also a great impact on the level of overall costs. The CC is to be derived as a weighted average of the rate of return that shareholders require on their shares in the company and the rate of interest that the company pays on its debt. An important component in the former is the risk premium to be included according to the network operator's overall risk. This risk premium and the weights that the two CC components have in the overall measure require regulatory determination. Given that costing is to be carried out on a CCA basis, the CC should be on a real rate basis, i.e. with the inflationary component taken off from the nominal rate.

*Operating, maintenance and administrative costs:* There does not exist much detailed factual information accessible to external observers on the costs of operating, maintaining and administering a telecommunications system. Therefore, the NRA must order the regulated firm to provide it with information that is as detailed as possible. If not available from an ABC system, studies should be carried out with the objective to provide such information according to the standards of ABC costing. The data submitted should document that the costs correspond to an efficient operation, maintenance and administration of the network in question. Further, it should be required, following the principles of ABC costing, that as little as possible of the total costs is left in the category of residual unattributable common costs.

*Treatment of sunk costs:* An important aspect of capital investment in telecommunications is the issue of sunk costs. There are sunk costs if there are capital items which have no alternative use and which have not yet been amortised. In particular when there has been investment in capacity which has become redundant, the network operator may argue that it should be allowed to include the extra burden in its prices and USO deficit figures. Such a deviation from the proper costing of USO services should, however, not be allowed. The USO provider should have had the opportunity to apply special depreciation charges on such sunk investment in the preparatory phases to the establishment of full competition. As regards *uneconomic* customers in an *economic* area that the USO provider would not have been able to identify beforehand, the net costs of serving them under the USO do not include the sunk costs of the local network since this cost is not avoidable. Pensions due to employees for which no proper reserves were built up in the past, as another category of sunk costs, are also not part of the costs of current service provision and in particular not of the cost of the provision of USO services.

*Treatment of common cost:* The proportion of total costs that on the basis of a thorough analysis shows no causal link to a service is the true common cost as it does not vary with the level of activity of the firm. Accordingly, the true common cost does not change if a network operator discontinues to serve specific areas or customers. Thus it is not part of the LRIC of USO services.

The detailed discussion underlying the above summary is found in Section 2.3.1 of the main text, with digressions on depreciation policies in Appendix A and on the sunk costs due to pensions in Appendix B. This discussion leads to the following recommendations:

#### **Recommendations 11 to 16**

11. There is a need for the NRA to be aware of the impact of cost accounting issues on the level of the costs of USO services. In particular, the NRA should be aware of the status of the cost accounting system of the USO provider. It should not be prepared to accept cost figures for USO services on the basis of a traditional FDC costing

system. Instead it should insist on the establishment of an analytical cost accounting system based on rigorously applied ABC principles.<sup>6</sup>

12. Since analytical cost models (in lieu or as an extension of an analytical cost accounting system) are quite powerful, even if no specific data from the network operator are available, the NRA should decide to use such an instrument for its own independent assessment of the costs of USO provision.
13. The choice of the depreciation regime has great influence on the costs shown for a capital intensive industry like telecommunications. For this reason, there is a need for the NRA to familiarise itself thoroughly with the implications of different depreciation practices. In this context, the NRA should in particular familiarise itself with the issues concerning Current Cost Accounting vs. Historical Cost Accounting. The former is the one used in rigorously applied analytical costing for the costing of capital items.  
The NRA should accordingly discuss with the USO provider the appropriateness of the depreciation policies that affect the costs of USO services.
14. There is a need for the NRA to familiarise itself thoroughly with the implications of sunk costs. Sunk costs that are due to inefficient and redundant investments in the past are not costs of the USO and should therefore not be covered by a USO compensation scheme. The NRA should impress on the network operator that it has itself the responsibility to take care of such sunk costs through special depreciation charges or through other arrangements, which, however, would not be allowed to affect the costing of USO services.  
Furthermore, sunk costs due to investment for services, that at the time of investment could not be identified as uneconomic, for example service to particular customer groups in economic areas found later to be uneconomic, do not qualify to be included with the costs of USO services, as these investments would also have been made under competitive conditions.  
Finally, sunk costs due to inappropriate past pension plan policies are not costs of current service provision, in particular not of the provision of USO services.
15. External observers know very little about the variable costs of a local network, since they are mainly costs of personnel for operations, maintenance and administration. The NRA should insist that these costs are provided to it according to the standards of ABC costing. If an ABC costing system has not yet been installed, the USO provider should be requested to carry out specialised studies designed to provide the data on a representative sample basis.

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<sup>6</sup> The NRA should not accept the possible argument that the cost of establishing such a costing system should be made part of the cost of the USO. In their future competitive environments, all network operators will need such powerful cost accounting systems for their own purposes, independent of any requirements under the USO.

16. The residual common cost is that share of total costs that remains after all costs caused in the long run by identifiable services are properly assigned on the basis of ABC costing. By definition, none of that cost would decrease or increase if USO services were discontinued or added on. The NRA must not allow that any part of this residual common cost be included in the costs of USO provision.

### *Issues relating to (local) network structure*

One of the aspects of a forward-looking approach to regulation of dominant network operators' prices and also, in particular, to determination of a USO deficit is that the underlying assessment of the costs is based on a state-of-the-art network structure. In the following we will summarise our insights on the questions of which network structure should be the basis for the assessment, how cost savings through non-USO services should be taken into account and how the appropriate size of a USO area should be determined:

*Most recent available vs. most recent employed technology:* Regarding the choice of the best technology, a telecommunication operator must often find the right balance between the one that is proven and reliable and represents more or less the current state of the art, and the one that is new, perhaps revolutionary, promising great cost savings but has not yet demonstrated conclusively its strengths. As costs of telecommunications services and in particular costs of USO services depend on the type of equipment used, the NRA should decide that the cost of efficient USO provision is calculated on the basis of the least-cost technology. In a decision problem of the kind mentioned the NRA should specify as least-cost technology a technology that is in actual use and not one that exists already but is not yet in use.

*Optimal vs. existing structure of local network:* Corresponding to the question of least-cost technology the question arises on the basis of which network structure USO costs should be calculated. Conceptually, there is no doubt that again the least-cost solution of an optimal network structure should be applied. Cost differentials that are at stake may run from 5% to 10%. In many cases, however, an informational problem will arise as the network operator will be much better informed about the implications of network optimisation than the NRA. In those cases the NRA should consider to insist on a costing of USO services on the basis of a least-cost network design only if the expected cost differential at stake is of a significant magnitude.

*Cost savings through non-USO services:* A local network is typically not designed to provide exclusively those services covered by the definition of universal service. Others can be leased line services, data transmission, or broadband delivery services. Cost savings occur, when the same facilities are used for either services. The way and the degree in which the underlying equipment costs are shared between the services needs a careful examination. The USO provider should be required to supply data from which

the extent of cost sharing between USO and non-USO services can be ascertained. If this cannot be demonstrated on the basis of an analytical cost accounting system, factual information should be provided that would allow to determine the cost savings by way of analytical cost modelling.

*The appropriate size of a USO area:* It is inherent in a network operator's planning of local networks that at the time of planning no consideration is given to the question of whether individual subscribers would be economic or not. The decision unit is always a larger segment of the network in question. So any network segment to be classified by the NRA whether being economic or not would have to require some minimum network configuration about which the operator can be expected to make a separate investment decision. The size of the area should on the other hand also be limited from above. Otherwise calculations of the USO net cost could risk to be very unreliable when potential competitors find it attractive, for example, to pick up a subset of profitable subscribers within a larger uneconomic area. Applying these principles, the appropriate area potentially to be classified as uneconomic appears to be a local exchange area which is directly served either by a parent local switching centre or by a remote concentrating/switching unit. In the relevant cases it delineates areas from a few hundred to a few thousand subscribers. Defining geographies as USO net cost areas that somehow combine (parts of) different exchange areas or even (parts of) different local networks should not be acceptable for the reason that they would give rise to arbitrary cost allocations and probably lead to cost figures in excess of what would be legitimate.

The detailed discussion reflected in above summary is found in Section 2.3.2 of the main text. It leads to the following recommendations:

#### ***Recommendations 17 to 20***

17. The NRA should insist that the costs of USO services is always calculated on the basis of the least-cost technology. The NRA should specify as least-cost technology a technology that is in actual use and not one that exists already but is not in use.
18. As regards network design, the NRA should require that the local network cost of serving uneconomic areas be on the basis of the optimal design of local networks, as this would be the proper approach based on LRIC. The NRA should, however, be mindful that it may not be in a strong position to argue conclusively with the network operator on technical questions as to what the optimal design of a local network should be. In such cases the NRA should insist on the cost of an optimal structure depending on the likely magnitude of the difference in costs.
19. The NRA should request the USO provider to supply data from which the extent of cost saving due to cost sharing between USO and non-USO services can be ascertained. The data should either come from the operator's analytical cost



accounting system or, if not available in this form, as factual information that can be used in analytical cost modelling.

20. The NRA should define an exchange area served by a parent switch or by a concentrating/switching unit as the proper extent of a USO net cost area. It is the minimum area to warrant separate investment decisions. It is also not too large so that some stability in the composition of customers in the area is assured despite the activities of competitors. The NRA should not accept other geographical boundaries for a USO net cost area as these risk to lead to arbitrary cost allocations and to cost levels of the USO that are unwarranted.

### *Methodologies for cost determination and steps to be undertaken by the NRA*

As already pointed out, most network operators have currently not yet installed a rigorous analytical cost accounting system of the ABC type. In these cases the NRA has to look for an alternative approach to cost determination. The NRA can either use analytical cost modelling carried out under its auspices or ask the network operator to provide figures obtained on the basis of analytical studies and statistical data collected for the purpose. In the following, we summarise the main principles of the two approaches. In addition we report on some benchmark calculations with a specific analytical cost model:

*Cost studies performed by the network operator:* When the network operator delivering USO services has no analytical cost accounting system installed but is requested to establish the avoidable costs for these services, it should be required to carry out special studies and use an adequate methodology to assure cost data that correspond to efficient service provision. The data should essentially cover the costs for uneconomic areas, uneconomic customers and uneconomic pay phones according to the different cost drivers and types of costs.

*Volume data requirements:* The direct net cost of universal service (to be dealt with in Section IV of this Executive Summary) will be the difference between relevant costs and revenues from uneconomic customers (Section III). To be able to determine the necessary total cost figures (which are generally derived as products of volume times unit cost), the NRA should require the USO provider to submit the necessary volume figures, i.e.:

- the number of subscriber lines of uneconomic customers in economic areas classified according to the actual cost per subscriber that could be avoided,
- volumes of business and residential local, national and international calls at different times of the day,
- volumes of interconnect calls, outgoing and incoming, at different times of the day.

The volume data requirements correspond to those for analysing revenues foregone (which like costs are also generally derived as products of volume times unit price, see Section III below). The volume data should be collected jointly for both purposes.

*Data verification requirements:* The data supplied by the USO provider will have to be verified whether they reflect rigorously applied ABC principles for proper cost assessment, in particular:

- a strict application of the forward-looking LRIC standard;
- use of Current Cost Accounting;
- use of the proper depreciation policy;
- use of the proper cost of capital;
- inclusion of no more capacity reserves as required for accommodating realistic future demand;
- inclusion of services not falling under the USO to catch the effects of shared use of facilities on incremental costs;
- incorporation of access, switch and transmission technology that either is the cost minimising one for the exchange area in question or, if this is the regulatory perspective taken, of the technology currently used by the operator.

Besides being verified on the basis of these principles, they should be checked against the results obtained from the analytical cost models. Any significant discrepancy should be taken up with the operator and reconciled in a way that to the satisfaction of the NRA the proper cost figures are determined. In particular, cost deductions would most likely have to be imposed if the cost data come from an FDC system adjusted to reflect cost causation but still also reflecting all the implied inefficiencies inherent in that approach. These deductions may have to run up to 30 %.

*Local network analytical cost modelling:* The application of an analytical cost model provides the NRA with independent information about the cost that an efficient USO provider would have to incur. These cost estimates can be contrasted with the data presented by the current provider. An analytical cost model should be in a position to model various network elements in a transparent and understandable manner. It should be possible to clearly identify line dependent and usage dependent cost elements. It should offer the NRA a high degree of freedom regarding the adjustment of input data according to its specific needs. This also enables the NRA to carry out a detailed sensitivity analysis to assess the impact of the various cost drivers on average and incremental cost. The model should offer the opportunity to perform calculations exclusively with data taken from the public domain for cases in which requested data are slow to be provided by the network operator, or for the purpose of contrasting cost figures from the operator with independently derived results. The model should further be in a position to capture the diversity of actual exchange areas, e.g. regarding the actual distribution of subscribers in the areas and the corresponding concrete topology of the network, in order to avoid calculations based on the simplifying assumptions of uniform population density or equal loop length. Working models and tools are already available to

meet these requirements, though they must be adjusted to deal with specific national circumstances.

*Benchmark calculations with a specific local network analytical cost model:* Sample calculations have been carried out as part of this study with a concrete analytical cost model demonstrating that such models can be used to estimate the relevant LRIC. The calculations cover access over a subscriber line and local network traffic. The required data for running the model (in particular prices of inputs) come from the public domain. As far as country specific inputs are concerned (e.g. labour and excavation), we differentiate between high wage and low wage countries. The following results were obtained: In case of a country with high labour costs, average monthly subscriber line costs fall in a range between 15.5 ECU for very low and 7.5 ECU for high subscriber density networks, and in the case of a country with low labour costs, correspondingly in the range between 9.7 and 5.1 ECU. As regards the costs of local network use (largely local calls), in the case of high labour costs, the cost per minute falls in a range between 1.26 cents and 0.2 cents of an ECU, and in the case of low labour costs, correspondingly between 0.8 cents and 0.1 cents, depending on the size of the local network and the density of subscribers. When considering these cost levels, it should be kept in mind that some of the cost estimates must be considered conservative, as they are based on data for current operating expenses derived from the records of former monopolist incumbent operators and therefore still reflect the corresponding inefficiencies, and as they assume no cost sharing between USO and non-USO services.<sup>7</sup>

The above methodological discussion is presented in detail in Sections 2.3.3 and 2.3.4 of the main text, and in Appendix C which is a digression on local network analytical cost modelling. This discussion leads to the following recommendations:

#### **Recommendations 21 to 23**

21. The NRA should place data requirements on the USO provider enabling it to determine the cost of efficient USO service provision. These data requirements should comprise appropriate unit costs as well as USO service volumes to be able to generate relevant total cost figures. Cost data should be based on the LRIC standard. Since a rigorously applied analytical cost accounting system will probably not be available, cost information should be based on special studies using high

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<sup>7</sup> We emphasise again that the above figures are estimates based on model calculations. They provide what we consider realistic estimates for ranges of costs for the two service categories in question, given different labour cost levels and densities of networks. In concrete cases, estimates would have to be derived on the basis of a model adjusted to the particular country using input data that reflect the real cost situation as closely as possible. The cost estimates are for retail services as the focus of this study is on the cost of services brought to the final customer. They include customer specific costs and are for combinations of network components different from those required, for example, for interconnection services at the local level.

quality sample data. The NRA should verify the cost data submissions as to whether they reflect rigorously applied ABC principles for proper cost assessment.

22. The NRA should carry out benchmark calculations with an analytical cost model of its own. The model used should incorporate the accounting standards necessary to get an estimate of an efficient provision of service. Even if the number of areas to be covered is large, the effort to calculate the cost of subscriber lines and calls for each of the prospective uneconomic areas would be moderate. Most of the data required for this costing exercise are normally in the public domain.
23. There is a need to exercise great care in the determination of the cost of USO service provision and for this purpose in carrying out the tasks listed above. The NRA will need to have sufficient expertise for this at its disposal and, if necessary, should seek to obtain assistance from outside.

### III The approach to revenue in the net cost calculation

#### *The problem to be solved*

If customers deemed to be uneconomic were disconnected or public pay phones withdrawn, revenues would be foregone. When analysing whether areas, categories of customers or public pay phones create a universal service cost (i.e., a direct net cost), revenues foregone must be set against long-run avoidable costs.

Our discussion of these issues, summarised above and presented in more detail in Section 3.1 of the main text, leads to the following recommendations:

#### ***Recommendations 24 to 25***

24. As unit of analysis for revenues foregone, the NRA should define exchange areas, customer categories (by tariff options or special schemes, beneficiaries of voucher schemes where applicable, bill segments, etc.) and public pay phone categories (by revenue segments and/or types of area).
25. Data on revenues foregone should be provided for each potentially uneconomic area, each potentially uneconomic category of customers and public pay phones. Information on areas, categories of customers and public pay phones that the USO provider considers to be economic from the outset could be provided in more aggregate form.

### *Revenues foregone of areas, customer classes, and public pay phones*

Revenues foregone for each (potentially uneconomic) area include revenues from access and outgoing calls billed to customers in that area, revenues from incoming calls billed to customers in other areas, revenues from called-party-pays calls billed to customers in other areas, and interconnect revenues billed to other operators for transporting calls to and from that area. However, the full amount of those revenues would not be foregone if the area were disconnected from the network. Some of the calls from and to disconnected lines in that area would be replaced by calls from or to lines (or public pay phones) in other areas. Revenues from such replacement calls have to be deducted from the revenues above since they reduce the amount of revenue foregone.

The corresponding calculation would be as follows:

	Access and outgoing call revenues
+	Incoming call revenues
+	Called-party-pays revenues
+	Interconnect revenues
-	Revenues from replacement calls
<hr/>	
=	Revenues foregone if an area were disconnected

For details regarding the above derivation, see Table 3.5-1 in the main text. In this table it can in particular be seen how the not directly observable revenues for incoming calls and replacement calls are estimated.

Similarly, revenues foregone for each category of (potentially) uneconomic customers include access and outgoing call revenues billed to these customers, incoming call revenues billed to other customers, interconnect revenues and called-party-pays revenues. Again, revenues from replacement calls have to be deducted to arrive at the amount of revenues foregone if a customer of the particular category were disconnected.

Finally, when looking at the universal service costs of public pay phones, revenues foregone have to be set against avoidable costs. Revenues foregone include outgoing call revenues collected and called-party-pays revenues.

The discussion of the approach, as summarised above and presented in detail in Sections 3.2 to 3.4 of the main text, leads to the following recommendation:

**Recommendation 26**

26. The NRA should request the USO provider to submit data on access and outgoing call revenues, incoming call revenues, interconnect revenues and called-party-pays revenues for each (potentially) uneconomic area, each customer class and, to the extent required, for each category of public pay phones. If data are not available on an area-by-area basis, by customer class and by pay phone category from the USO provider's records, estimates should be prepared on the basis of information as discussed in detail in the main text and according to the example developed in Table 3.5-1.

**IV Net costs of USOs***The problem to be solved*

After the determination of the avoidable costs of USO service provision and of corresponding revenues foregone, it remains to derive the resulting net costs. For this, two steps are required, first deriving the *direct* net cost by deducting from costs of USO services the relevant revenue figures, while taking care that no double counting occurs, and second, to deduct from the resulting figure the value of the indirect benefits that are flowing to the USO provider due to this status, to obtain the *overall* net cost.

*Determining the direct net cost of uneconomic areas, uneconomic customers, and of uneconomic public pay phones*

*Uneconomic areas:* For the calculation of the direct net cost of an uneconomic area, two steps are needed. In the first step potentially uneconomic areas are identified by determining the *simple* difference between costs and revenues, i.e. before elimination of double counted incoming call revenue. This is done as follows:

- Average cost of access per subscriber line *times* number of subscribers
- + Average minutes of outgoing calls per subscriber line *times* cost per minute of calls (each for local, long-distance, and international calls and differentiated according to relevant time zones) *times* number of subscribers, net of the cost of replacement calls
- + Average minutes of incoming calls per subscriber line *times* cost per minute of calls (differentiated as for outgoing calls above) *times* number of subscribers, net of the cost of replacement calls
- + Average minutes of interconnect calls per subscriber line *times* cost per minute of calls (differentiated according to relevant time zones) *times* number of subscribers, net of the cost of replacement calls

+	Average minutes of called-party-pays calls per subscriber line <i>times</i> cost per minute of calls (differentiated according to relevant time zones) <i>times</i> number of subscribers, net of the cost of replacement calls
-	Revenues forgone if the area were disconnected
<hr/>	
=	Net cost avoided if the area were disconnected

For details regarding the above derivation see Table 4.2.4-1 in the main text. In this table it can in particular be seen how the not directly observable costs of incoming calls and replacement calls are estimated.

In the second step double counted incoming call revenue has to be eliminated. Double counting occurs because revenues from incoming calls that are themselves coming out of uneconomic areas are counted there already as outgoing calls and included in outgoing call revenue. Since the double counted component can only be known with sufficient precision after the uneconomic areas are clearly identified and since for this identification the double counted component should itself be known already, an iterative procedure is called for. The aim of this iterative procedure is to identify those areas with initial surpluses - *potentially* uneconomic areas - which turn into *actual* uneconomic areas upon adjustment due to double counted income.

*Uneconomic customers:* The first step of determining the simple difference between costs and revenues of the various uneconomic customer categories in economic areas is identical with the first step in respect of uneconomic areas. In the second step again an iterative procedure identical to the one described before is performed in order to eliminate double counted call revenues between uneconomic customer categories. In this procedure care has to be taken to take those potentially uneconomic customers out of consideration that live in uneconomic areas as their net costs have already been included in the net costs of these areas.

*Uneconomic pay phones:* Potentially uneconomic public pay phones should be identified and grouped according to relevant distinguishing demand or cost characteristics which may be that they are prone to vandalism or are located at places where they can generate only low average revenues. The avoidable direct net cost of the types of pay phones identified will then be calculated as follows:

	Average cost of the relevant type (or subtype) of public pay phone <i>times</i> number of pay phones
+	Average minutes of outgoing calls per pay phone <i>times</i> cost per minute of calls (each for local, long-distance, and international calls and differentiated according to relevant time zones) <i>times</i> number of pay phones
-	Revenues forgone if service over these pay phones were discontinued
<hr/>	
=	Net cost avoided if pay phones were eliminated from the network

The direct net costs of uneconomic areas, uneconomic customers and uneconomic public pay phones determined in the way described above sum up to the total direct net cost of the USO provider.

Taking note of the complications in the process of determining the net costs of uneconomic areas, customers, and public pay phones, discussed in detail in Section 4.2 of the main text, we submit the following recommendations:

**Recommendations 27 to 29**

27. While the calculation of direct net cost of uneconomic units (areas, customer categories in economic areas, public pay phones) may essentially appear as a routine matter after the determination of their costs and revenues, care must nevertheless be exercised regarding a number of aspects. In particular, it must be assured that costs and revenues match in terms of underlying measures (same number of subscribers, volumes of calls, etc.), that double counting of costs and revenues is avoided, and that there is no redundancy of work due to an inappropriate order in which the operations are carried out.

28. Specifically, the NRA should make sure that:

- uneconomic areas are determined first, as their total number may heavily be influenced by the adjustment to be made for double counted incoming call revenue, and as all the uneconomic areas should be known when the calculations for uneconomic customer categories within economic areas are carried out;
- when uneconomic customer categories within economic areas are determined, those living in uneconomic areas, and thus having already been accounted for, should be excluded from the count early in the process of carrying out the work.

29. Tables 4.2.1.2-1, 4.2.2.2-1, and 4.2.4-1 in the main text have been prepared to serve as examples for the detailed steps to be carried out. The discussion that goes along with these tables should serve as guideline regarding the handling of the different aspects discussed above.

*The indirect benefits of the USO*

In order to determine the *overall* net cost of USO services, it must be taken into account that a USO provider benefits from several indirect effects brought about by this status. The following effects need consideration:

*Life cycle effects:* The life cycle effect refers to the effect of basing a decision on the net present value (NPV) of the business proposition in question, instead of on the current difference between costs and revenues. In the present context, the business proposition would be to serve particular areas or customer groups or to maintain pay phones, taking



into account the NPV of the expected business over the relevant future period. If areas, customer categories and pay phones, that appear uneconomic according to the current difference between costs and revenues, can be expected (following a suggestion by the British regulator Oftel) to turn economic within five years, they should be considered economic from the beginning. For this purpose, projections over this future period of both costs and revenues have to be made and the decision be taken on the basis of the difference between the sums of these cost and revenue streams discounted to the present time. One should essentially use standard investment project evaluation techniques for the purpose. In particular one would need projections of demand over the relevant future. The possibility of properly applying life cycle effects to the various categories of uneconomic customers and public pay phones depends heavily on the capability of the network operator to provide data that allows the identification of those categories of customers/pay phones that may possibly be economic in the long run. It will further depend on the evaluation of whether the category for which this is true is a large enough fraction so that it would be worthwhile to continue serving the whole group. From the NRA's point of view, in the absence of the information necessary for carrying out this evaluation, the whole group of each of uneconomic customers and pay phones according to the direct net cost measure should be classified as economic. As regards areas, each of them found uneconomic according to the direct net cost calculation should be examined according to whether they would remain so taking the development of cost of service delivery and revenues over the next five years into consideration and carry out the calculation on a NPV basis. It should be expected that a large share of areas found uneconomic on account of current net cost will be classified as economic when examined on an NPV basis. The sorting of uneconomic areas and customers, taking into account double counted incoming call revenue (see above), should be carried out *after* the life cycle tests has filtered out the areas and customers that on an NPV basis are not uneconomic.

*Enhancement of corporate reputation:* Being the USO provider is generally well reputed so that for this reason one should expect the USO provider to gain an enhancement of its corporate reputation. This would not be a marginal effect. If there is no other indicator, one should use as a measure of the benefit a percentage of the USO provider's advertising and marketing budget, like the 20 % share of BT's corresponding expenditure used by Oftel, or a share of the turnover of the USO provider, which, to correspond to the 20 % of the advertising and marketing budget, would in the BT case have been 0.65 %. The NRA should initiate consumer research in order to measure directly to what degree customers extend a greater loyalty to the USO provider, and what commercial benefit the latter derives from this greater loyalty. It should be expected that the results would yield a substantially larger benefit in terms of enhanced corporate reputation than is expressed by a 20 % share of the advertising and marketing budget or a 0.65 % share of the USO provider's turnover.

*Ubiquity:* A provider being ubiquitously present in a given country enjoys a substantial marketing benefit. It is a benefit that only the incumbent operator currently enjoys. It

comes into play in particular when customers are moving and they know that they can order telephone services from the incumbent operator nation-wide. They may then not go to the trouble of finding out whether there are competing providers of local network services and more or less automatically take services again from their old provider. This benefit is predominantly related to the incumbent being a large, well-established, market dominant, national operator. The fact that the incumbent operator is also the USO provider adds only very little to it. If the incumbent ceased to serve uneconomic areas, only in respect of the very small fraction of people moving out of uneconomic areas into economic areas - but only if the uneconomic areas are now being served by different USO providers - would there be an effect on these people's choices due to the change in the incumbent's ubiquity, as these people now know about alternatives. For everybody else there would be no change in their perception of the incumbent worthwhile taking into account. Thus, the incumbent would keep its reputation as ubiquitous provider very largely intact. The benefit resulting from it should not be set against the direct net cost when calculating the overall net cost of the USO.

*Access to full range of telephone usage data:* The incumbent network operator has because of its dominant market position a superior knowledge about how customers use the telephone. This is a significant marketing benefit. As is true in respect of ubiquity, this effect is primarily related to the incumbent operator being a large, well-established, market dominant, national operator. The fact that the incumbent operator is also the USO provider adds very little to it. If the incumbent withdrew services from uneconomic areas, customers and pay phones, it would lose only information that it does not value highly since, after all, it voluntarily gives up the relevant business. There should therefore be no deduction on account of this effect from the direct net cost when calculating the overall net cost of the USO.

*Advertising effect through public pay phones:* This effect should be considered as a non-marginal indirect benefit. Indicators for the corresponding value can relatively easily be ascertained through reference to the price for comparable advertising space in the relevant areas.

The arguments summarised above are developed in detail in Section 4.3 of the main text. They lead to the following recommendations:

### **Recommendations 30 to 33**

30. There is a need for the NRA to verify very carefully whether uneconomic areas, customer categories within areas, and public pay phones, are uneconomic over the relevant time period and not only on the evidence of deficits shown in current accounts. The NRA should make sure that the proper perspective is brought to bear on this evaluation. In particular:
- if areas, customer categories and pay phones can be expected to turn economic within five years, they should be considered economic from the

beginning;

- in respect of uneconomic customer categories in economic areas, if the USO provider is not in a position to identify those customers it would not serve, all the potentially uneconomic customers should be considered economic.

31. The NRA should organise the work for the determination of the USO net cost in a way to avoid redundancy of work, particularly as regards the test for life-cycle-effects and the elimination of double counted incoming call revenue.

32. Since the indirect benefit from USO provider status in terms of corporate reputation should be expected to be quite substantial and may in effect be of a magnitude to outweigh any direct net cost, there is value for the NRA to pay particular attention to this effect.

The proper value of the benefit that the USO provider draws from this status in terms of enhanced reputation can be ascertained on the basis of consumer research. Given the likely magnitude of this indirect effect, the NRA is urged to commission such research.

As long as the value of this indirect effect derived from properly designed consumer research is not available it is recommended to use as indicator a percentage of the USO provider's advertising and marketing budget or an appropriate percentage of the turnover of the USO provider, where we consider the latter measure to be the more appropriate one. For this, however, the NRA should rely on advice from advertising and marketing experts.

33. The effects of ubiquity and access to the full range of telephone usage data are predominantly related to the incumbent operator being a large, well-established, market dominant national operator, so that the effect due to being the USO provider is marginal. The NRA should not give this indirect effect much weight in the net cost evaluation. In contrast the advertising effect of uneconomic public pay phones should be considered as a non-marginal indirect benefit the corresponding value of which can relatively easily be ascertained.

## V Financing the net costs of USOs

### *Requirements for funding schemes*

If an overall net universal service cost exists, Member States can finance it out of general taxes or implement a specific universal service funding scheme to share the net cost among market players. In the report, we do not address general taxes as a means of financing USOs. It should, however, be noted that in terms of efficiency and market-neutrality, general taxes to which all tax paying entities contribute are preferable to specific universal service financing schemes to which only the telecommunications industry or parts of it contribute.

Our analysis demonstrates that specific universal service funding schemes must be designed with care. Unless appropriately specified, specific universal service funding schemes may

- have a damaging effect on economic efficiency;
- seriously distort economic incentives in the industry by favouring one use of telecommunications over others, integrated networks over interconnection, or one type of transmission technology over another;
- discriminate against the universal service provider or, alternatively, against competing operators with no USOs;
- discriminate against particular groups of market players such as new entrants that rely on interconnection;
- not satisfy practicability requirements and, hence, be difficult to apply;
- not satisfy the need for proportionality.

Above requirements are discussed in detail in Section 5.2 of the main text. They lead to the following recommendations:

#### ***Recommendations 34 to 38***

34. When devising specific universal service financing schemes, Member States should respect the goals of efficiency, market neutrality and non-discrimination, continuity of funding, objectivity and transparency, practicability, and above all, proportionality.
35. To minimise efficiency losses and ensure the continuity of funding, schemes should allocate the overall net cost of USOs across the broadest possible base of organisations allowed by Community Law, that is, all organisations operating public telecommunications networks and/or publicly available voice telephony services.
36. To avoid discrimination of market players and satisfy the need for market neutrality, schemes should
  - assess contributions in proportion to economic activity, that is, gross revenues before tax net of certain deductible expenditures;
  - be neutral with regard to provision of USOs;
  - not allow particular groups of market players to be exempted or to make discounted contributions unless justified by strong practicability reasons;
  - be structurally neutral, i.e., avoid double contributions on interconnect calls;
  - be neutral with regard to the services provided; and
  - be independent of the type of transmission technology used.

37. To ensure practicability of the scheme, the contribution to be paid by each operator should be higher than the administrative cost of assessing and collecting the contribution.
38. To meet the need for proportionality, financing schemes should not give rise to competitive distortions unless this is unavoidable for ensuring universal service objectives. On a more general level, it should be noted that the costs of a financing scheme in terms of efficiency losses, competitive distortions and administrative costs can be substantial. Given those costs, NRAs should not implement specific universal service financing schemes as long as it can be expected that the (incumbent) operator currently providing USO services will continue to do so as part of its competitive positioning without any need of compensation (see on this also Recommendation 1).

### *The case for a net revenues-based Universal Service Fund*

*Contributing organisations:* The EU framework allows Member States to share the net USO costs amongst all organisations operating public telecommunications networks and/or publicly available voice telephony services. Hence, organisations liable to contribute to a Universal Service Fund (USF) can encompass organisations that operate fixed public telephone networks and/or fixed public telephone services as well as public mobile telephone networks and/or public mobile telephone services. Organisations that according to the EU framework cannot be made liable to contribute to the fund include private network operators offering corporate networking, service providers offering data communications, value-added services or enhanced voice telephony services such as video-conferencing, voice mail services, and voice enquiry/reply services. Exemptions from the maximum scope of operators that can be made liable to pay contributions as defined in that framework must be carefully evaluated. They could unnecessarily narrow the basis of the fund and could violate the principles of non-discrimination and proportionality.

*Basis for assessing contributions:* The EU framework allows Member States to share the net cost of universal service amongst market players proportionate to a suitable measure of economic activity. Member States that implement a USF should carefully evaluate the compatibility of the measure chosen with the general requirements for a funding scheme described above. Gross revenues, call minutes, and number of subscribers do not meet the need for market neutrality and are discriminatory in a way that make them incompatible with Treaty rules. *Call minutes* are not neutral with regard to the type of calls provided; for example, a minute of a long-distance call would bear the same USO levy as a minute of a local call even though its value were higher. Furthermore, *call minutes* are not neutral with regard to the number of operators involved in carrying out a call; any allocation of call minutes between interconnecting operators is likely to be arbitrary. *Number of subscribers* would seriously disadvantage operators that predominantly serve low-volume users, such as households.

Contributions based on *gross revenues* would discriminate against new entrants that strongly rely on interconnection with the incumbent operator since any interconnect call would be charged twice.

Rather, the contribution base of each operator should be defined as follows:

- Gross revenues of operator, before taxes, from*
    - fixed voice telephony services
    - mobile voice telephony
    - wholesale services
    - interconnection services
    - leased line services
  - + *Internal revenues from providing network services within the company to business areas that provide value-added services, data communication services, corporate networking, etc.*
  - *Expenditures, exclusive of taxes, for*
    - wholesale services
    - interconnection services
    - leased-lines services
  - *Net revenues from uneconomic areas/customers/public call boxes, exclusive of taxes (deduction for universal service provider if regulatory constraints prevent it from passing on contributions to uneconomic areas/customers/ public call boxes)*
  - *Allowance of X*
- 
- = *Base on which to assess an operator's contribution to the USF*

*Gross revenues* in above calculation should include revenues from outgoing international calls (fixed and mobile). In turn, gross revenues should not include revenues from terminating incoming cross-border calls (interconnection revenues received from foreign operators, or payments received under the international settlement system). Also, expenditures for termination of calls in other countries (interconnection expenditures made to foreign operators, or payments made under the international settlement system) should not be made deductible. The reason is that operators and customers in one country should not subsidise the provision of USOs in another country. Operators and customers should only contribute to the USF in the country in which they are resident. Other options, where operators and customers in one country (indirectly) contribute to a USF in another country are likely to raise problems on a political level and are not advocated.

Network operators should also be charged a contribution on *internal revenues* from providing wholesale services and leased lines to business units within the firm that provide corporate networking, data communications and other value added services. This should be done in order to safeguard competitive neutrality since the network operators are assessed a contribution when they sell wholesale services or leased-lines to other providers of relevant telecommunications services.

Network operators' *expenditures for wholesale, interconnection and leased line services* should be deducted. These include already a contribution assessed at the source on the network operator that delivers them so that leaving them included would result in double counting.

*Net revenues from uneconomic customers* should not be included if regulatory constraints prevent the USO provider from passing on contributions to those customers. If such regulatory constraints exist, the universal service provider will have to spread the total amount of contributions to be paid over its economic customer base. With intense competition, this might not be fully feasible and problems for the financial viability of the USO provider could emerge. Hence, the universal service provider should be allowed to deduct net revenues attributable to uneconomic customers.

An *allowance* should be deducted to assure that small providers with an insignificant contribution base are not assessed to contribute to the USF. The allowance should be set at a level that no contributions are collected for which the administrative costs would be higher than what they are worth.

Net revenues from corporate networking and closed user group services, data communications, value-added services, and enhanced voice telephony services are not included in the above calculation of the contribution base. To do so would not be competitively neutral since the EU framework excludes *pure* providers of such services from contributions to the fund.

To ensure transparency, all operators liable to contribute to the fund should provide separated accounting information.

The case for a net-revenues based USF summarised above is developed in detail in Section 5.3 of the main text. The discussion leads to the following recommendations:

#### **Recommendations 39 to 41**

39. In principle, *all* organisations operating public telecommunications networks and/or publicly available voice telephony services should contribute to the fund. However, smaller operators whose net revenues are below a threshold level X should be exempted from contributions. Restricting the scope of contributing organisations to those above this threshold would strengthen the practicability of the mechanism and

keep administrative costs down. The disadvantages of an exemption would be small and justified by the administrative costs avoided.

40. Exemptions on other grounds add nothing to the practicability of the system while creating inefficiency and market distortions. Exemption of mobile telephony operators, in particular, would not be competitively neutral, distort investment incentives and discriminate against operators of fixed telephone networks, given that mobile and fixed telephony markets are converging.

41. Gross revenues, call minutes, and number of subscribers should not be used as a basis for assessing contributions since those measures violate virtually all neutrality requirements and are discriminatory in a way that make them incompatible with Treaty rules.

Contributions into a USF, in principle, should be based on gross revenues (before tax) net of expenditures for interconnection, wholesale services and leased lines (usually termed net revenues). Net revenues from uneconomic customers, however, should be excluded from the USO provider's contribution base if regulatory constraints prevent the USO provider from passing on contributions to those customers. Otherwise prices for the USO provider's non-USO services would have to bear a disproportionate share of the cost of the USO.

Net revenues is the only measure that meets the need for market neutrality and non-discrimination on the one hand and for practicability on the other hand.

### *Disadvantages of supplementary charges added to interconnection payments*

As an alternative funding scheme, the EU framework envisages a system of supplementary charges in addition to interconnection payments. With such an approach, the USO provider shares its net USO cost with other operators interconnecting with its network. Whereas interconnecting operators pay an explicit supplementary charge in addition to their interconnection payments, the universal service provider implicitly charges a share of the net USO cost to itself. The traditional understanding is that supplementary charges are based on the number of access minutes provided by the universal service provider to interconnecting operators. The universal service provider implicitly contributes on the basis of the number of call minutes of its customers.

In general, a system of supplementary charges added to interconnection payments is inferior to a USF. It creates inefficient incentives to avoid interconnection and violates market neutrality requirements with regard to market players, services, technology, and vertical structure, in particular, if supplementary charges are based on call minutes. Call minutes are not a proper measure of market activity and are discriminatory in a way that make them incompatible with Community Law. Furthermore, if competitors bypassed the USO provider's network, the continuity of funding would be endangered. Finally, a system of supplementary charges ties provision of USOs to the market dominant



operator and does not maintain the option of putting USOs out to competitive tendering in the future.

As an alternative to call minutes, supplementary charges to interconnection payments could be based on net revenues as defined. A net revenues based allocation of the cost of USOs among the USO provider and interconnecting operator would be less distortionary and meet the neutrality requirements to a greater extent than call minutes.

The above discussion, developed in more detail in Section 5.4 of the main text, leads to the following recommendations:

***Recommendations 42 to 43***

42. Given the problems involved in a system of supplementary charges to interconnection payments, such a scheme can only temporarily be justified in the immediate aftermath of full liberalisation, i.e., in a situation normally marked by the following characteristics:
- There is one dominant operator in the market.
    - All organisations providing public telecommunications networks and/or publicly available voice telephony services are interconnecting with the market dominant operator (with the exception of non-facilities-based resellers which, by definition, do not interconnect but buy wholesale services).
43. If a Member State temporarily applies a system of supplementary charges, the following requirements should be met:
- USOs should be solely imposed on the market dominant operator.
  - All operators interconnecting with the universal service provider should contribute to the funding of universal service. There should be no exemptions for particular groups of interconnecting operators such as mobile telephony operators.
  - The overall net universal service cost should be allocated among the universal service provider and interconnecting operators on the basis of net revenue. In contrast, because of their distortionary and discriminatory nature, call minutes should not be used as a bases for allocating USO costs between the USO provider and interconnecting operators.

*Costing and Financing Universal Service Obligations  
in a Competitive Telecommunications Environment in the European Union  
- Study for DG XIII of the European Commission -  
Bad Honnef, October 1997*

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# 1 Overview

## 1.1 Background

Before the liberalisation of the telecommunications market in the European Union, telecommunication services were widely provided as monopoly services by public telecommunications operators. As a consequence the operators' business policy was largely determined by political decisions. In particular, the provision of universal services as well as prices and quality of the services were part of the operators' performance as public enterprises. Insofar as these services caused losses they were financed by internal subsidies within the firm. Hence, there was no need to calculate the burden associated with universal service explicitly - a compensation by another public institution would have been considered only to lead to additional transaction costs.

In a competitive market, however, cross subsidies will no longer be possible because the new competitors will enter profitable markets such as long-distance telecommunications and business users. With the agreement at the European level to completely open up the telecommunications market for competition within most of the Community by 1 January 1998 a widespread discussion started on how to guarantee the maintenance of universal service in a fully liberalised market. With the abolition of all exclusive and special rights a need was seen for the establishment of rules concerning the provision and financing of universal telecommunication services at affordable rates to everyone. Besides a necessary definition of the scope of universal service thus a reconsideration is necessary to guarantee equal opportunities for any telecommunications operator and to ensure fair competition in the telecommunications market. According to Community Law, Universal Service Obligations (USOs) must not be allowed to have negative effects on the common market, in particular the free movement of services, and no distortion of competition in the internal market. This implies that liberalisation should be implemented by means of a regulatory framework that includes the necessary safeguards in form of a common set of principles on the provision and financing of universal service.

The EU regulatory framework for universal service is being established by three directives that have either already been adopted or are currently in the process of being adopted:

- Directive 95/62/EC of the European Parliament and of the Council of 13 December 1995 on the application of open network provision (ONP) to voice telephony, to be amended by the Proposal for a European Parliament and Council Directive on the application of ONP to voice telephony and on universal service for telecommunications in a competitive environment; the proposed "Voice Telephony Directive" of 4 November 1996 (replacing Directive 95/62/EC);

- Commission Directive 96/19/EC of 13 March 1996 amending Commission Directive 90/388/EC regarding the implementation of full competition in telecommunications markets; the "Full Competition Directive";
- European Parliament and Council Directive 97/33/EC of 30 June 1997 on interconnection in telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP), the "Interconnection Directive".

The Voice Telephony Directive, which is taken as the most authoritative reference, defines both the scope of universal service and the scope of the USO as it applies to different organisations. Provisions listed in Chapter II of the Directive, applying to organisations designated by Member States as having specific USOs, have to be distinguished from "General Provisions" defined in Chapter III that apply to all organisations providing fixed public telephone networks and/or publicly available telephone services.

The USOs defined in Chapter II of the Voice Telephony Directive cover

- (1) network connections and access to telephone services,
- (2) directory services,
- (3) public pay telephones, and
- (4) specific measures for disabled users and users with special needs.

The provisions in the chapter also specify that these services must be affordable which means that the Member States must ensure that they are offered at an affordable price.

With regard to (1) and (3) the provisions in Chapter II specify that if a user concerned or a certain public pay telephone can only be served at a loss or under cost conditions falling outside commercial standards, the net cost of service provision may be shared with other organisations under a USO cost sharing mechanism, for example a Universal Service Fund (USF). With regard to (2) the same holds where a Member State finds that no organisation is willing to make telephone directories publicly available, or to provide directory enquiry services to all telephone users. There is no provision that calls for the sharing of costs resulting from (4).

Article 9 of Chapter III specifies that Member States must ensure that all users with a connection to the fixed telephone network can access

- (5) operator assistance services,
- (6) directory enquiry services, and
- (7) emergency services at no charge.

While the above services are generally counted among the universal services - in particular they are treated as such in the Commission Communication of 13 March 1996<sup>1</sup> - there are concerning them in the Voice Telephony Directive no provisions calling for the sharing of net costs between organisations, as they belong to the services that *each* organisation is under the obligation to provide. It should be noted, however, that directory enquiry services under (6) are actually a subset of (2) above and may therefore fall under the services for which a sharing of net cost may be relevant. But this can happen only if no organisation is willing to provide these services to all telephone users.

Provisions in the Full Competition Directive address possible implications of universal service for the competitive process. Its provisions require that a national scheme aimed at sharing the net cost of USOs should

- apply only to undertakings providing public telecommunications networks, and
- allocate the respective burden to each undertaking according to objective and non-discriminatory criteria in accordance with the principle of proportionality.

It further calls for notification of the Commission of such national schemes giving it the possibility to verify that these will not interfere with competitive market forces due to the erection of entry barriers, distortion of investment incentives, excessive administrative costs, possible discriminatory procedures and other efficiency impairing practices.

Finally, the Interconnection Directive sets out the framework within which Member States can implement their national schemes to guarantee the fulfilling of USOs and assure their funding. This framework finds a detailed interpretation in the Communication of the Commission on USO assessment criteria of 27 November 1996<sup>2</sup> (henceforth referred to as Commission Communication). Since this document will be the main backdrop for the analysis in the present report, we list below its main points and implications:

- The cost of universal service covers the unavoidable net losses incurred by an efficient operator in providing universal service to so-called "non-viable" customers or groups of customers. These are customers to whom an operator, following solely commercial principles, would not offer services at an affordable price if there were no USO requirement to do so.
- Furthermore, as costs of universal service could qualify the costs of the provision of public pay phones, of emergency call centres supporting emergency telephone numbers and of network modifications for services to users with disabilities and users with special needs. From this follows that in respect of emergency services only the net cost of call centres could be recoverable via a national scheme for

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<sup>1</sup> See European Commission (1996a).

<sup>2</sup> See European Commission (1996b).



- universal service. The obligation to provide free emergency calls, which is generally placed on all operators, would not be recoverable so that each operator has to bear its own cost. Further, the above does not clarify whether the net cost of providing directories or directory enquiry services is covered by the cost of universal service, as is provided for in the proposed Voice Telephony Directive for the case .
- The net cost of universal service has to be calculated on the basis of objective, transparent, non-discriminatory and proportionate procedures and criteria. The calculation should identify the incremental costs and revenues - and associated benefits - of providing USOs.
  - The net cost (total incremental cost minus total incremental revenues) of public pay phones, emergency services and the network modification for services to users with disabilities and users with special needs should be identified separately and added to the total USO cost.
  - Benchmark estimates should be established for the following categories of benefits: enhanced brand recognition, universal coverage in the area of ubiquitous operation, life cycle value of particular customers, and marketing benefit of accessing full range of telephone usage data.
  - The mechanisms for financing USOs must also be based on objective, transparent, non-discriminatory and proportionate criteria and procedures. Such mechanisms may take the form of either a USF established at a national level or a system of supplementary charges.
  - In the case of a USF, the body administering the fund should meet the following criteria:
    - (a) The body shall be independent of the contributing and recipient undertaking(s).
    - (b) The body shall be responsible for the collection and transfer of payments or may oversee payments directly between the organisations concerned.
    - (c) The responsibility for verifying the USO net cost should remain with the relevant National Regulatory Authority (NRA).
  - A system of supplementary charges must be subject to review by the NRA and should particularly ensure that there is no conflict of interest between an operator's commercial activities and its role in collecting in-payments from its competitors. The contributions should be calculated annually on the basis of USO net costs. They may be collected as an annually one-off payment or at any other frequency determined by the NRA and must, in any case, be unbundled from traffic charges for interconnection.
  - Only organisations providing public telecommunications networks and/or public voice telephony services may be required to contribute to a USF or to any system of supplementary charges. In accordance with the principles of non-discrimination and

proportionality, contributions may only be imposed on voice telephony providers in proportion to their usage of public telecommunications networks. Nevertheless, the scope of the contribution base for universal service may evolve over time in line with changes in technology and market structure.

- National USO financing mechanisms should apportion contributions amongst eligible market players according to their activity in the relevant market. In order to ensure an objective, transparent, non-discriminatory and proportionate calculation, the mechanisms should comply with the following principles:
  - (a) The apportionment of contributions should not unduly distort investments incentives and economic efficiency.
  - (b) The criteria chosen to determine market share of eligible organisations should not have a disproportionate or discriminatory effect on particular players.
  - (c) The collection mechanism should prevent that specific organisations have to pay "double contributions" to the USO cost.

The Commission Communication makes it clear that the task of delivering services under the USO should be open to all providers in the market. Nevertheless, it is also clear that in the immediate future it is going to be the incumbent operator that will continue to be the USO provider. In a number of Member States it is expected that the incumbent operator is going to submit claims to be compensated for the cost that goes along with this obligation. From this follows that it is an urgent task to formulate a set of procedures that can be used when such claims come forward. They should at the same time allow the NRA to prescribe to the USO provider how to substantiate its claim for compensation and to verify the claims once they are submitted.

More concretely, while respecting the principles laid down in the Communication, the task is to develop

- criteria by which to identify the costs of efficient delivery of USO services;
- concrete procedures by which such costs can actually be measured;
- a methodology to assess the revenues to set against the cost of USO service delivery to obtain its net cost;
- approaches to a methodology for assessing the value of indirect benefits;
- a methodology for deriving the net cost of the USO by avoiding double counting;
- whenever possible, benchmarks for the values of the various elements in the net cost calculations; and
- the design of a compensation mechanism that fulfils the requirement that it does not distort incentives in the industry and distributes contributions among liable competitors in a way that none is disadvantaged.

The criteria and procedures should be practical and allow the determination of the relevant figures in a transparent and objective manner.

Beyond that the report aims to carry forward the debate about the proper costing of telecommunications services in general.

The following section will give an overview over the general approach taken to this task and outline how the discussion is organised. The section concluding this introductory chapter will then briefly discuss various issues of the USO that have been addressed by EU legislation or raised in discussions in the EU and that need to be mentioned. Since, however, these issues are not central to the subject of this report they will not be covered in it any further.

## 1.2 The general approach to cost determination and funding of USOs proposed in this report

### 1.2.1 Preliminaries

In most general terms, the net cost of providing universal services in a given financial year consists of:

(1)		Costs of service delivery avoidable if there were no universal service
(2)	-	Revenues forgone from these services
<hr/>		
(3)	=	Direct net cost
(4)	-	Value of any indirect benefits that flow from being a USO provider
<hr/>		
(5)	=	Overall net cost

The difference generated by lines (1) and (2) is the *direct* net cost because it is the directly measurable result from the USO activities in question. Deducting from (3) the indirect benefits of USO provision flowing to the USO provider leads to the *overall* net cost of universal service. The definition is in general agreement with definitions found in most other analyses. The discussion in the report is organised such that Chapter 2 deals with line (1), Chapter 3 with line (2) and Chapter 4 with lines (3) to (5). Finally, Chapter 5 discusses setting up the financing scheme by which compensation of the USO net cost is to be accomplished.

### 1.2.2 The cost of service delivery

Chapter 2 presents the analytical approach to USO cost determination which culminates in Section 2.3.4 with a summary statement of the steps to be undertaken by the NRA. It starts with a conceptual discussion regarding the proper cost standard, in particular what the requirements are that this standard has to fulfill. The appropriate cost standard is shown to be the one of forward-looking Long Run Incremental Cost (LRIC). It is shown that it is this costing standard which fulfills best the requirements of efficiency and non-discrimination.

After having established the cost standard to be applied, cost accounting procedures are discussed that assure that the cost calculations are done in a transparent and objective way, are practicable, and in particular provide the proper data in accordance with the required standard. From our discussion of this issue follows that the traditional costing system of Fully-Distributed Costing is inadequate for the purpose, that an analytical cost accounting system like Activity Based Costing should be used, and that in the absence of an analytical costing system the NRA should resort to analytical cost modelling of its own, which would provide it with a safeguard that not overstated costs are made the basis of the USO net cost calculations.

Another larger section of the chapter deals with particular issues of cost accounting which are very significant in respect of what the level of costs shown will finally be. These issues are about how to determine the costs of fixed investment (current vs. historical cost accounting, method of depreciation, cost of capital), and how it is to be assured that other categories of costs (operating, maintenance and administrative costs, common costs) accord with efficient operation. These are questions that the NRA cannot leave to the network operator to decide and on which it must develop its own opinion and rulings.

Another section relates to the underlying network structure as the costs, particularly of services in the local network, will depend on the type of technology used and on which network structure - optimal vs. existing one - the calculation ought to be based. Also the question of what the appropriate size of a USO area should be is discussed.

Building on the preceding discussion, the section on methodology lists, for one, the requirements to be placed on the network operator for providing cost data for the services of access to the national network, telephone services and public pay phones, for the other, describes how the criteria developed can be built into analytical cost models to be used by the NRA. Particular emphasis is placed on the need of developing such an analytical cost model for local network services. Benchmark calculations are presented for both local network access services and for local and long-distance calls that are derived from analytical cost models available on the market.

The chapter concludes, as already pointed out, with a section summarising the steps to be undertaken by the NRA for the purpose of obtaining reliable estimates of the costs of USO services.

### 1.2.3 Forgone revenues

If uneconomic areas, customer classes or public pay phones are disconnected or not served to begin with, revenues will be foregone. Those revenues have to be set against the avoidable costs since they reduce the cost of the USO. Chapter 3 presents the approach to revenues in the net cost calculation. It discusses the various revenues components, which include revenues from access and outgoing calls, revenues from incoming calls, revenues from interconnect calls and called-party-pays calls. It also provides recommendations on how to obtain estimates for data that are not available from the USO provider's records.

### 1.2.4 Direct net cost determination, indirect benefits, and overall net costs

Chapter 4 brings the strands of analysis in Chapters 2 and 3 together for the calculation of net costs. The data requirements that ought to be available following the procedures laid down in these two chapters are listed and the computational steps for calculating direct net costs are developed.

When the data on costs and revenues foregone are brought together to determine the direct USO net costs double counting should be avoided. Double counting can occur either because a part of the uneconomic customers live in uneconomic areas, or because revenues from incoming calls that are themselves coming out of uneconomic areas or from uneconomic customers are counted there already as outgoing calls. An iterative procedure is developed to solve the latter problem (it must be an iterative procedure since the double counted component can only be known after the uneconomic areas and customers are identified and since for this identification the double counted component itself must be known already). Also a sample calculation for the determination of the direct net cost of an area is presented.

Part of the determination of the overall net cost of the USO is the valuation of indirect benefits of being the USO provider, consisting of enhancement of corporate reputation, increased ubiquity, access to better information, and marketing effects of public pay phones. Approaches to determining the value of these benefits are presented and the assessment that, in particular, the enhancement of corporate reputation due to USO provider status can be of considerable value to the operator.

Finally, by adding together the direct net costs of uneconomic areas, uneconomic customers and uneconomic pay phones and deducting from that amount the estimated

value of indirect benefits, the overall net costs of USO service provision can be determined.

### 1.2.5 Financing

When devising specific universal service financing schemes, Member States should respect the goals of efficiency, market neutrality and non-discrimination, continuity of funding, objectivity and transparency, practicability, and above all, proportionality. Chapter 5 examines the various options for financing schemes and shows how they fare against these requirements.

The chapter, in particular, argues in favour of a USF. Organisations contributing into the fund should include *all* organisations operating public telecommunications networks and/or publicly available voice telephony services. Narrowing down the scope of liable organisations could increase allocative efficiency losses and distort investment incentives in the industry. Member States should, therefore, not provide for further exemptions. Smaller operators, however, should be exempted from contributions which would strengthen the practicability of a USF.

The chapter also discusses alternative bases for assessing contributions. It is argued that a net revenues-based measure is the only one that satisfies the requirements listed above. With net revenues, payments made to other organisations contributing to the fund for wholesale, interconnection or leased lines services are to be deducted from gross revenues. The contribution base reflects the telecommunications value added by an operator. Its essential advantage is its neutrality with regard to vertical structure, type of service, or technology used. Other contribution bases such as number of minutes, number of subscribers, retail revenues or gross revenues should not be used given the associated distortions or lack of practicability.

A USF is to be preferred against a system of supplementary charges in addition to interconnection payments. The latter creates inefficient incentives to avoid interconnection and violates market neutrality requirements, in particular, if supplementary charges are based on call minutes. Given the problems involved in a system of supplementary charges, such a scheme can only temporarily be justified in the immediate aftermath of full liberalisation, i.e., in a situation normally marked by all new entrants interconnecting with a single dominant operator.

## 1.3 Special issues not further addressed in remainder of the study

The net cost/compensation approach will consist of a set of procedures showing how the net cost of the USO - fulfilled by an operator which by default in most cases will be the incumbent operator - is to be determined and how such a net cost should be shared among all liable organisations. While this approach will be the main subject in the

present report, this is not to imply that it should be the predominant approach for the foreseeable future; it is the one that currently commands most attention because it is the one most urgently needed. As stated in the Commission Communication, there should be no automatic assumption that the current USO provider must continue to provide universal service or be the only provider.<sup>3</sup> Nor do we think that the USO should automatically be associated with the need to compensate a net cost arising from its provision. In the first two subsections of this section we briefly take up these aspects and consider two alternatives, i.e. setting up a scheme by which it is made likely that USOs are accomplished through the competitive process, and competitive bidding for USOs.

The remainder of the section addresses four special issues that in various ways are connected with the approach of a USO net cost sharing mechanism which need clarifying before starting the development of such a scheme. These issues concern

- the USOs required under the "General Provisions" of the Voice Telephony Directive, i.e. emergency, operator assistance, and directory enquiry services, and the question whether there is the need of establishing for them a mechanism for the compensation of net costs;
- the funding of network modifications for the offer of special services for disabled users and users with special needs;
- the proper handling of so-called voucher and virtual voucher schemes within a USO net cost approach; and
- the questions of whether so-called access deficits are part of the net cost of the USO.

### 1.3.1 Reliance on the provision of universal service by the current USO provider as part of its competitive positioning

It is possible to establish regulatory provisions by which delivery of universal service through the competitive process is assured without that it is considered a forgone conclusion that there will be a net cost and hence the need for compensation. The approach starts with the recognition that the incumbent operator is currently providing a satisfactory level of universal service. The incumbent and later on also other providers of services falling under the USO, may never be induced to submit a claim for compensation of such costs provided the procedure that must be followed to receive compensation is designed in an appropriate way. The procedure would have to force the USO provider to examine its case so carefully that it realises the possible disadvantages

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<sup>3</sup> See European Commission (1996b), p. 27.

associated with such a claim that it may simply choose to abstain from submitting any. In other words, the procedure would have to be designed in a so-called incentive compatible way leading the would-be claimant to evaluate the matter so that all the concerns of the regulator are also taken into consideration.

A case in point are the provisions regarding universal service in the German Telecommunications Act of 1996 (which are based on the recognition that the incumbent operator currently provides a satisfactory level of universal service). These provisions would allow for the compensation of the costs of fulfilling USOs only on condition that a number of steps have previously been undertaken that aim at securing delivery of USO services in an efficient and cost-effective (from society's point of view) manner. The various steps in these provisions entail the following:

- The incumbent operator must announce one year in advance if it intends to scale down its delivery of USO services, say, because of deficits in its delivery.
- The regulator examines whether any other supplier would be willing to take over the task without asking for a compensatory payment.
- If this fails the regulator can obligate the incumbent operator, or any other provider that has a dominant position on the relevant market, or the incumbent operator and these providers together, to fulfill the USO provision.
- If a provider to be so obligated shows that the delivery of USO services necessarily involves deficits and would justify compensation the regulator examines whether there should be a competitive bidding process in which the USO provider itself as well as the minimum amount of necessary compensation is to be determined.
- Only if such a bidding process does not seem feasible would it be conceded to the dominant operator that deficits due to universal service may be compensated.

These provisions have been interpreted to have the effect of preventing the dominant operator to consider submitting a claim for USO compensation. Prospective competitors in Germany have in effect gone on record that in those cases where Deutsche Telekom were to cease the universal service provision they would be prepared to provide it instead. This, so the general perception, leads Telekom to examine its case very carefully before it would go to the regulator with a claim to be compensated.

The above observation is consistent with what we will discuss in Chapter 4.3 that the overall indirect benefits of being the USO provider are quite substantial and may in many instances be large enough to outweigh the direct net costs arising from USO services.

At this point a general observation may already be in place: A USO net cost sharing mechanism may actually be called for only at a time when there are in fact already a number of providers in a market and these providers are also in the business of offering USO services. It would be at that time only that the costs and benefits of providing USO



services may be so unevenly distributed that it becomes a necessity that net costs and benefits are evened out. As long as this is not the case, the current USO provider, as follows from the above, is likely to assure universal service and not incur a net cost thereby. Installing under these circumstances a USO net cost sharing mechanism may run the risk of establishing a market entry barrier, in particular for smaller entrants. It would also mean that the administrative cost of such a scheme would have to be incurred without that the need for it has yet been established.

From above analysis we conclude:

1. There is value for NRAs to contemplate designing regulations aimed at assuring the provision of universal service by the current USO provider as part of its competitive positioning.
2. As demonstrated by the example of legislation in Germany, this can be accomplished by a procedure that leads the current USO provider to the realisation that submitting a claim may in the final analysis be to its disadvantage.
3. As long as competition is not really flourishing, as long as it can be expected that the current USO provider continues offering USO services without needing compensation, and as long as other operators are actually not also involved in the business of providing USO services, there may be little point in establishing a USO cost sharing mechanism. It could inhibit market entry of new, particularly smaller competitors and, in addition, cause substantial administrative costs that one should not incur unnecessarily.

### 1.3.2 Competitive bidding for uneconomic areas

As an alternative to imposing USOs on a network operator and measuring the cost of USOs by a costing approach, USOs could be put out to competitive tendering. The USO provider and the price of USO provision would be determined by a competitive bidding procedure. This would have the advantage that the provision of universal service, and any compensation that need to be paid for it, is submitted to competitive pressure.

The Oftel Consultative Document on universal telecommunications services<sup>4</sup> contains a description of the basic elements of such a procedure. It also addresses in passing the question of competitive bidding in the case where the USO provider status would convey benefits in economic areas so that the bidder should be prepared to pay for the privilege of being the USO provider (instead of claiming a subsidy). In the discussion below we follow the arguments advanced by Oftel placing in some cases greater weight on caveats regarding the procedure.

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4 Oftel (1997), pp. 39-42.

The regulator would first have to determine those uneconomic areas that are to be tendered. Potential candidates would generally be remote areas where the geographical characteristics and the low population density make the area expensive to serve. Oftel concludes that the best candidates for tendering would be areas where there is either competing infrastructure already in place or a good opportunity to deliver services using alternative technology at lower cost (e.g. fixed radio access).

An operator would be chosen as USO provider when it submits a bid requesting the lowest subsidy to take on the obligation. The contract between the NRA and the winning operator should cover the following issues: the detailed level of service to be supplied, the duration of the contract, the quality of service standards, contingency arrangements, monitoring and penalty arrangements. The contracted operator would have to compete with any other operator in the area but would be the supplier of last resort, i.e. would be obliged to supply basic telephony to any customer on reasonable request. Furthermore, it would be subject to an explicit control on prices. The required subsidy would be paid to the winner of the tender using the available compensation scheme.

As it is likely that there would be only a few bidders in any particular area, the auction process would have to be designed in a way that the chances of strategic or collusive bidding are minimised. Hence it would be useful to set a reserve price, based on the estimated universal service cost of the area to the current USO provider. Furthermore, a single round auction of sealed bids would seem to be preferable to a multi-round auction for the same reason. In order to avoid the "winner's curse", i.e. the high risk that a bidder other than the incumbent wins the tender at a subsidy that would be insufficient to cover the net cost incurred, measures would have to be taken to reduce the informational disadvantages of the competitors. If this could not be done successfully, and potential bidders are aware of their disadvantage, there may then be no bidding at all except by the incumbent.

We should note the two precautions mentioned in the preceding paragraph: statement of a reservation price and reduction of information disadvantages that competitors have *vis à vis* the incumbent operator. Establishing a reservation price would, at least at the beginning, require a prior cost estimation procedure that one actually would like to avoid with competitive bidding. As regards compensating for the informational disadvantage of competitors, we believe that accomplishing this would be very difficult. In particular, the incumbent operator would not only have the advantage of privileged access to operational information about serving the area but would also have a clear perception of the indirect benefit of being the USO provider, in this area and generally (see Chapter 4.3). Not wanting to jeopardise its enhanced reputation arising from this position by allowing competitors to gain if only part of it, the incumbent would be likely to require a lower compensation than otherwise. This of course would make it even more difficult for competitors to submit a winning bid. Their cost advantage would have to be quite substantial to compensate for this handicap.

We do not believe that in the short run competitive bidding should be used in Member States that have fully developed networks and where at the present time the incumbent operator controls the overwhelming part of that network. It could in our estimation lead to the result that the incumbent is the winning bidder in almost all areas at some positive compensation when in fact, on an overall evaluation, there would be no need to pay compensation at all because the benefits that the incumbent operator draws from its USO provider status outweigh any direct net costs (see again Chapter 4.3).<sup>5</sup>

When there is on balance a benefit from being the USO provider in an area, it is of course also true that the competitive bidding process would bring out the true value of that benefit - if carried out under conditions of information symmetry and without any strategic interferences, *and* without any interdependence of the benefit reaped from USO status in this area with corresponding benefits reaped in other areas, or for that matter in most of the country. We would argue that the latter effect would also in this case mitigate against using competitive bidding at the present time, as new competitors would hardly be in a position to outbid the incumbent.

In general, the approach of competitive bidding should be taken into closer consideration once more is known about the overall net cost of USO provision, its distribution over different areas and categories of customers, and in particular on how to deal with the fact that the incumbent operator is currently practically the only USO provider nationwide and the recognition it gains from this gives it, so to speak, "overlapping" benefits. We would agree of course with Oftel that the idea of applying the bidding procedure to the USO should be developed further in order to overcome these difficulties.

In agreement with the Commission Communication<sup>6</sup> we believe that tendering would hold promises for Member States where the roll-out of the network has not yet been completed and where there remain whole areas essentially still to be connected. In these regions, where the incumbent operator may not be in a position to provide for network build-up in a short enough period, using the bidding procedure to pick the best alternative operator would appear feasible. Under these circumstances, some of the caveats that we listed above would apply with less force than in Member States with fully developed networks.

Thus we conclude:

1. Using competitive bidding to determine USO providers would have the advantage of submitting the provision of universal service to competitive pressure.

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<sup>5</sup> Note that Oftel concludes that BT has no justified claim to be compensated for a net cost of USO provision, mostly due to indirect benefits BT draws from the USO (see Oftel (1997), p 33).

<sup>6</sup> See European Commission (1996b), p. 28.

2. For competitive bidding to be successful, the design of the bidding procedure must preclude the possibilities of collusion, on the one hand, and the danger of either winner's curse results or no bidding at all, on the other.
3. We would not recommend to use competitive bidding in Member States where the network is fully developed and currently controlled by the incumbent network operator before more is known about the overall net cost of USO provision, its distribution over different areas, and its impact in terms of indirect benefits to the incumbent operator and current USO provider.
4. Competitive bidding holds promises for Member States in which network roll-out is not complete. Other operators in addition to the incumbent could be selected by this procedure to speed up network build-up throughout the country.

### 1.3.3 Requirement to "play" for services falling under the "General Provisions" of the proposed Voice Telephony Directive

The provisions in Chapter III of the proposed Voice Telephony Directive are clear in that some of the typical USO services must be offered by all network operators and providers of telephone services. Since this obligation is placed on all operators it follows that each bears its own cost and therefore there is no need to include the services in a regime established for the sharing of USO net costs. According to these provisions this applies without qualifications to

- emergency services and
- operator assistance services.

As regards

- directory enquiry services,

there may be an exception if a Member State finds that no organisation is willing to provide directory enquiry services to all telephone users. In this case the Member State may provide that the net cost of the service may be shared among all operators.

In the terminology that has established itself in the USO context, there is for these services an obligation for all operators to "play" and there will be no obligation to "pay" into a fund for the sharing of USO costs for any of these services,<sup>7</sup> with the one possible exception noted. The question may nevertheless arise whether operators may not reject

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<sup>7</sup> According to this terminology, the obligation to "play" means that the USO in question is placed on market entrants as well as on the incumbent, whereas the obligation to "pay" refers to the situation in which the incumbent operator is the only USO provider and entrants pay their share of the burden, say, by contributions into a USF.

this general obligation and submit claims to be compensated for the costs of providing the services, on the grounds that the obligation places a burden on them that prevents them to compete on equal terms and are therefore discriminatory.

The argument should be dealt with as follows. No network operator connecting customers to the general public telephone network or running public pay phones can afford not to offer these services. They are simply necessary as part of a basic offering of telephone services. Not offering any of the above services would have adverse reputational effects of a magnitude that would put a big question mark behind the operator's whole competitive position. Since all operators know this none will contemplate the idea not to offer the services, whether they are part of the USO or not.

Proof to this are provisions in existing interconnection agreements everywhere assuring that the new competitors have access to so-called ancillary services - to be provided by the incumbent operator - putting them in a position to offer above services to its customers. In these agreements great emphasis is generally placed on precisely defined levels of quality of these support services,<sup>8</sup> which should be interpreted as an indication of the importance that the competitors place on the ability to satisfy their customers in this respect.

From the above follows that the regulatory concern to make sure that these services are universally offered seems to be more a matter in the realm of interconnection than of the USO. In order that competitors can offer the services like the incumbent operator, they must be able to use resources, e.g. the information base needed for directory services and the infrastructure to convey emergency calls to their proper destination, that are mainly under the control of the incumbent operator. The incumbent has unrestricted access to these resources enabling it to demonstrate to users that it will continue to reliably offer these services as it always has. For the new competitors to do the same, it must have access to these resources on terms and conditions that do not place it in a disadvantageous position.

The regulator's task in this context appears therefore to lie in assuring that new network operators obtain access to the necessary resources at rates and conditions that are called for under the Interconnection Directive. They should not be discriminatory and the fees to be paid for using these resources should be based on costs. We argue that fulfilling this condition will preclude the possibility that any operator comes forward advancing claims to be compensated for net costs arising from the provision of the above services.

The prices for these services fall of course under the affordability constraint - one thinks here primarily of directory enquiry services that are generally thought to generate deficits. If this is in fact the case, and if it is the incumbent operator that foots the bill for

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<sup>8</sup> For an example see Vogelsang (1994), p. 39, where the interconnection agreement between BT and Nynex Cable Comms, a TV cable company entering the telephone business, is analysed.

the required expensive resource, the interconnection prices to be paid by the other competitors for the use of this resource should reflect the circumstance. This would not affect the judgement according to which this is a matter of interconnection required for the purpose of enabling services that each of the competitors would have to offer, independent of any universal service obligation.

Finally, the incumbent operator may be expected to come forward with a claim that for the price of, say, directory enquiry services allowed under the affordable price regime, it would remain with a net cost that ought to be compensated. Since, however, every network operator faces the same price constraint on these services - if only through the working of the normal competitive process - and since every operator bears the cost of its service either by assuming the cost of required resources directly or by paying for them in form of interconnection payments, there is no balance of net costs or net benefits that needs to be evened out, and there is still no case for including the service among the ones that cause net costs requiring compensation.

The argument actually applies with equal force to emergency call centres that are explicitly referred to in the Commission Communication as a USO requirement.<sup>9</sup> The service of an emergency call centre should be looked upon as an ancillary service that all competitors can use to handle emergency calls. In principle, each competitor could establish such a centre; this, however, should be considered a waste of resources as it would be difficult to draw a competitive advantage from having one's own emergency call centre. If there exist already such centres established by the incumbent operator new competitors should be allowed to use them and in turn assume part of the cost of maintaining them.

If none exist yet, the operators should normally have an interest to install emergency call centres jointly because of the economies of scale that can be realised this way. Of course, the parties would have to agree on the modus of sharing the costs and that may be difficult. (In this case one would, by the way, not be able to invoke principles of interconnection in the classical sense, as this would normally presuppose control over a bottleneck resource by one of the operators, which is not the case under the assumed circumstances.) In this context then there may be a case for regulatory intervention calling for the establishment of emergency call centres. This would still not be a sufficient case to finance them through the mechanism of the USO compensation scheme. If the competitors cannot come to an agreement by themselves on how to share these costs, the NRA should use its influence and power of determination to bring such an agreement about. This would have to be an agreement on the division of costs of jointly used resources. This is a different matter than sharing the net cost of USO services delivered by one (or a few) and financed by all through a compensation mechanism very specifically designed for this purpose.

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<sup>9</sup> See European Commission (1996 b), p. 12.

Thus we conclude:

1. The competitive process will assure that the USO services of
  - emergency calls,
  - operator assistance, and
  - directory enquiry servicesare offered by all network operators as part of their basic offerings.
2. Since all operators are required to "play" in respect of these services, and as there will be no tendency for imbalances in possible net costs to arise, a need for the compensation of any net cost will not arise.
3. In order to assure that new competitors are able to offer above services, it will be necessary to arrange for effective interconnection arrangements that enable new competitors to use needed bottleneck facilities (e.g. data bases) that are under the control of the incumbent operator.
4. One should expect that the establishment of jointly financed emergency call centres lies in the interest of all competitors. If they have to be brought about by regulatory intervention, however, this would not mean that their costs need to be financed through the USO compensation mechanism. The NRA should, if necessary, use its influence or power of determination to bring about an agreement regarding the sharing of costs of these resources that depends on the use of these resources by each of the competitors.

#### 1.3.4 Network modifications for the provision of services to users with disabilities and users with special needs

It will need special initiatives in the future to get the network modified in a way (e.g. get text relay systems installed) to help those that in one way or another are impaired to use the normal telephone services. We imagine that for this the NRA will have to organise support from the competitors, public organisations dedicated to the improvement of the living conditions of the so handicapped, as well as from national government and possibly the EU. In particular, industry will be made to realise that investing in the provision of such services may be a good business proposition. Such initiatives will therefore involve many sides and in particular may also have to unlock sources of finance beyond the telecommunications sector.

From the above follows that the provision of such equipment and its funding could not so easily be fitted within the confines of a standardised net-cost/compensation scheme for normal USO services. To mention a possible circumstance which makes the point perhaps more obvious. Suppose that the direct net cost of standard USO services is more than outweighed by the indirect benefits to the USO provider so that on account of

these services there would not only be no need for a compensation mechanism but also the USO provider would have some surplus benefit left to it. This would, however, presumably not preclude the necessity that projects be set up for the development and instalment of such special equipment and that agreements be concluded between competitors (and others) in respect of its funding, possibly within the confines of a special USO fund.

The main focus of this report is the development of criteria and procedures for the cost determination and funding of standard USO services. It would be beyond the scope of the study to assess the many ways in which the provision of such specialised equipment could be fit into this scheme.

From this we conclude:

1. Due to the special efforts that must go into the organisation of providing and funding specialised equipment of services to users with disabilities and users with special needs, their USO cost cannot simply be included within a standard USO compensation scheme.
2. It may be appropriate to install a special USO fund for this equipment (in form of projects supported by most competitors, for example) to organise the provision and funding of such equipment.

### 1.3.5 Specially targeted funding schemes

Schemes by which customer groups with specifically low demand or with special social needs are given preferential access to the telephone service belong to the approaches that are being used or contemplated by some EU governments. Usually they take the form of light user schemes with special low tariffs, or so-called voucher schemes by which eligible users are given vouchers the value of which can be deducted from the bills for services priced at standard levels. When the vouchers are replaced by entitlements that can be claimed by customers solely by virtue of belonging to a particular socio-economic group, the latter schemes are also referred to as "virtual" voucher schemes. Through these schemes the users in question can get the preferential terms and conditions envisaged by the government policy. The schemes are legitimate policy options for governments endeavouring to bring universal service also to people who may not have the means to subscribe to services priced at standard levels. This would particularly apply in those countries where the providers of telephone services have not introduced such pricing policies on their own initiative. The schemes may indeed engender efficiency gains if they are properly targeted and - which is an important proviso - they are not too expensive to administer.



In the determination of the USO net cost, there is no need to consider these kinds of special offers to low users and/or users with special needs separately and in addition to the normal USO net cost determination. To see this it is only necessary to refer to the formula for calculating the USO net cost which we stated at the beginning of Section 1.2.1. Following lines (1) and (2) of the formula, one starts with the cost of service provision caused by the services under the USO and deducts from this cost the revenues received from the services' users - low as they may be - to obtain the USO's direct net cost. Now, if these users are beneficiaries of schemes like the ones mentioned above, the revenues will reflect this fact. If the users benefit from low user schemes the revenues correspond to the special tariffs accorded them; if the users benefit from (virtual) vouchers distributed to or claimed by them, the cash revenues obtained from them are reduced by the amounts due to the vouchers. Thus, the effect of the schemes on the USO net cost is picked up through the reductions in the revenues that they bring about.

It may also conceivably be the case that the government finances the schemes out of its general budget by refunding to the USO provider the amounts by which the schemes reduce revenues. In this case there would be no extra effect through them on the net cost position of the USO provider whatever. The relevant case would most probably be the one, however, where the cost of the schemes has to be financed through the USO net cost sharing mechanism.

There may then be the tendency to consider as the relevant USO cost of such schemes the difference between the standard price, on the one hand, and the price received under the special scheme, on the other, multiplied by the number of units demanded by the scheme's beneficiaries. In particular (virtual) voucher schemes may be susceptible to be regarded this way.

The approach would be problematic for the following reasons. First, it is doubtful that it would be consistent with Community Law as it would not correspond to a net cost determination of the cost of the USO. That this is so follows directly from the discussion in the paragraph preceding the last one. It is not the value of the vouchers nor the difference between standard and special tariff under low user schemes that determines a deficit but rather the difference between costs and revenues - which of course must be net of the value of vouchers and/or evaluated at the low special tariffs.

Second, there is the risk that a "burden" of the USO is established that is in excess of the actual net cost. There may actually be two cases: In the one case, the users in question would not cover the cost of the service they are getting even if they were paying standard prices; benefiting from the voucher system or from low user special tariffs they will now even pay less. The direct net cost of the USO determined in the costing calculation will then necessarily include the total amount of the social scheme. In the other case, it may be true that even under the special schemes there are some customers that do not cause a deficit. This could be true if there are very low costs for such users, for example because a large share of overall cost say in a local network

would be incurred in any case whether the customers in question are being served or not. Even if in this case the value of the scheme by itself is considered as the direct net cost of the USO this would overstate that direct net cost as not all of the beneficiaries would actually cause a deficit. In both cases, however, it holds that if the values of the schemes were added to the amount determined by a net cost calculation there would be the risk of double counting up to the total amount of the schemes as the deficit caused by them would normally also be picked up by the net cost calculation.

From the above discussion we conclude:

1. While specially targeted funding schemes (low user schemes, (virtual) voucher schemes) may be efficient elements of an approach to implement universal service policies, the amounts corresponding to the value of such schemes should not be considered as a separate item besides the determination of the net cost of the USO. The reason is that the amount of the USO net cost determined through the net cost calculation would necessarily include these amounts; any additional consideration would thus amount to double counting.
2. Using the value of such a scheme in lieu of a net cost determination would be contrary to Community Law. In any case using the value of such a scheme in lieu of a proper net cost determination would risk to overestimate the direct net cost of the USO.

### 1.3.6 Access deficit contributions

The term "access deficit contribution" was framed in the context of the interconnection negotiations in the UK at the beginning of the 1990s. It referred to a perceived imbalance between the cost of a subscriber line and the monthly rental that BT received from its customers implying that BT had to cover the "deficit" from its call revenue. Given that BT still owned almost all of the local access networks and competitors were therefore not faced with such a deficit, the regulator decided that the latter should contribute to BT's deficit through the inclusion of an access deficit contribution (ADC) in interconnection charges. The British regulator has, however, made very limited use of this instrument.

The concept has also entered the discussion concerning interconnection in other EU Member States. As discussed in the Commission Communication<sup>10</sup>, national ADC schemes will be allowed under Community Law on a temporary basis until, as required by the Full Competition Directive, the necessary tariff rebalancing by incumbent operators eliminating the access deficits has been accomplished. Such schemes must also meet the requirement that they are structurally separate from any USO net cost sharing mechanism.

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<sup>10</sup> See European Commission (1996 b), p. 6.

Underlying this position is the argument that the access deficit is not part of the cost of the USO. The position is consistent with the approach developed in the present report, as already expressed in the formula for calculating the USO net cost stated at the beginning of Section 1.2.1. In accordance with this formula, the USO net cost equals the net cost of serving customers that would not be served if there were no USO. The access deficit, in contrast, is the difference between the totality of costs of subscriber lines minus the totality of rentals received from the users of these lines. For the overwhelming majority of these users, however, it will be true that revenues received for calls and other services outweigh the access deficit. Each of these customers will therefore generate a surplus and be served by the network operator for purely commercial reasons. These customers obviously do not generate net costs.

The point taken is not that an imbalance between the cost of subscriber lines and rental revenues, to the extent that it exists, is of no consequence. There is no question that it could have an influence on the competitive position of the operator who owns the subscriber lines - virtually always the incumbent operator - if in fact prices for calls would have to be substantially higher than otherwise necessary. The answer to this problem is, however, for the operator to restructure its tariffs according to the requirements of the competitive market, and not to declare the amount of the imbalance a cost of the USO. If due to this restructuring of tariffs there are customer classes that are hurt in an unacceptable way, special tariff packages like light-user schemes should be introduced to neutralise this impact.

It may then be the case that the special tariff packages (which in effect may include as an element a low rental charge and therefore generate an "access deficit" for the customers using them) lead to revenue/cost relations through which particular customer classes or even whole areas become uneconomic. In these cases the USO net cost compensation scheme would pick up the corresponding deficits and address the problem in the correct way.

We conclude:

1. So-called access deficits are not part of the USO net cost. To the extent that they exist and cause financial imbalances for the incumbent operator, a restructuring of tariffs is called for.
2. Unfavourable impacts of this tariff restructuring on certain customer groups should be neutralised through the introduction of special tariff packages. If taking advantage of such tariff packages makes these customers uneconomic, the corresponding deficit would be eligible to be covered by a USO net cost sharing mechanism.

## 2 The approach to cost in the net cost calculations

### 2.1 The problem to be solved

The most essential component of the net cost of the USO is the cost of production of the services falling under it. The first step in carrying out the corresponding cost determination consists in identifying the individual services or service elements for which this is relevant and state what the task implies.

According to the Commission Communication<sup>11</sup>, the services and service elements for which there may be compensation under a national USO scheme are the following:

- access of customers to the national network from a fixed location (mainly subscriber lines),
- switched telephone services,
- public pay phones,
- directory services,
- network modifications for services to be offered to users with disabilities and users with special needs, and
- emergency call centres.

The Commission Communication does not include the further services mentioned in the "General Provisions" clause of the Voice Telephony Directive, i.e.

- emergency calls and
- operator assistance services

because these services have to be offered by each provider on its own so that no uneven distribution of a USO burden and therefore no need for a cost sharing mechanism arises.

Of the services that the Commission Communication explicitly includes as eligible for cost sharing under a USO scheme, *access to the network*, *switched telephone services* and *public pay phones* are the most important ones. They will be the subject of this chapter, and for that matter, the rest of this report. Of the remaining services, *directory services* in form of white page services are part of the package of providing access to the network and are therefore automatically included, while *directory enquiry services*, *network modifications required for specialised services for the handicapped* and

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<sup>11</sup> See European Commission (1996 b).

*emergency call centres* should not be included under a standard USO net cost compensation scheme, as we discussed in Sections 1.3.3 and 1.3.4. From now on, these latter services will not occupy us any further.

*Access to the network* and *telephone services* are services that concern identifiable customers. The process of cost determination concentrates here on particular groups of customers and customers living in particular areas for which demand and cost conditions are such that revenues do not cover costs. Similarly, while the service over *public pay phones* is always delivered to anonymous customers, the cost determination process will have to focus on the pay phones where the revenues generated are not sufficient for cost covering. Thus part of the task in regard of these services consists in identifying the groups or types of customers, areas and pay phones that may be uneconomic.

The main objective of this chapter lies in generating a set of criteria by which to determine the relevant costs of service provision. That this is not a straightforward matter lies in the fact that most telecommunications network operators do not possess cost accounting systems that are in a position to provide the needed information. In particular, the systems that are in place often generate cost data that do not properly reflect cost causation. In the following, the first objective is therefore to clarify a number of conceptual and methodological issues, in particular regarding the cost standard to be used.

The chapter will further address practical problems which have to be solved in advance of a concrete USO cost determination. They concern cost accounting issues such as the method of capital cost determination, procedures to assure that costs of operating, maintenance and administration are used that correspond to efficient network operations, and the treatment of common costs. In addition, questions are addressed concerning the technology and network structure on which the calculation should be based and how the appropriate size of a USO area should be determined. This discussion will lead to the development of a methodology of determining the costs of USO service provision. The discussion will be concluded with benchmark calculations for the costs of local and national network services obtained from analytical cost models.

In the closing section the concrete actions will be listed that the NRA should follow for the purpose of determining the costs of the three services identified above as falling under a USO compensation regime.

## 2.2 Conceptual and methodological issues

### 2.2.1 The Long Run Incremental Cost standard

The cost standard that we propose to use in the determination of USO costs is the Long Run Incremental Cost (LRIC) caused by the USOs. The incremental cost is the cost that is caused by the activity in question, here the provision of the USOs, when it is carried out with a long-run perspective. Equivalently, looking at the question from the perspective of a TO<sup>12</sup> currently providing USOs, the incremental cost caused by them is equal to the costs that could be avoided in the long run if USOs were removed from the incumbent TO and it would discontinue to provide the service. As a corollary, we could therefore also say that the price should be set at the Long Run Avoidable Cost (LRAC) if USO provision is discontinued.

The two concepts are equivalent whenever the costs not incurred due to the decision to discontinue a service from now on are in the long run (after all necessary adjustments have been carried out) the same as the costs incurred due to the decision to start now the service. We consider this to be the case in most applications.

The LRIC concept is motivated by its relevance under competitive conditions. Price setting in a market with strong competition requires that costs be based on the LRIC standard. This implies that they are calculated from a forward-looking perspective, in particular

- from the standpoint of building production and service capability today,
- at current input prices, including a return-on-capital consistent with competitive capital markets, and
- in a way that is most cost effective in light of today's available technology, input prices, and expectations about demand.

In a competitive market, only prices derived from costs based on these principles guarantee success and survival of the enterprise. We will argue below that this general principle which reflects the competitive standard must necessarily also apply to the calculation of the costs from which compensation to be paid for USOs are to be derived. The principles essentially have implications for the fixed investment since a method must be applied that determine their costs consisting of depreciation and cost of capital that are in accordance with these principles' prescriptions.

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<sup>12</sup> The expression "TO" is used alternatively for "incumbent network operator" and stands for "Telecommunications Organisation" which in Community documents has been defined to mean a "public or private bod(y), to which a Member State grants special or exclusive rights for the provision of a public telecommunications network and, where applicable, public telecommunications services".

One of the defining features of the LRIC standard is that it is a forward-looking concept. The Interconnection Directive requires in Annex III that the USO cost leading to any compensation under a cost sharing mechanism must be determined according to a forward-looking standard. The LRIC standard clearly fulfills this requirement.

The LRIC concept has in recent discussions undergone a refinement that should be noted. This refinement differentiates between "Total Service" and "Total Element" LRIC. The latter (TSLRIC) measures the increment in cost occurring in the long run of offering a complete service in addition to other services in the programme of the firm. In contrast, TELRIC refers to the increment in cost that is caused by identifiable elements that are needed in the production of a service, like switching or transmission between switching centres or a certain advanced function implemented in the switch. The latter will be more relevant, for example, for the pricing of interconnection services; for the pricing of USOs the former, i.e. TSLRIC, is the appropriate concept.

While the LRIC concept is a concept from economics, this does not mean that it does not have its counterpart in the business administration literature. In particular, TSLRIC has its immediate counterpart in the concept of "long-term product costs" as they are generated by the approach of Activity Based Costing (see more on this in Section 2.3.1.2).

We conclude:

1. If USO services were provided as the result of a fully competitive process, their prices would have to be based on costs derived following the Long Run Incremental Cost (LRIC) standard. This makes the standard a natural candidate to be used in the USO cost determination process.
2. LRIC is the cost caused by a service under a long-run perspective. It is determined from the standpoint of building capacity today, at current input prices and at a return-on-capital consistent with competitive capital markets, and in a way that is most cost effective in light of today's available technology, input prices, and expectations about demand.

### 2.2.2 Requirements to be met by costing procedures

According to both the Full Competition and the Interconnection Directive, the costing of USOs must comply with the principles of objectivity, transparency, non-discrimination and it must be carried out in a proportionate way. The latter we interpret in the present context to mean that the scheme must be practicable and not lead to costs of its own which are in a disproportionate relation to its objective. In addition, the Commission Communication also specifies that the costs in question can only cover those costs that are incurred by an efficient operator.

In the following we will take up these requirements and briefly discuss their implications starting with the questions of efficiency and non-discrimination.

### 2.2.2.1 Efficiency and non-discrimination

One associates with strong competition the achievement of efficiency. From this follows that the cost standard used successfully in the competitive process is also the cost standard that corresponds to an efficient operation.

The Commission's requirement in its Communication that a cost standard be used reflecting the cost of an efficient operator implies therefore that the USO cost determination process be based on a standard that would prevail under competition. A standard not fulfilling the efficiency requirement would imply that operators that are fulfilling their USO with contributions to the USO fund would pay with these contributions more than would be necessary if this "price" were determined in the competitive process. Application of such a standard would allow the USO provider to earn a profit without having to cope with competition and in fact imply that the other competitors in part subsidise the USO provider. This would clearly be discriminatory in that it advantaged the one and disadvantaged the others.

The costing procedure that must be used instead of relying on a not available competitive process must attempt to replicate the latter's result. We have already pointed out and will argue throughout the report that the standard recommending itself for this purpose is the standard of Long Run Incremental Cost (LRIC). It is the standard that most closely reflects the costs of efficient provision which is the standard when there is vigorous competition. Using this standard would provide the safeguard that all market participants obligated to contribute to the funding of USOs pay in fact no more than would be demanded from them if the service in question were provided in a truly competitive environment. There would also, as far as cost determination is concerned, be no discrimination.<sup>13</sup>

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<sup>13</sup> While we place strong emphasis on the necessity of applying a rigorous competitive efficiency standard, one may ask whether it might not be incongruous to apply such a rigorous standard in respect of universal service provision given that in the normal business of bringing services to customers one observes that still something quite less than this standard prevails. It may be observed, for example, that the incumbent is asking prices in some areas that are higher than sufficient to cover costs and in some cases interconnection charges may also in this sense be high. The regulator might have acquiesced in this practice because the incumbent has still some sunk costs left un-amortised from its administrative-monopolistic past that the regulator feels it needs to cover from revenues obtained this way. Why not also allow the incumbent some leeway in respect of the costing of USOs for the same reason?

This objection, however, cannot be accepted. Suppose in an economic market segment the incumbent charges prices that are high relative to the costs of efficient provision. Then competitors have an incentive to enter that market, try to gain a share of the business and thereby put downward pressure on prices. Suppose, further, a competitor is required to pay interconnection charges that



From this we conclude:

1. Requiring determination of the cost of USOs on the basis of a cost standard reflecting efficient operation assures that this cost corresponds to the cost under a competitive standard.
2. Determining the cost of USO provision for the purpose of compensation using a standard that does not fulfill the efficiency requirement implies that the contributors to the compensation would effectively subsidise the USO provider.
3. To avoid discrimination in the financing of USOs, contributions into the USF by "paying only" market participants must be based on costs of USOs that correspond to efficient provision. We propose that this is the standard of LRIC.

#### 2.2.2.2 Practicability

In determining the net cost of the USO, the NRA will have to follow a procedure that insures reasonably well that it will lead to the desired results. The procedure must give the NRA confidence in the results and at the same time be manageable. In applying the procedure the NRA must have at its disposal instruments of evaluation and informational and data bases that assure these requirements.

In practice, it will probably invariably be the case that for the purpose of determining the cost of universal service, the USO provider will propose to submit cost measurements that it derived from its existing cost accounting system which usually implements some Fully Distributed Costing (FDC) approach and which reflects historic input prices. Even if the operator recognised that the costing should be done on an incremental cost basis, it would argue that these measures be derived from its existing cost records and then be properly adjusted. It is our position and has been shown in previous exercises that this is very difficult and would be extremely time consuming.

One particular aspect in this context is the control of information on which the cost measures are to be established. It might appear simpler to start from the cost records of the operator and work back from them in trying to derive the proper net cost figure of the USO. In addition to the difficulty mentioned above to achieve this, there is the problem

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are high relative to costs. The incumbent would here as well invite competitive attack from rivals attempting to build their own access to customers.

Such competitive responses from competitors if the incumbent's provision of universal service were accompanied by excessive compensation payments would be difficult. This would be because in most instances it is for the foreseeable future unlikely that (new) competitors - mainly for reasons of economies of scale and scope not yet realised and for information asymmetries - will be in the market for USO services. So it could be that a regime is established in which the USO provider is for a long time paid more by way of compensation - and this by its competitors - than would be justified by costs corresponding to truly competitive supply.

that the exercise would start from a cost data base which would be extremely obscure to the NRA. It would know nothing about the necessary adjustments to the raw data coming out of this cost data base which would be dictated to a large extent by the structure of the cost accounting system in place. Control over the actual cost standard applied would lie almost exclusively with the operator.

We will argue in the following that Activity Based Costing (ABC) is the proper cost accounting approach for a telecommunications operator. This applies in regard of general cost accounting purposes and in particular regarding the purpose of USO costing. As Arthur Andersen<sup>14</sup> in their report to the European Commission on the subject, however, suggest, it is unlikely that many telecom operators in EU Member States will at the present time have implemented this costing approach.<sup>15</sup> Since this is the case we will argue that the next best thing to fully implemented ABC should be used, i.e. cost studies and in particular analytical cost modelling that as closely as possible takes into account all the necessary cost drivers.

The important aspect of analytical cost models is that they can be constructed using generally available information and knowledge about telecommunications network structures and the productive process of bringing services to customers. Such models can therefore be made available to the NRA with relatively little expense of time and money. The immediate and important benefit is that the NRA is in control of the cost information used. In any case, applying an analytical cost model is less demanding than trying to derive proper cost measures (LRIC) from the existing cost records of the operator if these are not based on ABC.

We conclude:

1. The likely non-availability of the proper cost accounting approach of Activity Based Costing (ABC) provides no justification to rely on data from existing Fully Distributed Cost (FDC) accounting for reasons of practicability.
2. Instead of using FDC data, it is more consistent with regulatory objectives - and it is also more practical - for the NRA to use cost studies and in particular analytical cost modelling for the purpose of USO cost determination if the USO provider has not implemented the ABC approach.

### 2.2.2.3 Transparency and objectivity

Above we developed that the proper cost measure for the costing of USOs is Long Run Incremental Cost. We also argued that - absent an ABC methodology - the proper cost

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<sup>14</sup> See Arthur Andersen (1994).

<sup>15</sup> It has been reported that some telecom operators have converted their costing to ABC. See Kylén and Olve (1993) with respect to Telia, and Mercury (1993).

measure is best derived using an analytical cost model that is made as complete as possible following the principles of ABC. Within the analytical cost model, it would be possible to trace all individual cost calculations on the basis of the functional relationships that are used to reflect the cost causalities involved. Thus the very process of carrying out these calculations assures transparency.

While it is true that analytical cost models can be built that are so complex that only the experts that constructed them are able to interpret any particular cost calculation, there is actually no need to rely on models with this degree of complexity. Above we indicated that the models should be constructed in a way that they closely reflect the cost determining process that is followed in ABC. If this is done, the issue of over-complexity does not arise, or does not arise more than in ABC.<sup>16</sup>

The objectivity of the process depends of course on the quality of effort going into the costing exercise. It is independent of the methodology used. Whoever is involved in the process must constantly keep the requirement of objectivity in mind when cost measures are selected that are supposed to reflect the costs incurred due to USO provision. In any of the available approaches, such cost measures must inevitably rely on averaging of cost figures over representative units, also to some extent on proxy measures because the real costs cannot directly be observed. Objectivity then means that the best available approach to carrying out the operations of averaging is used, that the most judicious choice of proxies is being made, and so on. Such operations and choices always involve judgements which may - even with the most professional approach - not be completely free of subjective bias. Transparency as described above will, however, allow that such biases, if they creep in, can be discovered and eliminated.

Of course, transparency and objectivity should be ensured not only on the cost side but also on the side of the revenues. According to the net cost approach, one has to deduct from the costs of USO provision the revenues that would be foregone if there were no such provision. While data on direct foregone revenues should in principle be obtainable from the records of the operator in a transparent and objective manner without any problem, it will necessarily be more difficult to derive data with this claim for indirect revenue effects that also exist. When for this purpose one looks at suitable indicators,

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<sup>16</sup> Sometimes it is argued that the requirement of transparency is fulfilled if it is possible to trace in detail how from an existing cost accounting system the "relevant" cost data are taken and combined to derive cost figures for a particular purpose in question. Usually one has in mind an accounting system based on FDC. As is generally well known and as will become apparent from the discussion in Section 2.3.1.2, FDC cost measures are not well suited to reflect cost causality. The transparency provided when using these cost figures would stop very close at the surface of the problem. One would have to consider as acceptable whatever is recorded as the relevant cost data and not question to what extent it truly reflects cost causation. Often the cost data are not broken down far enough to obtain any measure that reflects the cost of the unit in question. So one would need to resort to extrapolation. While we are far from claiming that with the approach proposed here USO costs could in any sense exactly be determined, we do claim, however, that it gets much closer to a realistic measure of cost causation than is offered by the conventional FDC approach. And we believe that this is the real meaning of transparency, allowing to *transparere* (show through) the cost causation process.

again one has to apply good professional standards to obtain objective measures in a way that can easily be reproduced by an external observer.

We conclude:

The most professional standards in the application of the costing methodologies should be adhered to in order to safeguard objectivity. Even then, subjective valuations cannot be avoided completely. For this reason, it should be the aim to make the process of costing as visible and transparent as possible.

## 2.3 Practical issues

### 2.3.1 Cost accounting issues

#### 2.3.1.1 Why a discussion of cost accounting issues?

When it is said that price setting should be cost-based, the meaning of this is that prices should reflect the value of the resources used up in the production of the product in question. Between this requirement and the assurance that the requirement is adhered to lies cost accounting. In competitive industries where there is no need for regulation, cost accounting is strictly an internal affair that in general underlies no direction by the state, and companies use it for operations control, derivation of results, and price setting as they see fit. This is different when a company is regulated - because it has a dominant market position and competition is too weak to keep it in check; or, as in the present context, cost figures are used to determine deficits in the provision of USO services; or both situations apply. In these circumstances accounting practices become very much a regulatory concern as the validity of the cost figures needed in a regulatory determination largely depends on the way cost accounting is carried out.

In business practice, cost accounting has been in constant evolution.<sup>17</sup> With competition becoming ever more pervasive, knowing what one's costs are becomes in many industries a precondition for survival. A reflection of this is the current move in many business organisations to adjust their cost accounting systems from conventional Fully Distributed Costing, until recently the approach almost universally used, to the much more analytically oriented approach of Activity Based Costing (see Section 2.3.1.2). One needs only browse through the academic literature on the subject to obtain an impression of this development.

The telecommunications sector has in most countries of the world, in particular also in most Member States of the EU, until quite recently not been operating in a competitive

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<sup>17</sup> See Johnson and Kaplan (1987).

environment. Typically, telecommunications services were provided by a state-owned public enterprise protected by monopoly rights or by factual monopoly status. An analytical cost accounting for the purpose of helping the company to cope in the competitive process was almost by definition not necessary. Cost accounting has in these circumstances almost exclusively been used for the purpose of distributing past and current outlays over units of services to ascertain that - in total - all "costs" are covered by the tariffs charged to subscribers. Such tariffs stood often only in a faint - if at all - relation to the underlying costs. In fairness this was also due in many cases to public policy concerns, but even if an effort had been made to base prices on costs the cost system would not have allowed to calculate prices that are truly reflective of the corresponding resource use, due to the lack of the proper analytical instruments.<sup>18</sup>

With the advent of competition this is most probably going to change. The change will be the quicker the faster competition is actually challenging the incumbent operators in all fields. At the present time, there are still conservative forces at work tending to slow down the process, especially for services where monopoly positions are expected to be maintained for some time to come. In these areas a cost accounting approach wedded to the old practices would still allow to carry as costs items of outlays past and present that have no or only a very tenuous causal relationship with the process of bringing the service to market. Since this has had the stamp of approval for so long, the practice is often defended with arguments like "What was right in the past cannot all of a sudden be wrong now" and "One cannot change over night what has been accepted practice for decades". As regards the regulatory authority, it may suspect as underlying incentive for this unresponsiveness that a more analytical approach to cost accounting would uncover costs of inefficiencies that one would not be able to recover in competitive markets but which one is still able to include in one's prices in areas where the competitive threat is slow to materialise. Such a conduct must be considered as rational for a company that has this kind of monopoly control over its markets.

For reasons that we have spelled out earlier, if there is to be compensation for deficits due to the provision of USOs, the basis for the calculation of such compensation must be the cost of efficient provision. In this section we have seen that there may be obstacles to obtaining proper measures for such costs. The obstacles primarily lie in the absence of the necessary analytical instruments, a circumstance which in some cases may also be used as a screen to prevent access of the regulator to the relevant cost information (in general regulated firms are not known to volunteer the provision of cost information to outsiders, of which the regulator is certainly considered to be one).

Not only for purposes of the costing of USO provision, but generally for all its regulatory functions, the NRA must be familiar with the cost accounting systems of the regulated firms. The NRA may in fact require that these systems be adjusted to satisfy certain conditions that are necessary for regulatory control. Before this general background and

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<sup>18</sup> See Arthur Andersen (1994).

the one laid out above, the discussion in the following sections will provide an overview over the properties of the various cost accounting approaches and instruments and the ill consequences of following practices that are not geared to the requirements of a competitive environment. At the same time we will discuss what the reaction of the NRA should be and what remedies could be used in the face of these difficulties.

We conclude:

Cost accounting issues should command prime regulatory attention as it is one of the essential prerequisites for being able to judge properly the costs of USO provision.

### 2.3.1.2 Cost accounting practices

From the beginning of regulatory intervention in the telecommunications sector, one question has been in the centre of the discussion. It is the question which costing standard provides an appropriate basis for practical problems such as regulation of monopoly prices in particular regulation of prices for interconnection services, determination of the local access loss of a regulated operator, and determination of the cost of USOs.

Over the years regulators have answered the question for the right costing standard in different ways. We can observe two general approaches:

- In the first period regulators generally based their decisions on the Fully Distributed Cost (FDC) standard. This was mainly done for practical reasons as nearly all of the regulated operators applied FDC-costing systems for their own purposes. Since the regulators had not yet developed their own concepts, they were practically obliged to accept the cost measures submitted by the network operators.
- In the past twenty years or so the weaknesses of the FDC-method with regard to regulatory as well as managerial decisions have become more and more apparent. Therefore, the standard of Long Run Incremental Cost (LRIC) was proposed and increasingly adopted as an alternative to FDC because it fulfills the economic and regulatory requirements to a much greater degree.

In the following we will present outlines of the FDC costing approach as well as of the Activity Based Costing (ABC) method, which is the approach that much more nearly fulfills real cost accounting requirements. Further we discuss analytical cost modelling as an extension of ABC and as an instrument that can be used independently.

### *FDC costing method*

This method provides for an exhaustive allocation of all costs to the services of the enterprise. The resulting FDC data generally include the costs directly and indirectly attributable to a service, plus a share of those costs with no causal relationships, i.e. joint and residual common costs. The methods for allocation of the indirect costs and overheads are supposed to be causally related, but in practice arbitrary allocations prevail.

FDC data are usually based upon an organisation's historical costs, i.e. they are based on the existing physical network engineering capacity together with the commercial and administrative processes within the organisation. The data are derived from the organisation's books and records. So they reflect the actual fixed assets used to provide the service, and the existing levels of capacity and network utilisation inherent in them. There is normally no correction if for example there is excess capacity.

There are different methods of allocating the residual joint and common costs to individual services. To divide the common costs over all services equally is a very simple and crude method which will generally lead to arbitrary and even illogical allocations. The most common methods adopted in practice are:<sup>19</sup>

- The "Relative Output Method" (ROM) where costs are allocated to services in proportion to their share of total output. This method is only possible when all outputs can be expressed in terms of a common physical unit.
- The "Gross Revenue Method" (GRM) where costs are allocated to services in proportion to their share of firm revenue.
- The "Net Revenue Method" (NRM)<sup>20</sup> where costs are allocated to each service in proportion to its contribution to net revenue.
- The "Attributable Cost Method" (ACM) where costs are allocated to each service in proportion to the direct and indirectly attributable costs of the service.

The application of the FDC method on regulatory and pricing decisions has caused a lot of criticism in the economic literature. The main arguments can be summarised as follows:

- The arbitrariness of cost allocations underlying the FDC data make them unsuitable for pricing decisions.

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<sup>19</sup> See Arthur Anderson (1994).

<sup>20</sup> Not to be confused with the "Net Revenue Approach" discussed below in Chapter 5 in the context of the financing of the net cost of USO services.

- When GRM or NRM are applied as allocation methods the use of costs of service to set prices involves a circular argument as these methods are based on revenue.
- Prices for goods set on the basis of FDC data generally lead to inefficient resource allocations as such prices do not reflect the real scarcity of the good.<sup>21</sup>
- As Richard D. Emmerson has shown in his "Death Spiral" example,<sup>22</sup> a profitable multiproduct firm may become unprofitable when it withdraws a product from the market whose fully distributed costs are higher than the revenue generated by this product.
- The FDC approach generally takes no account of technology changes as well as of potential inefficiencies in business processes and work practices.

Given these weaknesses, the continuing use of the FDC standard can be explained by tradition, maybe by the fact that it simplifies the data collection tasks and, therefore, serves another accounting purpose - the creation of periodic financial statements - in a cheaper way, but probably ultimately by the fact that the pressures of competition in the industries in question is not great enough yet to force its abandonment.

### *ABC method*

Rigorously applied Activity Based Costing (ABC) overcomes most of the weaknesses of the FDC method. ABC generated information aims at providing an accurate picture of the cost of producing, marketing, and delivering products or services to the market. It differs from the traditional FDC approach in that it focuses primarily on the underlying activities required to produce products and services, rather than on the products and services themselves. So the ABC data are generally better capable of meeting information needs for the strategic decisions of an organisation's management as well as those serving regulatory purposes.

According to the ABC method, costs are attributed to products and services based on an analysis of the causes of those costs which are called cost drivers. Costs are traced and allocated on the basis of the activities performed for the products and services produced. So the ABC approach establishes a clear cause-and-effect relationship between activities performed, their associated costs, and the output resulting from those activities.

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<sup>21</sup> Accordingly, with regard to the theme of this study the use of FDC data is likely to lead to an overestimation of the USO costs.

<sup>22</sup> Emmerson (1994), page 2.9-2.12. Emmerson shows in this example of a 4-product-firm with a positive corporate profit that the profit may become negative and further decreases if the firm withdraws "unprofitable" products in a fully distributed costing approach. The reason for this phenomenon lies in the fact that the products are not really unprofitable as their revenues are higher than their incremental costs so that they provide contributions to the common costs of the firm.



A step-by-step review of the functioning of an ABC system consists of the following essential measures:

- Identification of the products and services offered by the organisation.
- An activity analysis to define the set of activities required to produce, market and deliver the product or service.
- Identification of the cost drivers which determine the level of costs incurred for the level of activities performed.
- Attribution of direct and indirect costs to the activities performed based on the consumption of these cost drivers.
- Linkage of activities and their attributed costs to products and services produced.<sup>23</sup>

As ABC systems use a wider variety and greater number of allocation bases for assigning overhead costs to products and services, accountants attain greater precision in assigning costs according to causation and resource consumption. ABC systems focus on activities as the driving forces behind cost incurrence and consider all costs in the value chain from research and development to customer service. So they provide the appropriate foundation for measuring LRIC and for linking them to the responsible products and services.<sup>24</sup>

ABC systems provide not only the relevant information for pricing decisions, they are also an effective tool for the control of production processes and thereby for cost control. It is mainly for this reason that they are increasingly applied in the economy, i.e. to serve the demands of a vigorously competitive process. When installed and being used for these purposes they provide what is really also required for a USO costing exercise: cost data reflecting efficient production.

There are a number of companies in the telecommunications industry reporting that they already have installed or are in the process of installing ABC systems. Among them are Mercury (UK), Telia (Sweden), and Deutsche Telekom (Germany). In the case of incumbent network operators, however, one must be careful when evaluating cost information when produced by their ABC systems. These may be accurate in respect of cost causation but not necessarily reflect efficient service provision given the inefficiencies that these companies have been prone to in the past and given that it is likely that these inefficiencies still persist. Given the important degree of market power

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<sup>23</sup> If there is still a residuum of non-attributable common costs after performing these steps one can think of a further step where these common costs are allocated to the products by one of the above mentioned FDC allocation methods. This step, however, has to be rejected as it provides a mixture of an ABC approach with a traditional FDC approach and its accompanying weaknesses as mentioned above. The aim should be to reduce the residuum of non-attributable costs on the basis of cost causation as far as possible.

<sup>24</sup> See Committee and Grinnell (1992).

that they still command, they can hope to be able to cover these inefficiencies through the prices they earn in the market. If these inefficiencies are included in costs reported for the purpose of a USO net cost calculation, however, the NRA must make sure that the inefficiency components are eliminated from the figures. Practitioners that have in concrete cases gone through this exercise report that the necessary corrections may run in the order of 20 to 30 % of the originally produced figures.

Two concluding observations: First, proponents of the ABC approach refer to its cost measures in terms that in spirit correspond exactly to the (for our purposes relevant) TSLRIC version of the Long Run Incremental Cost concept.<sup>25</sup> We pointed this out already in Section 2.2.1 when introducing the LRIC concept. Second, as follows from the above discussion, TOs will need to install powerful analytical costing systems of the ABC type for their own purposes, particularly in order to be able to face their future competitive environments. Any argument that may possibly be advanced from their side that such systems will have to be installed exclusively for the purpose of USO cost determination are therefore not valid.

### *Analytical cost modelling*

What makes the ABC approach discussed above so relevant for the requirements of the competitive market place is its insistence on cost causation at every analytical turn of the approach. The word "cost driver" is the one most often used. From the provision of this kind of analytical cost data to combining them in functional relationships that depict the productive process for a particular service is only a short analytical step. Provided such functional relationships take account of all the cost drivers, they would be in a position to show cost profiles of services and service elements according to the different circumstances of delivery and for various quantities and qualities. One would then actually be using an analytical cost model. Analytical cost models have recently become important in the regulatory process surrounding the universal service discussion in the

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**25** Testimony to this are the following excerpts from the section entitled "Long-Term Product Costs" in the standard work on ABC costing by Johnson and Kaplan (1987), pp. 234 and 235: "The most important goal for a product cost system is to estimate the long-run costs of producing each product, each salable output, in the company's product line. ... A good product cost system measures the long-run costs of each product. Conventional notions of fixed and variable costs are ignored because, for purposes of product costs analysis, the time period is long enough to warrant treatment of virtually all costs as variable. ... That many of the most significant product costs are called fixed or sunk signifies the poverty of current cost accounting thinking. All costs are the consequences of managerial decisions at some time. While some cost categories may not vary currently, based on the quantity of current production output, that does not mean that they are not controllable or caused by product-related decisions made every day. These so-called fixed costs have been the most variable. They are the costs that have increased the most during the past several decades, as a percentage of total manufacturing costs. The goal of a good product cost system should be to make more obvious, more transparent, how costs currently considered to be fixed or sunk actually do vary with decisions made about product output, product mix, and product diversity."

United States. Indeed they are a powerful tool as they can also be constructed by outsiders to the firm the costs of which are in question.

The characteristic property of analytical cost models - that sets them apart from typical cost accounting methods - is that they establish functional relationships between the particular conditions of service delivery (say a local network of a big city vs. one in a thinly populated rural area), the cost drivers relevant for these conditions and the corresponding costs of that service delivery. Their advantage is thus precisely that they allow to assess the effects on the costs of a particular service of different network sizes, density of traffic, combination of offering several services over the same structure, and so on. Still in other words, they allow to assess the effects on costs of economies of scale and economies of scope.

The antecedents of analytical cost models have been engineering cost models. These have always routinely been used by the engineering departments of network operators for their planning and investment purposes. Such models have also been constructed by outside experts, especially researchers in universities and other research bodies, eager to analyse the cost structure of telecommunications. Such engineering cost models have in the past typically focused on the network cost side of service provision and neglected the administrative and marketing cost side. This was mainly a consequence of the then monopoly situation and the interest of researchers at the time to test natural monopoly aspects of the industry and whether there existed overinvestment in equipment due to the high and riskless returns that could be earned on such investment. Questions of marketing, customer care and administration, and their respective costs, were simply not at the forefront of regulators', managers' and researchers' concerns. It is wrong, as has frequently been done, to disqualify these analytical cost models because they would not pick up all relevant cost elements. These models can be made as complete as one wishes through picking up the resource use cost of each cost driver identified by ABC for the delivery of a particular service. They are then the natural extension of ABC.

Analytical cost models can be constructed by experts external to the operators in question because the largest part of the cost of delivering telecommunications services is caused by the network and there is widespread knowledge of how such networks are constructed, what the required investments and corresponding costs are. It is true that for the costs of operations, administration and marketing there does not exist such a good informational base and the model builders must for these rely on estimates. Still such models have proven to yield quite good approximations to network operators' service costs. They thereby become powerful tools for regulators in their effort to overcome the information asymmetry that they face in their dealings with network operators. In particular of course the models can be used by the regulators in verifying network operators' claims for compensation of net costs of USO delivery.

Finally, an advantage of analytical cost models being constructed by outsiders lies in the fact that the regulated firm does not need to reveal to outsiders - here: competitors - the

complete contents of its internal costing system, since these models always retain their character of a common-knowledge based instrument.

Discussions that are conducted with their help would concern functional relationships between resources and outputs that all informed experts in the industry could in principle know about. As a result of such a discussion one would hope to reach agreement on more or less narrow ranges regarding concrete costs of USO services.

#### *Concluding observations*

Of the three approaches discussed, the FDC method is most widely used but the least appropriate for determining the cost of USO provision. The ABC method is the most appropriate approach but unfortunately not yet practised by most incumbent telecommunications operators. There remains the instrument of analytical cost modelling which can be used as an extension to the ABC approach. Analytical cost modelling can also be carried out by external observers which makes this tool so valuable to the regulatory authority.

Thus we conclude:

1. The costing system traditionally used in telecommunications is Fully Distributed Costing (FDC). Mainly because FDC data do not provide an appropriate basis for pricing decisions, the approach is increasingly under criticism with regard to its adequacy for managerial as well as regulatory purposes.
2. Because of its analytical approach to the cost causation processes, Activity Based Costing (ABC) is the most suitable approach to the determination of LRIC. ABC systems are increasingly applied in the economy. USO providers should be required to install such analytical costing.
3. Analytical cost modelling should be used as an extension of ABC or in lieu of it if the USO provider has not yet installed a corresponding system.

#### 2.3.1.3 Current vs. historical input prices

The costing systems of telecommunications organisations have generally, as also those of companies in other industries, been based on historical prices of the inputs used in the production process. As mentioned in the preceding section, this was usually done in connection with an FDC costing approach. There are mainly two arguments for the usage of historical cost data:

- The data are easily available as they are documented in the books and records of the operator.

- If the operator is in a market situation that allows it to base the prices of its products and services on historical cost data it is able to ensure the recovery of its expenditures actually incurred.

In recent years the inadequacy of historical cost accounting with regard to pricing decisions has increasingly been recognised by managers as well as regulators.

From management's point of view, historical cost accounting is becoming inappropriate as a basis for pricing decisions since telecommunications markets are increasingly subject to competition. In the course of this process, incumbent network operators' dominant market positions are threatened and, correspondingly, the ability to charge any prices to cover all their revenue requirements. Suppose a new entrant provides the same services using modern equipment with much lower costs than the historical costs of the incumbent. The incumbent is then forced to set prices also on the basis of these current costs in order to maintain its competitive position.

From a regulatory point of view, historical cost accounting has to be rejected for reasons that are closely related to the reasons that motivate management. In areas of service provision where customers need the protection of the regulator, prices should also satisfy the competitive standard of efficiency. As we have seen, however, prices based on historical data do not satisfy this criterion. Since competition cannot be relied on directly, the regulatory authority has to prescribe an appropriate cost standard which is the forward looking cost concept on the basis of current replacement costs of assets. In particular, the LRIC cost standard is a forward-looking concept. Only prices based on current cost data provide for efficient resource use as consumers are encouraged to take account of the actual resource costs in their purchasing decisions.<sup>26</sup>

In summary, the market forces and also the regulatory requirements provide for an increasing need for current cost accounting (CCA) instead of historical cost accounting. One can conclude that the advantages of CCA outweigh possible costs evolving from the creation of the data base.

According to these findings, regulators in several countries in the process of liberalisation have moved to price regulations based on the forward looking cost concepts and CCA methods:

- The German government's ordinance on the regulation of telecommunications tariffs of October 1996<sup>27</sup> provides for prices of dominant operators based on the costs of efficient service provision which have to be determined according to TSLRIC.
- In its last publications on price control, the British regulator Of tel provides for a determination of BT's costs based on a CCA method.<sup>28</sup>

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<sup>26</sup> See Of tel (1995), p. 19.

<sup>27</sup> Bundesrepublik Deutschland (1996), p. 1492ff.

The difference between CCA and HCA affects primarily investment goods since inputs that are used up soon after their purchase pose no problem in the context of CCA vs. HCA. CCA requires that the part of an equipment's value that is allocated as cost each year reflects this year's equipment price. In terms of level and structure of costs, the consequence of CCA is that the cost of using an investment good develops over time in step with the price of that investment good. This in turn depends on the prices of the inputs needed in the good's construction/manufacture and on the rate of innovation and technical progress in its production. When investment goods require a great deal of labour input their prices have a tendency to rise in step with the cost of labour, the same then holds for the cost of using this installation. Conversely, all equipment items that are benefiting a lot from innovation are becoming steadily less expensive and this also holds for using them.

It follows that the cost of a particular service, whether it will be higher or lower than according to HCA, will depend on whether the service uses facilities which needed heavy labour input in their construction or manufacture, therefore whether it has had a tendency to experience price rises in the past, or whether it uses facilities the manufacture of which experienced a lot of innovation so that their prices have been decreasing. In respect of USO services, given that most of them are local network services, both cost trends have been effective. The costs of switching and electronics based transmission (e.g. interoffice transmission and increasingly transmission in the feeder cable part of local plant) have been benefiting from price decreases of innovation incorporating equipment while underground works have rather been suffering price increases in step with labour cost increases.

In order to provide an impression of the extent to which CCA may affect various cost components, it can roughly be said that about 60 % of the capital costs of a local network are driven by the rate of innovation while the remaining 40 % are driven by labour costs. Capital costs in turn make 50 to 60 % of total cost of running a local network. Incidentally, the remaining costs are caused by operating the network, maintenance and repair, and administration, which in turn are primarily driven by the cost of labour.

Issues that relate to how the costs of capital goods should be spread over the units of services produced during its useful life, taking CCA prescriptions into account, will be treated in the following section.

From the discussion in this section so far we conclude:

1. There is an increasing need for telecommunications operators to move from Historical Cost Accounting (HCA) to Current Cost Accounting (CCA) as a forward-looking concept. The necessity emerges from managers' demand for a proper data

base for pricing decisions in an increasingly competitive environment as well as from regulatory requirements for costs and prices satisfying the efficiency criterion.

2. CCA affects primarily the cost of capital goods. The cost of capital goods benefiting from innovation are lower and the cost of capital goods the production of which is intensive in the use of labour are higher than under HCA.

#### 2.3.1.4 Network costs due to depreciation of invested capital

The discussion on historical vs. current costs in the preceding section has given an impression of the issues surrounding the determination of costs caused by fixed capital investment. In addition to the question of historical vs. current prices, it involves questions of how changes in the prices of invested equipment and expectations of demand growth and the associated risk with such investments are to be taken into account. How in fact should capital costs enter the cost calculation for pricing decisions? The answer to this question is certainly an essential element for an effective regulatory oversight over prices in general and the determination of any compensation to be granted for USO provision in particular.

The *fixed* costs caused by investing equipment for a fixed period of time - during which it is productive and generates income for the company - consist of the initial outlay for the capital item and the interest on the capital sunk into that investment (we disregard in the discussion of this section the variable operating and maintenance costs). In order to express the initial investment outlay as cost per time period, it is converted into amounts of depreciation that in their sum cover the amount of the outlay. The number of depreciation amounts corresponds to the expected number of years that the capital item is expected to be useful. During that period of useful life, interest is included to assure a return to the providers of capital. So much is simple and rather trivial. What is not clear from this description is what must be done to make these cost figures based on "current prices" and how is the element of risk taken into account.

In Appendix A we provide stylised examples showing, first, how cost accounting deals with the risk aspect, second what the implications are of using current prices for capital items for the resulting cost elements, and, third, how future demand growth and reserves to accommodate such growth should properly be taken account of.

The examples and the conclusions drawn from them are the following:

- The *straight line depreciation* regime is the most conventional approach to depreciation. It implies carrying charges for an invested item of capital that are constant per period over the item's useful life. Relative to revenue streams that start with low levels but increase over time to levels high enough to make buying the equipment altogether worthwhile, these charges would appear high during early periods. Either prices are high enough to cover these charges or deficits would show

up that would possibly require compensation under a USO scheme. The case demonstrates that alone through the application of straight line depreciation a bias towards an early amortisation of capital is implemented. The implied premium can be defended on the grounds that there is a component of risk to be included in the cost charged for long-lived equipment items.

- Another variant is *degressive depreciation*. Such a depreciation policy involves relatively high depreciation rates early on in the life of the equipment and lower ones towards the end. The variant would be relevant when there are declining equipment prices and the CCA requirement is adherent that the depreciation in any year reflects both the *current price* as well as the *current change in the price* of that equipment. As a consequence, a higher risk premium is included in the capital carrying charge. From this follows that the apparent deficits in the early periods are larger and the corresponding prices, respectively, the necessary compensation to cover deficits are higher than in the straight line depreciation case.
- In a third version, which approaches *economic depreciation*, variations in demand are taken into account. In particular, if, what is typical for telecommunications, there is growing demand and if this is reflected in depreciation rates as it should, this would counteract the effect of declining prices just discussed. The reason is that to each unit of output a comparable amount for the use of the equipment should be charged. From this follows that because of the growth in demand the depreciation amounts charged per period should in early periods be lower and in later periods be higher than otherwise. If this rule is followed, depending on demand increases relative to price decreases over time, the effect of declining prices may be somewhat, completely or actually overcompensated. In the just-compensating case we would end up again with straight line depreciation. Conversely, if there are increasing prices of investment goods coupled with increasing demand then progressive depreciation rates would be justified (these are, however, due to risk considerations hardly ever used).

The discussion above has made clear that determining the cost of USO provision based on cost accounting data will always involve expectations of future developments and how these should be taken into account. In choosing a particular variant one implicitly also always makes a judgement about the associated risk. This risk is subject to different evaluations and the NRA and the regulated firm will necessarily differ on how this risk should be factored into costs.

There is therefore a need for negotiations between the NRA and the management of the regulated firm as to what the proper safety margins should be that can be allowed to be included as part of costs. What the NRA should be wary about are degressive depreciation rates, particularly in an environment of increasing demand. Straight line depreciation is probably a rough and ready approximation to economic depreciation reflecting the effects of both decreasing prices and increasing demand. The lengths of



the lives of invested capital items are then still parameters in the depreciation calculation that require careful examination.

We conclude:

1. In a capital-intensive sector like telecommunications the choice of an appropriate depreciation policy is one of the central strategic parameters in the area of cost accounting.
2. From a regulatory and efficiency point of view and especially with regard to the determination of USO costs a depreciation method is preferable which is as closely as possible in line with the method of economic depreciation (which takes into account changes in the prices of the equipment invested as well as expected changes in the demand for the output generated by the equipment).
3. In the current environment, straight line depreciation is probably a rough and ready approximation to economic depreciation reflecting the effects of both decreasing prices of investment goods and increasing demand.

#### 2.3.1.5 The cost of capital

The rate of interest to be used in determining the annualised cost of capital goods, more precisely the cost of capital (CC) that the regulated company incurs for the use of capital tied up in its investments and that it must be allowed to earn on account of the services it supplies under the USO, has until now been taken for granted. Like the selection of a particular type of depreciation policy, discussed in the preceding section, the value used for the CC has substantial influence on the level of costs arising from the capital goods used in the production of these services.

The CC is derived as the weighted sum of the return that share holders require from the company on their shares (before deduction of corporate taxes) plus the rate of interest payable on debt. If we let E stand for shareholders' required return, R for the interest rate on debt,  $\alpha$  for the share of equity in the company's balance sheet, and T for the corporate tax rate, then the company's CC is determined by the formula below :

$$CC = \alpha * E / (1 - T) + (1 - \alpha) * R$$

The values of the parameters E, R, T and  $\alpha$  making up above formula vary from country to country. A realistic case would be the following: The operator in question has a capital structure with a 40 % equity share from which follows that  $\alpha = 0.4$ ; the corporate tax rate is around 40 %, thus  $T = 0.4$ ; the company has access to capital from lending institutions at very favourable interest rates that are currently estimated to run - on a real rate basis - at around 5 %, and given a risk premium of about 4 % for this company, the shareholders required return on their shares runs about 9 % (which means that  $E / (1 -$

T) = 15 %).<sup>29</sup> Fitting these values into above formula yields a value for CC equal to about 9 %.

Since costs are to be determined following the prescriptions of CCA, the CC to be used should be a real rate, i.e. the inflation induced upwards bias contained in a nominal rate should be taken off. As indicated, the values used above for Germany are based on real rates of interest.

From this we conclude:

1. It is very important that the proper rate for the cost of capital (CC) is used in the costing of capital goods employed in the production of USO services as it has great impact on the level of overall costs.
2. The CC is to be derived as a weighted average of the rate of return that share holders require on their shares in the company (before deduction of corporate taxes) and the rate of interest that the company pays on its debt.
3. Given that costing is to be carried out on a CCA basis, the CC should be on a real rate basis, i.e. with the inflationary component taken off from the nominal rate.

#### 2.3.1.6 Operating, maintenance and administrative costs

There does not exist much detailed factual information on the costs of operating, maintaining and administering a telecommunications system that is accessible to external observers. The information used in analytical cost models is of a rudimentary kind in that they postulate summary relationships between the level of investment, the number of subscriber lines in a local network and these costs respectively.

Therefore, the NRA must order the regulated firm to provide it with information on these costs that is as detailed as possible. As they are most probably not available from an ABC system, studies should be carried out with the objective to provide such information according to the standards of ABC. The studies should document in particular the deployment of labour for the various activities and how the level of these activities are driven by the demands of an efficient operation, maintenance and administration of the network in question.

The cost analyses should be as comprehensive as possible leaving in the category of true common costs only those cost components for which the actual cost drivers can in fact not be traced to individual services. This common cost category should contain only

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<sup>29</sup> The term  $E/(1-T)$  should be used in the formula of the text in lieu of simply E because in order to be able to offer shareholders a return of 9 % *after* corporate taxes, the company must earn 15 % to allow for the deduction of the corporate tax at the rate of 40 %.

those cost elements that effectively do not vary in the long run with the volume of services.

Thus we conclude:

1. With regard to operating, maintenance and administrative costs, the USO provider should submit information to the NRA that is as detailed as possible.
2. The data submitted should document that the costs correspond to an efficient operation, maintenance and administration of the network in question.

#### 2.3.1.7 Treatment of sunk costs

A business decision taken at some point in time entails a "sunk" cost whenever rescinding the decision at a later time would not cause this cost to disappear. A classical sunk cost is a telecommunication cable buried into the ground which cannot be used for anything else but for the transport of telecommunications signals between the given points in space. After the fact of investment, the cable cannot, except at prohibitive additional costs, be taken away and be placed somewhere else and put to an alternative use. The cost of the cable is thus sunk and cannot be recovered except through using it for the initially intended purpose of the investment.

The non-recovery aspect of sunk capital cost has relevance as long as the item is not written down to zero and amortised through the generation of services sold to customers. It has particular relevance if there has been inefficient overinvestment and the investment outlays are still on the books while the equipment giving rise to capital charges does not give rise to income. The network operators may argue that they should be allowed to include these extra burdens in their prices, in particular also in the USO deficit figures that should be compensated. Our position on this is that such extra burdens should be taken care of through the use of special depreciation charges so that only those sunk costs remain on the books that correspond with the revenues still expected to be generated by the capital items in question (see the discussion at the end of Appendix A).

Sunk costs due to capital investments have a particular implication affecting the determination of the cost of USO services. When a network operator has committed itself to rolling out a local network, it has little choice but to connect all premises in that area, as it can generally not be known beforehand which customers will generate an unsatisfactory level of revenue. Having judged that *in toto* the area will be economic, the risk must be taken that some premises are also connected that subsequently will be

inhabited by uneconomic customers.<sup>30</sup> If, as it were after the fact, customers with low revenues are identified in the area the relevant cost that could be saved by discontinuing services to these customers would not include the sunk cost of connecting their premises as these costs could not have been avoided. Only the variable costs caused by these customers, such as the current cost of operation, maintenance and administration as well as the line termination equipment, should be set against their low revenues in order to determine the net cost of serving them. The remaining sunk cost have to be considered non-avoidable even if there were no USO. Costs like these are part of the risk that is inherent in any business enterprise. They are not part of the costs caused by the USO.

Sunk costs arise not only as a consequence of capital investments; they also arise in the context of employment policies. Pension liabilities are a very important case in point. They are sunk costs because they stem from past policy decisions and they continue irrespective of whether the policy is still appropriate or not. As a matter of fact, pension policies that appeared to be right in the past have ceased to be so in the new competitive environment. The typical case is that of pension liabilities due to retired civil servants which in comparison to alternative current contributions into a public pension scheme or into a reserve for company sponsored retirement benefits are much higher. Since, however, the corresponding commitments cannot be changed retroactively, there arise burdens in excess of what would otherwise be normal. Being sunk costs due to past inappropriate policy decisions, the same reasoning applies to these burdens as to sunk costs due to inefficient and redundant capital investment. They are not costs of current efficient service provision and therefore also not part of the cost of the USO. In Appendix B we provide a discussion of the problem of pension liabilities and the possibilities of dealing with that problem.

Thus we conclude:

1. A USO provider's sunk cost due to redundant investments are not part of the cost of efficient service provision and are therefore also not part of the cost of the USO. The USO provider should apply special depreciation charges to take care of these sunk costs.
2. For *uneconomic* customers in an *economic* area that it would not have been possible to identify beforehand, the net costs of serving them under the USO do not include sunk costs incurred at the time of investment.

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<sup>30</sup> Even if uneconomic customers were known beforehand, not laying cable till close to their premises would be unwise because a premise inhabited now by an uneconomic customer may in a few years be inhabited by an economic one. Thus it would make sense to incur the extra cost of also laying the distribution plant in these cases, in particular since the corresponding *incremental* cost in a local network being constructed anyhow will be substantially lower than the *average* cost per premise.

3. Sunk costs arising out of inappropriate past pension plan policies are not part of the cost of efficient service provision and therefore also not part of the cost of the USO.

### 2.3.1.8 Treatment of common costs

The discussion in Section 2.3.1.6 on the costs of operation, maintenance and administration has shown that on the basis of a thorough analysis of cost drivers only a relatively small proportion of total costs ought to be left without establishing a causal link between the service in question and the cost causing activity.

The remaining costs of the enterprise will either be caused by other services, i.e. non-USO services - and belong on the cost accounting records of these services - or they are true common costs. True common costs do not change when the volume of activity changes and they would thus not change if the firm discontinued to serve uneconomic customers. Thus they are not part of the long-run incremental costs that are the basis for the calculation of the cost of USO services. They should therefore not find any consideration in that calculation.

Thus we conclude:

1. True common costs are costs that do not vary with the level of activity of a firm. Detailed cost and activity analyses are necessary to determine this residual share of costs as precisely as possible.
2. As true common costs do not change if a firm discontinues to serve specific areas or customers they are not part of the corresponding LRIC of USOs.

### 2.3.2 Issues relating to (local) network structure

#### 2.3.2.1 Most recent available vs. most recent employed technology

The test whether a business organisation efficiently provides a service in a truly competitive environment is its ability to survive and to prosper. That organisation would use the best productive technology available for its business or, if not, see to it that the costs caused by it are not higher than that of that technology. As we have seen in Section 2.3.1.4 an appropriate depreciation and amortisation policy may be part of such a strategy.

Regarding the choice of the best technology, the firm must often find the right balance between the one that is proven and reliable and represents more or less the current state of the art, and the one that is new, perhaps revolutionary, promising great cost savings but has not yet demonstrated conclusively its strengths. In such contexts, one

would therefore often find that firms prefer the existing, current state-of-the-art technology to avoid the risks associated with a new technology. Such decisions would prove to be sound or not depending on what other firms in the industry will do facing the same decisions and whether those that go for the new technology gain an edge or not. In other words the market place decides.

The situation sketched above is currently typical for telecommunications. For example, there exists now the new technology of the wireless local loop instead of the twisted pair of copper wire or optical fiber to connect customers to the telephone network. This technology may actually have the potential of realising substantial cost savings in what are currently high cost areas. There has, however, until now only been relatively little competitive pressure towards widespread use of this new technology. This can be due to the effects of sunk costs (since the existing copper in the ground has no other uses, it is not worthwhile pulling it out and replace it by something else, although, if the initial investment had to be made now, one would use WLL, see Section 2.3.1.7) or because the technology is still so surrounded by uncertainty that it would be too risky to use it on a wide scale.

The NRA must decide on the basis of which technology the cost of efficient provision should be calculated. For this purpose the NRA can, however, not substitute its decision for that of the operator as to which technology should currently be the most efficient one in use. It will have to go by what at the present time is in fact the most recent equipment in use and accept cost calculations based on this basis using Current Cost Accounting. The possible error and overstatement of costs may then not be too great and to the extent that overstatements do occur must be tolerated. If the NRA proceeded differently, this could lead to larger errors.

Thus we conclude:

1. Costs of telecommunications services depend on the type of equipment used. These costs may become lower as more and more innovative technology is becoming available.
2. The NRA should calculate the costs of efficient provision of USO services on the basis of the least-cost technology that is currently in actual use and not on the basis of the best available technology but not yet in use.

### 2.3.2.2 Optimal vs. existing structure of local network

The question of whether throughout an optimal network structure should be assumed when making USO cost calculations is different from that we discussed above regarding the most efficient technology. In this case there is in general no uncertainty any more that larger local networks should be designed because of both economies of scale in the switching technology and lower cost of transmission which allows feeder cables to be

longer. In a competitive situation, say, where a large district now served by several smaller local networks of the incumbent operator could be threatened by a new competitor - if the existence of sunk costs on the part of the incumbent did not prevent this - this competitor would of course use the most efficient network design to get the benefit of lower costs and competitive advantage. In order to take account of this competitive threat, the incumbent operator should depreciate the book value of its several smaller local networks down to the value of the large most efficiently designed network. This would be the more appropriate if the incumbent had already begun to consolidate its network structure according to an optimal network design.

The instrument of analytical cost modelling can actually cope with this aspect as in principle such models can without any great problem be used to calculate the network costs of any given size, using each time the most appropriate technology. Here it is more the question of the strength in technical matters of the NRA *vis à vis* the regulated firm whether it has the authority to argue convincingly in each individual case what the right network structure should be and accordingly the relevant costs. One should make it dependent on this competence whether to insist on a costing of USO services on the basis of such least cost network designs. On the basis of rough rule-of-thumb calculations, differences in costs of local networks due to optimal network design in relation to current network structure may run from 5% to 10%, so they are not of a negligible magnitude.

Thus we conclude:

1. There is a case to have the local network USO costs be based on the optimal design of local networks. Cost differentials that are at stake may run from 5% to 10%.
2. The NRA should, however, be mindful that it may not be in a strong position to argue conclusively with the TO on technical questions as to what the optimal design of a local network should be.

### 2.3.2.3 Cost savings through non-USO services

A local network is typically not designed to provide exclusively those services covered by the definition of universal service. Others can be leased line services, data transmission or broadband delivery services. Facility sharing may also occur regarding transmission equipment, such as multiplexers and line termination equipment. Of course, the possible degree of sharing depends on the actual configuration of the network.

Cost savings occur, when the same facilities are used for either services. This is always the case in service-integrated networks (e.g. ISDN). At least in the physical layer of the network - i.e. in the access network consisting of ducts, copper wire or optical fibre, etc. - is here shared use by multiple applications. In other cases, the total cost of a

network allowing the sharing of facilities by different services - including for example broadband services - tends to be higher than the cost of a stand-alone network for, say, standard telephone services. There may then, however, well be economies of scale or scope leading to a reduction of the cost attributable to a single service compared with the situation where subsets of services are carried on separate networks.

Whenever a local network or a segment of a local network is in respect of USO services under review as a potential uneconomic area, and the cost of that area is to be determined as part of the net cost calculation, the question addressed above whether there are lower costs due to the sharing of facilities arises. To what degree non-USO services are actually implemented in the area is a matter of fact that only the TO itself can answer. In cases where there is an offer of such services (for example leased line services) the cost decreases caused by the joint production should be ascertained by an appropriate analytical cost accounting approach and, alternatively, be determined by a correspondingly specified analytical costing model. Since, as we know by now, the network operator will in most actual cases not yet have implemented the required cost accounting approach and not be in a position to provide the relevant cost data, the NRA should require it to provide the factual data regarding facility sharing so that the necessary cost modelling can be carried out.

Thus we conclude:

1. As modern telecommunications networks provide the basis for the provision of a bundle of multiple - USO and non-USO - services, it needs to be ascertained to what extent the underlying equipment costs are to be shared between the services.
2. Since the network operator will most probably not be in a position to provide the relevant cost information from its own records, the NRA should require the network operator to provide the factual information so that the corresponding cost modelling can be carried out.

#### 2.3.2.4 The appropriate size of a USO area

Before addressing the question of what the proper size of a USO area is, it is useful to carry out a couple of preliminary analytical steps. First, one should get an idea what the options are that an operator faces when making decisions about network investments. Then one should ask oneself whether considerations regarding any single subscriber could play a role in this decision. Only after that would one be able to define the criteria on the basis of which the proper size of a USO should be determined.

At the time when an operator has to decide on laying out a local network, or an addition to an existing one, it normally has only incomplete information about the revenues from the prospective subscribers. The TO will have to rely on its experience aided by socio-demographic information about the population of the district under consideration. For



example a district inhabited by blue-collar workers will elicit different revenue expectations than one inhabited by civil servants, or pensioners, or one in which there are mainly student dormitories.

Implicit in the above description of the operator's decision situation is that there is very rarely such a decision regarding a particular single customer. In the overwhelming number of cases, individual customers are part of a local network and do not enter as potential individual customers into the decision about laying out a local network. Either individual customers live in an area that the TO has decided is economic, or they live in an uneconomic area, and in this case the status of uneconomic customers applies to all of them.<sup>31</sup>

Now, an area should in principle only be a candidate as an uneconomic area if the USO provider could from the start have decided against connecting this area. Again, in principle, if at the time the area in question had been accepted as economic and afterwards it had turned out the other way round, the company should be obliged to absorb the losses as part of its normal risk taking. However, the decision about declaring a particular area as uneconomic must in most cases be taken *ex post* - i.e. after the networks in question have already been in existence for quite a number of years. Given this we suggest that an area should be considered uneconomic when the NRA on the basis of a current evaluation can reasonably judge that the TO would today choose not to connect it. From this follows that one has to provide criteria by which such a region can be identified from this *ex post* position. In particular, one needs criteria by which to determine what the minimum size of such an uneconomic area should be.

Without being categorical about the criteria determining the minimum size of an area that could be uneconomic, the most sensible appear to be the following:

- The area selected would have to require some minimum network configuration about which the operator can be expected to make a separate investment decision.
- The size of the area should be limited from above. It should not be profitable for a potential competitor to pick up a subset of potentially economic subscribers within this single uneconomic area.

The first criterion is of a common-sense nature. Investment decisions that we are considering come generally in minimum sizes and concern units regarding which it is worthwhile for the planning department of the TO to make separate decisions. Such a minimum unit, except in special circumstances, would in our estimation not consist, for example, of a block of houses within a city, town or village; one would expect these houses to be included in a relevant network configuration even if one could suspect that the average revenue would lie below the critical average.

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<sup>31</sup> This by the way is also the position taken by the European Public Telecommunications Operators' Association (ETNO), see ETNO (1995, 1996).

The second criterion is connected with the other one. Market entrance by new competitors will have to occur on the basis of a reasonable minimum number of customers and some minimum network configuration. The area making up an uneconomic area may contain in it islands of economic customers. It would in our opinion destabilise the USO arrangement if in an area that is overall uneconomic it would have to be expected that the economic islands within it should be subject to be taken away by competitors. In other words, the USO area should be determined in a way that the relationship of customers in it, and, therefore, the revenues obtainable in it by the USO provider, stand in a stable relationship to the costs incurred for it. This condition would be jeopardised if smaller groups of economic customers that might exist in it could easily be picked up by competitors.

Based on the above arguments we propose as an area potentially to be classified as uneconomic an exchange area which is directly served either by a parent local switch or by a remote concentrating/switching unit. Such an area is large enough to warrant separate network planning and investment. On the other hand, it would probably be small enough that, if it were uneconomic overall, it would not contain within it islands of economic customers that it would be worthwhile for a competitor to compete for while leaving out all the uneconomic customers. A typical number for the subscribers in such an exchange area would be between 2,000 and 5,000. In smaller local networks the number could be smaller, in big urban local networks it could exceed this range.

An implication of above analysis is that the definition as USO net cost areas of geographies that somehow combine (parts of) different exchange areas or even (parts of) different local networks should not be acceptable for the reason that they would give rise to arbitrary cost allocations and probably lead to cost figures in excess of what would be legitimate.

We conclude:

1. It is inherent in a network operator's planning of local networks that no consideration is given to the question of whether individual subscribers would be economic or not. The decision unit is always a larger segment of the local network in question.
2. Any determination of a network segment or of a served area to be classified whether being economic or not should be guided by the following principles:
  - The area selected would have to require some minimum network configuration about which the operator can be expected to make a separate investment decision.
  - The size of the area should be limited from above. It should not be profitable for a potential competitor to pick up a subset of subscribers within this single uneconomic area.
3. Based on these principles we propose as an area potentially to be classified as uneconomic an exchange area which is directly served either by a parent local switch or by a remote concentrating/switching unit.

### 2.3.3 Methodologies for cost determination

In the comparison of cost accounting approaches of Section 2.3.1.2 we pointed out that most network operators have currently not yet installed an analytical cost accounting system of the ABC type. In these cases the preferred approach should then be the use of analytical cost modelling to obtain estimates of the relevant cost figures. We argued that the information from such an approach could be expected to be more reliable than the data provided by the network operator's FDC accounting system which then would have to be adjusted to conform to the LRIC standard.

Alternatively to analytical cost modelling carried out under the auspices of the NRA, the latter could ask the network operator to provide data obtained on the basis of analytical studies and statistical data collected for the purpose that could be used to calculate the costs of serving customers in different local network settings. This would basically be the approach followed by Oftel.

In the following we will first, drawing substantially on Oftel (1997), present what the approach of having the operator carry out the studies and provide the data involves in terms of instructions to the network operator. This consists primarily in specifying the various cost components and the levels of disaggregation to which the latter are to be broken down. Thereafter we will discuss the essential elements of an local network analytical cost model. In doing this we emphasise that the local network should be the main focus in the cost modelling effort. The reason is that, under an affordability price constraint, the greatest part of the costs of USOs are caused by the cost variations in serving customers at the local level.

### 2.3.3.1 Cost studies performed by the network operator

When there is no reliable analytical cost accounting system available and the operator is requested to provide the relevant cost data, the latter will have to be given discretion as to what analytical approach to use. It could be an analytical cost model or some other method to compile cost data that reflect the required LRIC standard. It would have to be verifiable by the regulator showing that the cost figures correspond to that of efficient provision.

Following mostly the Oftel Consultative Document on universal telecommunications services<sup>32</sup> we present below the requirements for uneconomic areas, uneconomic customers and uneconomic public pay phones.

#### *Uneconomic areas*

Total avoidable costs for an area claimed to be uneconomic should be determined broken down according to all relevant services and service components identified as cost drivers. Cost drivers are

- the number of access lines in the area, differentiated according to lengths;
- the number of business and residential telephone connections in the area,
- the number of each local, national and international call minutes (outgoing and incoming) at different times of the day,

For each of above cost drivers, data should be provided covering

- depreciation and cost of capital employed, broken down by network element or business function (e.g. access cables, concentrator centre or remote switching unit, dedicated transmission links to parent local exchange, local switching, billing systems), and
- the costs of operation, maintenance, and administration broken down by relevant activity (e.g. provision and installation, maintenance of telephone lines, servicing of switching equipment, customer care).

For the purpose of identifying the drivers of variations in the cost levels of network elements and operation, maintenance and administration, the following information should be provided:

- actual capacity of the various network elements (in use as well as held in reserve),

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<sup>32</sup> See Oftel (1997), note 1.

- actual levels of operating activities, and
- average travel times.

Due to the statistical study approach, such detailed data will most probably be available only for a limited number of areas. Thus for any particular area that may be uneconomic, one would have to estimate costs of service delivery with reference to results from these sample areas. It is then useful to define representative types of exchange areas (in Oftel terminology: different geotypes), representing rural and remote exchange areas, using one or in combination all of the following characteristics:

- the average density of access lines,
- the location of the area, and
- the length and the capacity of the outer-core transmission.

The average density is the most important indicator of local network costs as these vary substantially depending on the number of customers per square kilometre. The location of the area is also important as it determines the type of terrain and depending on it the necessary underground work and the corresponding cost, or - if this is an option - the possibility of placing aerial cable which involves less cost. The length and the capacity of the outer-core transmission links may also differentiate significantly between areas if their distances from the next centre with a parent local exchange vary substantially.

Part of all this information may not be available on a per area basis at all. In these cases one may have to resort to national averages to obtain estimates of the relevant data.<sup>33</sup>

If above information must be obtained for areas that are still in the process of being rolled out, it will necessarily have to consist primarily of estimates of planned costs as in these cases there is yet no actual experience to refer to. In these cases the term "avoidable" more so than in the other cases implies "incremental" cost - in the sense of TSLRIC - that must in future be incurred for serving customers in that area. Conceptually there is no difference, since the two types of costs converge for the long run. In practical terms there is a substantial difference as the crutch of referring back to actual cost data does not exist.

### *Uneconomic customers*

An uneconomic customer as a separate entity may occur when the area in which he/she lives is economic but this particular customer's bill fails to cover relevant costs.

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<sup>33</sup> For example in the UK out of a total of more than 5000 exchange areas BT was able to provide relevant data for 299 of them. Further, after more than two years of regulatory attention to the matter, a substantial amount of required data could not be provided even for these sample areas (see Note 2 attached to the Oftel Consultative Document).

As regards the relevant costs, there are two possibilities depending on whether the customer could be identified as uneconomic before he/she is connected, or not. In the first case not only variable costs but also a share of otherwise sunk costs could be avoided, in the second case only variable costs are avoidable (see Section 2.3.1.7).

Normally the second of above cases applies so that only variable costs qualify as avoidable. For these, the specific cost drivers are

- the customer specific line termination equipment in the local switch, and
- the number of each local, national and international call minutes (outgoing and incoming) at different times of the day.

These cost drivers should be considered as avoidable also in the short run as the corresponding capacities can be redeployed for the purpose of serving other customers. As in the case of uneconomic areas, the data should cover depreciation and cost of capital employed as well relevant costs of operation and maintenance. Costs of operation, maintenance and administration will in general - i.e. not only in respect of the components listed above but also in respect of maintaining and servicing the line and other such operations - vary in the short run with the number of customers so that the average per customer should be considered as avoidable.

One should not completely dismiss the case where the network operator could at the time of laying out the network - expected overall to be economic - have anticipated that in this network there would be a number of uneconomic customers. This is not to say that the operator would have been able to recognise individually these customers, however, that it would have been able to predict that there is going to be a certain fraction of all customers that would demand service under the affordable price constraint but not generate enough revenue to cover costs. Deciding at this point of time that it would decline to serve these customers the operator would plan and construct the network with a certain lower capacity than otherwise and therefore have avoidable cost. Our position is that this is an unlikely scenario and that the NRA should place a heavy burden of proof on the operator to make this case plausible. Only if it can provide this proof should it be allowed to include a share of sunk costs, in particular

- depreciation and cost of capital employed of the relevant network elements (as discussed above in respect of uneconomic areas),

as part of avoidable costs if these customers were not served. Otherwise the operator should be required to absorb this cost as part of its normal business risk.

In contrast, if uneconomic customers in an overall economic local network (usually the network of a larger city) are clustered in distinct districts that can readily be identified, the situation would approach the case of an uneconomic area discussed at the beginning of this section. In this case it would be justified for the operator to argue that if it

discontinued to serve that area all the sunk costs associated with feeder and distribution plant as well as the switching machine would in the long run be avoidable as in the cases of uneconomic areas.

In addition, there will certainly be individual cases where the current request for connection from a prospective customer may be recognisable as a loss-making prospect so that the customer can beforehand be identified as uneconomic. This could for example be the case of a new low-income housing project. If the connection were then declined the avoidable cost would also consist of a share of the sunk cost. This would then probably not be the total costs of trenching and of the feeder cable, but most probably only of a share of the cost for distribution plant and the dropwire. If, as another example, a customer living alone in a remote place is to be connected, then there may in fact be a substantial share of sunk cost that would be avoidable. These are individual and probably relatively few cases that should be handled separately. They should not be allowed to serve as a reason to include in general a large share of the sunk costs as part of the avoidable costs of individual uneconomic customers.

#### *Uneconomic public pay phones*

Total avoidable costs for a public pay phone claimed to be uneconomic should be determined broken down according to the following cost drivers:

- the booth of the public telephone;
- the line to the exchange (essentially equivalent to a subscriber access line);
- the number of each local, national and international call minutes (outgoing and incoming) at different times of the day,

For each of above cost drivers, data should be provided covering

- depreciation and cost of capital employed, broken down by network element or business function (e.g. access cables, concentrator centre or remote switching unit, dedicated transmission links to parent local exchange, local switching, billing systems), and
- the costs of operation, maintenance, and administration broken down by relevant activity (e.g. provision and installation, maintenance of telephone lines, servicing of switching equipment, customer care).

When compiling these data on a sample basis, care should be taken that the sample data allow to differentiate between the costs of groups of pay phones having different causes for their uneconomic status. The principal causes are the high cost of maintenance and repair in some areas (often due to vandalism) and/or the low average amount of revenues.

### *Concluding observations*

The determination of the cost of actual service delivery to customers is probably the most complex part of the calculation of the net cost of USOs and the area where much discretion will have to be left to the network operator if asked to provide the relevant data, as discussed in this section. Proof to this complexity and the degrees of freedom the NRA would have to concede consists in the virtual impossibility to discuss in the space of the present analysis every detail of the many aspects of that cost calculation. Therefore, much reliance will have to be placed on the verification of the data obtained from the operator. In order to assure that these data report costs that correspond to an efficient service provision, due attention should be given to the aspects we discussed in Sections 2.3.1 and 2.3.2.

The task of verification should be carried out by expert auditors familiar with telecommunications networks and modern cost accounting practices. If the NRA does not have the expertise available in its own organisation it would have to obtain it from outside, perhaps with the assistance of the European Commission.

From the discussion in this section we conclude:

1. When the network operator delivering USO services has no analytical cost accounting system installed but is requested to establish the avoidable costs for these services, it should be required to carry out special studies and use an adequate methodology to assure cost data that correspond to the efficient service provision.
2. The data should essentially cover the costs for uneconomic areas, uneconomic customers and uneconomic pay phones differentiated according to the different cost drivers (different services, different service elements, etc.) and types of costs (costs of equipment and facilities, variable costs).
3. The submitted cost data should be audited as to whether they correspond to the cost of efficient service provision.
4. If necessary, the NRA should use for the purpose expertise obtained from outside, perhaps with the assistance of the European Commission.

#### 2.3.3.2 Analytical cost modelling

When the NRA decides to carry out cost estimates on its own with the help of analytical cost modelling, it takes itself the initiative in determining what these costs shall be. The NRA should then have at its disposal a modelling tool that is in a position to generate estimates with a degree of reliability that allows to enter discussions with the USO provider with a great deal of confidence.



In this section we provide an overview over the structure that such a model should have in general, concentrating thereby on the modelling of a local network. In the following section we will provide results from a specific local network model that give an indication what to expect from this methodology.

Analytical cost models are generally designed to represent an efficient local network structure on the basis of state-of-the-art technology. One distinguishes between models, which take the location and type of switches in the existing network of an established operator as given and models which set switch type and location endogenously as a result of a network optimisation procedure. Whether the one or the other approach is taken depends on the particular circumstances. In general, a rigorous application of forward-looking LRIC methodology would require cost determination to be based on an optimised structure. This, however, would require that the optimal network structure would always be implementable which is a very rigorous demand to be placed on the network operator and also puts a heavy burden on the model results in respect of their precision. Therefore it is sensible to take the existing structures for the local networks in question and derive the costs on their basis. If, however, the NRA is unable to obtain the information on local network structure from the operator, the inclusion of an optimisation feature in an analytical cost model would allow to proceed anyhow (this approach is followed for the benchmark calculations reported on in the following section); a concession with respect to the level of costs reflecting the actual network structure could be made at that time when the model estimates are eventually confronted with the data from the operator.

The model must be in a position to provide cost estimates for the most important of USO services, i.e. local access and local calls. It should also be able to provide at least basic cost information on the provision of non-switched services (leased lines) and public pay phones (it has, however, no advantage in providing information on the presumably largest cost items of public pay phones, i.e. their booths and their maintenance).

In the following we discuss the major components, cost drivers and types of cost that should be incorporated in the model:

- *Network elements* The model should explicitly provide for the following network elements: the local loop, local switching, interoffice transmission (in cases where more than one switch is present in the local exchange network) and connection to the national network *via* the appropriate interface. The network constructed should be based on wireline technology which is currently the actual standard. Wireless connection of customers to the central office or to some concentrating point within the local loop may become the cost-minimising access technology in the future. In this case it should be included in the model as a reasonable alternative to traditional wireline access. This evaluation also applies to alternative wireline access technologies like broadband (coaxial) cable networks.

- *Local loop* The local loop is defined as the whole plant that connects customers to the central office, thereby providing a transmission path for signalling, data and voice. Starting at the customer's premise, it consists of the drop wire, distribution cable, cross connection points, feeder cable and ends at the main distribution frame (MDF) located in the central office building. The MDF can be seen as the cross-connect between access network (feeder and distribution) and the local switch. The investment for line termination (line cards) can be included in the cost module for switching equipment. However, the resulting costs are definitely line related and should be allocated to the overall cost of access. The physical layer in the distribution plant usually consists of twisted copper pairs, in the feeder section it may also be optical fibre. For narrow band voice telephony, the deployment of optical fibre can be justified, when the distance from the primary cross connection point near the customers premises and the local switch exceeds a certain threshold. The model should distinguish between cables laid in trenches, cables running through conduit systems and aerial cable. The model should allow the user to define different mixes of cable installation types, so that it is possible to replicate an existing outside plant, or alternatively assume what is considered to be optimal in terms of costs and characteristic of the area.
- *Switching* The model should assume throughout digital switching technology. This is reasonable for a cost scenario built on a forward-looking basis although the migration from analog or even mechanical switching is not yet completed in all European countries. Remote units with limited switching capabilities should be modelled for the purpose of handling internal traffic as well as concentrating external traffic to allow cost savings due to shorter loops and efficient transport to the local switch on a digital transmission link.
- *Interoffice transmission and connection to the national network* If there is more than one switching centre in a local network, an interoffice transmission network should be modelled. Also each local switching centre should be connected to a tandem switching centre to allow customers the placement of long-distance calls. If the location of the tandem switch is unknown, it is reasonable to place it inside the business district of a city, possibly co-located with a local switching centre. In rural exchange areas with a relatively small number of subscribers it makes sense to locate the long-distance switching centre outside the exchange area reflecting the fact that such offices are typically located in larger cities. Costs for links between the local and long-distance switching centres should also be included in the costs of interoffice transmission.
- *Capital costs* The annual costs of the network elements described above should be derived by transforming the prices of the investment goods into annual values using a carrying charge factor. The latter should reflect the proper depreciation policy as well as the appropriate cost of capital that the company faces in its capital market.

- *Operations, maintenance and administration* The drivers for these costs can only very imperfectly be modelled by an external observer. For this reason, one should request the necessary information from the network operator as discussed in the preceding section. If the operator cannot provide such data, estimates from the public record, as imprecise as they may be, should be used (this procedure is followed in the benchmark calculations reported on in the following section). One should expect, that the resulting cost figures are generally higher than those warranted by an efficient operator.

The implementation of a model of a local network as outlined above requires in any case extensive data input. Generally, the operator whose costs are to be modelled should be asked to provide any necessary information. However, if data from the operator are not provided in time or if the operator refuses to disclose data at all, calculations on the basis of publicly available information are nevertheless possible. Besides the cost information regarding operations, maintenance and administration mentioned above, the most important types of required information concern the number and distribution of subscribers within a local network area and the procurement prices of capital goods. The former are available from statistical offices and the latter can be obtained from trade associations and specialised professional services. Furthermore, the proper depreciation policy should be specified. The NRA should make its own determination on this question aided by experts from outside the network operator under review.

One of the great advantages of an analytical cost model implemented by the NRA is that all the cost accounting concerns discussed in Section 2.3.1 can be addressed in the proper way.

The results from such a modelling exercise should be confronted with those presented by the network operator and, if necessary, be reconciled with them. This reconciliation would reveal where the modelling exercise possibly has neglected essential cost components or where the operator's data reflect overinvestment and inefficiencies.

There exist models on the market that are in a position to perform the necessary calculations, for local network services as well as for switched long-distance services. They can provide the NRA with estimates of the costs of service provision which can be expected to be substantially closer to the required cost standard than cost figures obtained from network operator's cost accounting records on an FDC basis. As before, if the NRA does not dispose of the expertise to handle this kind of cost modelling (an existing model would most likely have to be adjusted to reflect national characteristics), it should be able to obtain adequate assistance from outside.

We conclude:

1. The application of analytical cost models can provide the NRA with useful information about the cost that an efficient USO provider would have to incur. These cost estimates can be contrasted with the data presented by the current provider.
2. An analytical cost model should be in a position to model various elements of a network in a transparent and understandable manner. It should be possible to clearly identify line dependent and usage dependent cost elements.
3. An analytical cost model should offer the NRA a high degree of freedom regarding the adjustment of input data according to their specific needs. This also enables the NRA to carry out a detailed sensitivity analysis to assess the impact of the various cost drivers on average and incremental cost.
4. The model should offer the opportunity to perform calculations exclusively with data taken from the public domain for cases in which requested data are slow to be provided by the network operator, or for the purpose of contrasting cost figures from the operator with independently derived results.
5. The local network model should be in a position to capture the diversity of actual exchange areas, e.g. regarding the actual distribution of subscribers in the areas and the corresponding concrete topology of the network, in order to avoid calculations based on the simplifying assumptions of uniform population density or equal loop length.
6. There are models available which meet all these requirements, but have to be adjusted for national features. The NRA should be able to obtain external assistance in order to become familiar with the application of these models and make the necessary modifications.

#### 2.3.3.3 Benchmark calculations with a specific local network analytical cost model

For the calculations reported in this section, a local network model constructed by the two American researchers David Gabel and Mark Kennet<sup>34</sup> was used. The model was adapted for the purpose by WIJK to serve as a tool for relevant regulatory decisions in Germany. It has here also been used to estimate costs for countries with different input prices than for Germany, in particular for labour intensive operations and for facilities the construction of which is labour intensive.

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<sup>34</sup> Both David Gabel and Mark Kennet are recognised regulatory experts in the USA. Gabel is professor at Queens College, New York, but currently on leave to assist State Public Utility Commissions on questions of universal service and interconnection. Kennet is currently with the FCC and works there on questions of cost modelling.

The model meets all the requirements placed on such a model above. It explicitly models the network elements local loop (subdivided into distribution section, feeder section and MDF), remote concentrating or switching, local switching, transmission between local switches or between local switches and remote units, and transmission to the national network via a tandem switch. Lacking information about switch locations calculations were performed in the optimisation mode. This means, that the model's search algorithm is used to determine the cost minimising combination of local switching centres and remote switching units and their locations. The distribution as well as the feeder sections of the access network in all cases consist of twisted copper pairs as the physical layer. For long feeder routes, four-wire digital transmission turns out to be the cost minimising technology. We set up the model in a way that no concentration occurs in the access network, so that every subscriber has a dedicated voice channel up to the local switch or to the remote switching unit. For host-remote links and for interoffice transmission links, we assume that fibre is always the technology of choice irrespective of cost. It turns out that traffic volume and distance between offices in most cases justifies the deployment of fibre even from a cost minimising point of view.

Throughout we assume that the network is entirely built for the provision of switched voice services. It follows that there is no cost sharing between different services, e.g. between switched services and non-switched (private line) services. Furthermore, we assume that the costs resulting from infrastructural investment like conduit systems or trenches are fully allocated to the telecommunications network. In reality, these facilities are often used by other networks as well, e.g. by cable operators, electric utilities and the like.

The distribution of subscribers within a local exchange area was derived on the basis of census data for Germany. For the communities for which we carried out the modelling, we assume that each household is connected to the network and estimated the number of additional business lines as a fraction of residential lines, which varies with population density. Prices for excavation work, cable laying, telecommunication cables and supplementary materials (e.g. pipes or manholes) were collected from a specialised German source. To provide cost estimates for countries with different price and in particular different wage levels, we allowed cost levels for excavation and cable laying to vary depending on these differences, holding the price for material constant. This approach is justified on the grounds that the common market in Europe leads to a convergence of prices of tradable goods, whereas for prices of non-tradable services (like excavation work) differences exist today and will likely persist in the future.

We have carried out model calculations for Germany, the "high cost country" case, and two additional cases. The "medium cost country" case is meant to reflect the price level in Spain, whereas the "low cost country" case refers to Portugal. The adjustment factors

applied to the prices and wages for Germany were derived from OECD-statistics on purchasing power parities.<sup>35</sup>

Prices for transmission and switching equipment are for the DMS 100 system from Nortel which is beside Lucent the leading manufacturer in North America. Prices were taken from a study conducted in New Zealand and therefore should equal world market prices. Costs for operation and maintenance are expressed as a fraction of total investment in a specific category, e.g. switching equipment. They correspond to data taken from the US-ARMIS reports<sup>36</sup> and therefore reflect the ratio of historic expenses to embedded investment, which is not fully satisfactory for a forward looking approach. The resulting figures should be valued as rather conservative in the sense that they represent an upper limit on the cost of an efficient operator. For the middle and low cost country cases, the mark-ups on the investment sum were lowered to take into account the different level of labour costs in these countries. Here, adjustment factors are based on data from Eurostat covering labour costs of EU Member States.<sup>37</sup>

Costs for operation and maintenance together with capital costs and depreciation form the annual carrying charge factors used to transform investment into annual costs (see Appendix C for detailed discussion). Network access costs per subscriber on a monthly basis were calculated for several types of local exchanges and are presented below. Access costs comprise the cost for the local loop plus the cost of connecting a line to the switch. The line includes all equipment up to the first point of concentration which is therefore directly attributable to a single subscriber. For each exchange we distinguish between the three cases (high, medium and low cost country) described above.

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<sup>35</sup> OECD (1996).

<sup>36</sup> ARMIS stands for Automated Reporting Management Information System. It was established in 1987 by the FCC and is used for the periodical collection of financial and operating data from local exchange carriers in the US. Since 1989 most of the ARMIS data is no longer considered proprietary by the FCC.

<sup>37</sup> Eurostat (1995).

**Table 2.3.3.3-1: Access costs per subscriber**

1	2	3	4	5	6	7
Name of German municipality used for modelling	Number of inhabitants	Density of population	Monthly access costs per subscriber			Average loop length
	subscribers		high cost	medium cost	low cost	
			ECU			
Lichtenau	10,461	55 / km <sup>2</sup>	15.49	13.54	9.68	3.20 km
	3,432					
Nörvenich	10,760	163 / km <sup>2</sup>	14.34	12.63	9.22	2.67 km
	5,647					
Wachtberg	28,849	270 / km <sup>2</sup>	10.83	9.55	6.99	2,13 km
	12,338					
Meckenheim	24,558	705 / km <sup>2</sup>	9.22	8.17	6.08	1.76 km
	12,229					
Herdecke	26,278	1,173 / km <sup>2</sup>	9.94	8.86	6.69	2.18 km
	16,251					
Euskirchen	52,205	374 / km <sup>2</sup>	10.27	9.12	6.82	2.66 km
	28,627					
Cologne	965,697	2,383 / km <sup>2</sup>	7.51	6.70	5.08	0.97 km
	429,642					

Source: WIK

In the reported calculations, per subscriber access costs for the entire local exchange network fall in a range between 15.5 ECU and 7.5 ECU in the high cost country case. For the low cost case the respective values are 9.7 and 5.1 ECU. If the cost results for the sparsely populated exchange areas appear to be moderate, even in the high cost case, it should still be kept in mind that these results were obtained with rather conservative assumptions regarding input prices. For example, expenses for operations and maintenance were estimated on the basis of historical accounting data taken from the US ARMIS reports which were not corrected for possible inefficiencies on the operator's side. Furthermore, all infrastructure costs were fully allocated to the telephone network.

We note that even sparsely populated areas do not automatically cause very high costs as long as customers are clustered and not distributed evenly across the exchange area. Even in small exchanges the optimal network structure requires the deployment of remote switching units. As a result, the maximum average loop length in the sample is 3.2 km which is rather short compared with the 0.97 km for the extremely densely populated inner districts of Cologne at the other end of the spectrum. One should note that the deployment of remote switches or remote concentrators leads to a shift from line related to traffic related costs. This trade off is reflected in the model calculations since it is throughout assumed that each customer generates a certain amount of traffic. Optimisation is done over total network costs which include access and conveyance, not over access cost alone. The results suggest that additional investment in switches, especially in remote units that one might judge at a first glance as a kind of overinvestment, is within certain limits outweighed by the obtained savings in loop costs.

Table 2.3.3.3-2 shows average network usage costs per minute. The values were calculated in the following manner: The annual cost for switching equipment and inter-office transmission was reduced by the fraction of switch costs which is directly attributable to access. The residual was then divided by total network usage minutes per year. To obtain that number, we assumed that busy-hour traffic makes up for 10 % of total daily traffic and that the busy-hour can occur on 250 days per year. For the sake of simplicity we assume all non-line related switch costs to be traffic sensitive. Doing this, we neglect the fact that switch technology exhibits indivisibilities which lead to fixed costs, especially costs for the central processor and the switching network. These may vary significantly between system manufacturers according to the offered degree of modularity.

**Table 2.3.3.3-2: Network usage costs**

Name of German municipality	Local network usage costs per minute		
	high cost	medium cost	low cost
Cents of an ECU			
Lichtenau	1.26	1.11	0.79
Nörvenich	0.85	0.74	0.52
Wachtberg	0.52	0.45	0.30
Meckenheim	0.32	0.28	0.19
Herdecke	0.26	0.22	0.14
Euskirchen	0.25	0.21	0.14
Cologne	0.20	0.17	0.11

Source: WIK

The costs per minute reported above should be interpreted as an average that comprises three different types of usage, namely usage for locals calls that originate and terminate at the same switch, usage for locals calls that originate and terminate at different switches but within the local exchange area, and network usage for long-distance calls. They fall in a range between 1.26 cents of an ECU for the smallest exchange in the high cost country case and 0.11 cents of an ECU for the largest exchange in the low cost country case. As is not surprising, usage costs are highest for small exchanges and decrease with exchange size. One reason lies in the described trade off between the cost of access and the cost of conveyance that in the balance leads to the deployment of little utilised remote switching units. Another is that in the context of the model even the smallest exchanges are served by at least one host switch, which as mentioned exhibits fixed costs. In these cases one can argue that the area of optimisation has been chosen too small. Indeed it was found that it can be economical to serve small exchanges in rural areas with remote switching units which are connected to a switching centre located in the nearest bigger town.



In closing the discussion of this section, we emphasise again that the cost figures presented above are estimates based on model calculations. They provide what we consider realistic estimates for ranges of costs for the two service categories in question, given different labour cost levels and densities of networks. In concrete cases, estimates would have to be derived on the basis of a model adjusted to the particular country using input data that reflect the real cost situation as closely as possible. The cost estimates are for retail services as the focus of this study is on the cost of services brought to the final customer. They include customer specific costs and are for combinations of network components different from those required, for example, for interconnection services at the local level.

Appendix C will provide a more detailed discussion of model results, in particular in respect of the incremental costs of subsets of subscribers. Here we conclude from the discussion above:

1. An analytical cost model can be used to calculate directly the Long Run Incremental Costs both for access and for local network traffic.
2. In the high cost country case, average monthly subscriber access costs fall in a range between 15.5 ECU for very low and 7.5 ECU for high subscriber density networks, and in the low cost case, correspondingly in the range between 9.7 and 5.1 ECU.
3. In the high cost country case, local network usage costs per minute fall in a range between 1.26 cents and 0.2 cents of an ECU, and in the low cost country case, correspondingly between 0.8 cents and 0.1 cents.
4. If our benchmark calculations have led to cost levels that appear moderate to low, it should still be kept in mind that some of the cost estimates must be considered conservative as the results are based on historical accounting data for operating expenses and assume no cost sharing between USO and non-USO services.

#### 2.3.4 Summary statement of steps to be undertaken by the NRA

Chapter 2 has been a rather extensive discussion on the question of the approach that the NRA should take for the determination of the costs of USO services. The extensiveness is a tribute to the complexity of the problem. The material covered ranges from the conceptual problems of why a cost standard reflecting efficient service provision should be used and what this standard would be, to associated accounting issues and issues concerning network structure, to the practical questions of actually obtaining cost estimates reflecting the required standards.

All this needs to be summarised into a set of prescriptions that can be followed when the actual work of cost determination has to be undertaken by an NRA. Below, we list the

steps that must be carried out in order to obtain good cost measures caused by the provision of USO services. This list forms the closing set of conclusions to the chapter:

1. Data on the costs of all potentially uneconomic areas, uneconomic customers living in economic areas, and public pay phones should be requested from the USO provider. Cost data should be based on the LRIC standard. Since an analytical cost accounting system will probably not be available, it should be requested that the cost information are to be based on special studies using sample data.
2. As a check on the data provided by the network operator, benchmark calculations with analytical cost models should be initiated. The models used should incorporate the accounting standards necessary to get estimates of an efficient provision of service.  
Even if the number of local areas to be covered is large, the effort to calculate the cost of subscriber lines and calls for each of the prospective uneconomic areas would be moderate. Many of the data required for this costing exercise are normally in the public domain.
3. For deriving total cost figures, volume figures need to be obtained from the USO provider, i.e.:
  - volume of business and residential local, national and international calls at different times of the day,
  - volume of interconnect calls, outgoing and incoming, at different times of the day,
  - the number of subscriber lines of uneconomic customers in economic areas classified according to the cost per subscriber that could be avoided (in most cases this should only be variable costs, see the discussion in Section 2.3.3.1),As regards call volume figures, these are essentially the same that are going to be discussed in Chapter 3 in the context of assessing revenues. Here they are addressed as a component of total cost.
4. The data supplied by the USO provider will have to be verified whether they reflect the considerations discussed above in Sections 2.3.1 and 2.3.2. This means in particular whether the following applies:
  - a rigorous application of the LRIC standard;
  - use of Current Cost Accounting;
  - use of the proper depreciation policy;
  - use of the proper cost of capital;
  - inclusion of no more capacity reserves as required for accommodating realistic future demand;
  - inclusion of services not falling under the USO to trace the effects of shared use of facilities on incremental costs;
  - incorporation of access, switch and transmission technology that either is the

cost minimising one for the exchange area in question or, if this is the regulatory perspective taken, of the technology currently used by the operator.

5. Great care should be exercised in the determination of the cost of USO service provision and for this purpose in carrying out the tasks listed above. If the organisation of the NRA has not sufficient expertise for this at its disposal, it should seek to obtain assistance from outside.

### 3 The Approach to Revenue in the Net Cost Calculation

#### 3.1 The problem to be solved

If customers were disconnected or public pay phones withdrawn, revenues would be foregone as well. When analysing whether areas, customer classes or public pay phones are uneconomic, those revenues should be deducted from the avoidable costs since they reduce the financial loss due to USOs.

When calculating universal service costs, the unit of analysis should not be an individual customer or individual public pay phone. Rather, the analysis should look at all customers within a particular area or all customers belonging to a particular category. Likewise, we should focus on particular categories of public pay phones. As the appropriate size of an area that could be uneconomic we have defined an exchange area which is the area that is directly served either by a parent local switch or by a remote concentrating/switching unit. Customer categories should be defined by tariff options or special schemes, beneficiaries of voucher schemes where applicable, and by bill segments (by 5 ECU steps). Public pay phones should be categorised according to revenue segments and type of area where the pay phone is located.

In order to calculate universal service costs, disaggregated data on revenues are needed for each potentially uneconomic area, customer category and category of public pay phones. In contrast, there is no need for revenue information on individual areas, categories of customers or public pay phones that can be considered to be economic from the outset. It is sufficient to analyse economic areas, categories of customers or public pay phones as a whole.

It should be noted that in this chapter, we are looking at revenues foregone from disconnecting an uneconomic area, a category of uneconomic customers or uneconomic public pay phones. If, for example, service is withdrawn from several areas, the total revenues foregone are not simply calculable as the sum of revenues foregone of individual areas. Simply summing up revenues foregone would result in calls exchanged between uneconomic areas being counted twice. Hence total revenues foregone would be overstated. Likewise, revenues from uneconomic customer categories would lead to calls exchanged between customers being counted twice. The procedure to correct for double countings is described in Chapter 4.

We conclude:

1. When measuring the universal service cost, revenues foregone from disconnecting areas, and categories of customers and public pay phones must be set against the long-run avoidable costs.
2. As unit of analysis for revenues foregone, NRAs should use exchange areas, customer categories (by tariff options or special schemes, beneficiaries of voucher

schemes where applicable, bill segments, etc.) and public pay phone categories (by revenue segments and types of area).

3. USO providers should submit disaggregated data on revenues for each potentially uneconomic area, customer category and category of public pay phones. In contrast, there is no need for revenue information on individual areas, categories of customers or public pay phones that can be considered to be economic from the outset. It is sufficient to analyse economic areas, categories of customers or public pay phones as a whole.

### 3.2 Revenues foregone of areas

Revenues foregone for a (potentially uneconomic) area A should be calculated as follows:

	Access and outgoing call revenues
+	Incoming call revenues
+	Called-party-pays revenues
+	Interconnect revenues
-	Revenues from replacement calls
<hr/>	
=	Revenues foregone if area A were disconnected

Access and outgoing call revenues of area A are revenues billed to customers in area A that include

- (annualised) connection charges and line rentals,
- outgoing call revenues from local and long-distance calls as well as from international calls (net of outpayments to foreign operators).

Incoming call revenues of area A are revenues billed to customers in other areas for calls made to customers in area A.

Called-party-pays revenues of area A are revenues billed to customers in other areas for calls made by customers in area A, such as calls to freephone numbers.

Interconnect revenues of area A are revenues billed to other operators for transporting calls to and from customers in area A.

Not the full amount of those revenues would be foregone if an individual area A were disconnected from the network. Some of the calls from and to disconnected lines in

area A would be replaced by calls from or to lines (or public pay phones) in other areas. Revenues from such replacement calls have to be deducted from the revenues above since they reduce the amount of revenue foregone.

#### *Access and outgoing call revenues*

The NRAs should require the USO provider to submit data on access and outgoing call revenues for each (potentially) uneconomic area. Ideally, the NRA would obtain for each of the areas in question individually measured figures, both for revenues and the underlying volumes of calls. It is unrealistic, however, to expect that this kind of finely disaggregated data are available so that the NRA should be prepared to accept estimates prepared on the basis of representative data. We recommend that estimates are prepared on the basis of the following information to be provided by the USO provider:<sup>38</sup>

- *Average number of (outgoing) call minutes per line, differentiated by distance and time of day, separately for residential and business customers.* It can be expected that nation-wide averages are available from the USO provider's records. These averages would have to be adjusted on the basis of specific information concerning the different geotypes of potentially uneconomic areas. The adjustments would normally affect the total number of calls as well as the pattern of calls. For example, in low income areas number of calls would be lower than the national average, and evidence from the UK suggests that calling rates from low-density areas are about 10 % higher than the national average.<sup>39</sup> Evidence on the variation of call patterns across different types of area should be derived from representative surveys of the USO provider's customers.
- *Number of lines in each area for residential and business customers.* To be taken from USO provider's records.
- *Average access revenues (annualised connection charge and rental) per line.*
- *Average revenue per call minute by distance (local, national, international) and time of day of call.*<sup>40</sup>

On the basis of this information, access and outgoing call revenues can be estimated for each (potentially) uneconomic area. Access revenues of area A are given by:

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<sup>38</sup> See Oftel (1997), for a similar procedure.

<sup>39</sup> See Analysys (1995), Annexes, p. 25.

<sup>40</sup> Average revenue per minute of an international call should be net of outpayments to foreign operators for terminating the call.

$$\begin{array}{r}
 \text{Average access revenues per line} \\
 \times \quad \text{Number of lines in area A} \\
 \hline
 = \quad \text{Access revenues of area A}
 \end{array}$$

On the basis of the information described above, outgoing call revenues of area A can be calculated for each type of customer (residential or business) for different types of call defined by distance (local, long-distance, international) and time of day, and taking into account the geotype of the area (density of subscribers) as:

$$\begin{array}{r}
 \text{Average revenues per call minute} \\
 \times \quad \text{Average number of (outgoing) call minutes per line} \\
 \times \quad \text{Number of lines in area A} \\
 \hline
 = \quad \text{Outgoing call revenues of area A}
 \end{array}$$

#### *Incoming call revenues*

Data on incoming call revenues are unlikely to be available for individual areas and should, therefore, be estimated starting from outgoing call minutes per line. Until further evidence becomes available, the number of incoming call minutes per line could be set equal to the number of outgoing call minutes. It could also be assumed that call patterns of incoming and outgoing calls are identical.

Since we are interested in the number of minutes from calls made by customers outside area A to customers in area A, we cannot set the full amount of outgoing call minutes of customers in area A equal to incoming call minutes. The share of local traffic that remains within area A has to be deducted from average outgoing call minutes. This would be relatively easy where uneconomic areas make up complete local networks, which is not an unlikely case for rural parts of the country. In this case intra-area calls comprise all local calls, and incoming call minutes of area A can be calculated as outgoing call minutes less minutes from local calls, or simply: minutes of outgoing long-distance and international calls. If the uneconomic area is part of a larger area with a local calling rate, the share of internal local calling would have to be estimated on the basis of the number of customers in the potentially uneconomic area as a share of the total number of customers with whom local calling is possible.

Incoming call revenues of area A should be calculated for each type of customer (residential or business), for different types of call defined by distance and time of day, and taking into account the subscriber density of the area, as:

Average revenues per call minute

$$\begin{array}{l}
 x \quad \text{Average number of minutes per line from outgoing calls less average number} \\
 \quad \text{of minutes per line from local calls (or a proportion of if several exchange areas} \\
 \quad \text{make up a local network)} \\
 \\
 x \quad \text{Number of lines in area A} \\
 \hline
 = \quad \text{Incoming call revenues of area A}
 \end{array}$$

#### *Revenues from interconnect calls*

The USO provider should also provide information on revenues from interconnect calls. Data to be submitted to the NRA should comprise:

- *Average number of minutes per line from interconnect calls to and from the area.*
- *Average revenue per minute of an interconnect call.*

Using the information above, interconnect revenues can be calculated for each area as:

$$\begin{array}{l}
 \text{Average revenues per minute of an interconnect call} \\
 \\
 x \quad \text{Average number of minutes per line from interconnect calls} \\
 \\
 x \quad \text{Number of lines in area A} \\
 \hline
 = \quad \text{Interconnect revenues of area A}
 \end{array}$$

#### *Called-party pays revenue*

The USO provider should also provide estimates for called-party-pays revenues on an area-by-area basis.

#### *Replacement call revenue*

In order to arrive at the relevant amount of revenues foregone, revenues from replacement calls have to be deducted from all four revenue components. The NRA should require the USO provider to submit information on the likely amount of call replacement that would emerge if an area were disconnected. A priori, the ability of a disconnected customer to replace calls will depend on a number of factors, such as (a) ease of access to alternative lines belonging to friends or neighbours, to work phones and public pay phones; (b) difficulties associated with compensating customers to the lines on which replacement calls are made; and (c) the degree of substitutability



between day time calls and after hour calls.<sup>41</sup> Oftel, for example, proposes the following replacement rates for outgoing and incoming calls if an area is disconnected:<sup>42</sup>

- Share of outgoing calls replaced: 0-20 %.
- Share of incoming calls replaced: 0-10 %.

The replacement rates proposed by Oftel provide a reasonable starting point until further evidence becomes available. The rates reflect the fact that it is more difficult for a subscriber on the network to reach a disconnected customer than for a disconnected customer to make a call to another subscriber. This is why it can be expected that the degree of call replacement for incoming calls is significantly lower than for outgoing calls.

Finally, it should be taken into account that a proportion of replacement calls will be made to and from lines operated by competing operators. Revenues from such replacement calls do not reduce the USO provider's revenues foregone. The USO provider's market share should be taken as a proxy for the proportion of replacement calls that are made from and to lines belonging to the USO provider.<sup>43</sup>

Section 3.5 will provide a sample calculation for a hypothetical area showing in detail the different steps that need to be taken.

### 3.3 Revenues foregone for customer classes

Revenues foregone for each potentially uneconomic customer category C should be calculated as follows:<sup>44</sup>

	Access and outgoing call revenues
+	Incoming call revenues
+	Called-party-pays revenues
+	Interconnect revenues
-	Revenues from replacement calls
<hr/>	
=	Revenues foregone if customer category C were disconnected

<sup>41</sup> See Cave, Milne and Scanlan (1994), pp. 34-36.

<sup>42</sup> See Oftel (1997), Detailed explanatory notes, p. 8.

<sup>43</sup> A better proxy would be the share of economic customers served by the universal service provider.

<sup>44</sup> Revenue components are defined as in the previous section.

### *Access and outgoing call revenues*

The NRAs should require the USO provider to submit data on access and outgoing call revenues for each potentially uneconomic customer category (defined by tariff scheme and annual bill segment). Ideally, the NRA would obtain for each of the customer categories in question individually measured figures, both for revenues and the underlying volumes of calls. As in the case of areas, it is unrealistic to expect that this kind of finely disaggregated data are available and the NRA should also in this case accept estimates prepared on the basis of representative data. We recommend that estimates are prepared on the basis of the following information to be provided by the USO provider:<sup>45</sup>

- *Average number of (outgoing) call minutes per line for residential customers, by distance and time of day. Available nation-wide averages would have to be adjusted on the basis of specific information concerning the different categories of potentially uneconomic customers. As in the case of areas, the adjustments would affect the total number of calls as well as the patterns of calls. Evidence on the variation of number of calls and call patterns across different customer categories should be derived from representative surveys of the USO provider's customers.*
- *Number of customers in each category. To be taken from USO provider's records.*
- *Average access revenues (annualised connection charge and rentals) per line.*
- *Average revenue per call minute by distance (local, national, international) and time of day of call.*<sup>46</sup>

On the basis of this information, access and outgoing call revenues can be estimated for each (potentially) uneconomic category of customers. Access costs of category C, for example, Light User Scheme customers, can be calculated as

$$\begin{array}{r}
 \text{Average access revenues per customer} \\
 \times \quad \text{Number of customers in category C} \\
 \hline
 = \quad \text{Access revenues of category C}
 \end{array}$$

Outgoing call revenues of category C can be calculated for each type of call defined by distance and time of day, as

$$\begin{array}{r}
 \text{Average revenues per call minute} \\
 \hline
 \end{array}$$

<sup>45</sup> See Oftel (1997), for a similar procedure.

<sup>46</sup> Average revenue per minute of an international call should be net of outpayments to foreign operators for terminating the call.

$$\begin{array}{r}
 x \quad \text{Average number of call minutes per line} \\
 x \quad \text{Number of lines in category C} \\
 \hline
 = \quad \text{Outgoing call revenues of category C}
 \end{array}$$

#### *Incoming call revenues*

Data on incoming call revenues should be estimated starting with the assumption that, for a residential customer, the average number of incoming call minutes is equal to the average number of outgoing call minutes. Incoming call revenues for category C customers can then be calculated for each type of call defined by distance (local, long-distance, international) and time of day, and taking into account particular characteristics of the category, as

$$\begin{array}{r}
 \text{Average revenues per call minute} \\
 x \quad \text{Average number of (outgoing) call minutes per line} \\
 x \quad \text{Number of lines in category C} \\
 \hline
 = \quad \text{Incoming call revenues of customers in category C}
 \end{array}$$

#### *Revenues from interconnect calls and called-party-pays calls*

The USO provider should also provide estimates on revenues foregone from interconnect calls and called-party-pays calls.

#### *Replacement call revenue*

The replacement rates used for customer categories should be higher than those for areas. Oftel, for example, proposes the following replacement rates:<sup>47</sup>

- Share of outgoing calls replaced:           0-40 %.
- Share of incoming calls replaced:           0-20 %.

As it is the case for areas, we can expect the degree of call replacement for incoming calls to be significantly lower than for outgoing calls. The levels of call replacement, however, are likely to be higher for individual uneconomic customers than for uneconomic areas. First, the ability of a former customer to use alternative lines is affected by the extent that neighbouring customers are also disconnected.

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<sup>47</sup> See Oftel (1997), Detailed explanatory notes, p. 9.

Disconnected customers in a given area will have less difficulty in finding access to a neighbour's or friend's phone, or to a public call box, if the area remains being served compared to a situation where the area is disconnected. Second, uneconomic customers in economic areas are typically those with lower incomes and lower billed revenues. Since, for those customers, the number of outgoing and incoming calls is small, the share of essential calls is likely to be relatively higher. As a consequence, the level of call replacement for individual customers in economic areas is higher than for customers in uneconomic areas.

Again, a certain proportion of replacement calls would be made from and to lines provided by competitors. Revenues that accrue to competitors do not reduce the USO provider's revenue foregone figure and hence should not be deducted for the calculation of universal service costs. The market share of the USO provider can serve as a proxy for the proportion of replacement calls that would be made from lines provided by the USO provider.<sup>48</sup>

The sample calculation for a hypothetical area in Section 3.5, showing in detail the different steps that need to be taken, can also serve as example for uneconomic customer groups since there are no essential differences in the procedure.

### 3.4 Revenues foregone for public pay phones

Finally, when looking at the universal service costs of public pay phones, revenues foregone have to be set against avoidable costs. If a category P of public pay phones were withdrawn, the following revenues would be foregone:

Outgoing call revenues	
+	Called-party-pays revenues
-	Revenues from replacement calls
<hr style="border: 0.5px solid black;"/>	
=	Revenues foregone if category P of public pay phones were disconnected

Outgoing call revenues of category P of pay phones are revenues collected for local and national calls and for international calls (net of outpayments to foreign operators).

Called-party-pays revenues of category P pay phones are revenues billed to other customers for calls made from category P pay phones, such as calls to freephone numbers.

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<sup>48</sup> A better proxy would be the share of economic customers served by the universal service provider.

Incoming call revenues billed to other customers for calls made to public pay phones are omitted from the calculation since they are either negligible or non-existent. Revenues from interconnect calls can also be neglected if the incumbent operator is the USO provider.

Again, if service were withdrawn from a public pay phone, some of the calls would be replaced by using other lines. The replacement call revenues have to be deducted from the revenue components above.

#### *Outgoing call revenues collected*

The USO provider should submit data on outgoing call revenues for each class of potentially uneconomic public pay phones. For the estimates, the following information should be obtained:

- *Average number of (outgoing) call minutes per public pay phone, by distance and time of day.* Representative data on number of calls and call patterns across different classes of pay phones can only be obtained from the records of the USO provider. The data should be sufficiently differentiated to be able to sort potentially uneconomic pay phones into the different classes.
- *Number of public pay phones in each category.* To be taken from USO provider's records.
- *Average revenue per call minute by distance (local, national, international) and time of day of call.*<sup>49</sup>

On the basis of this information, outgoing call revenues can be estimated for each (potentially) uneconomic category of public pay phones. Outgoing call revenues of category *P* can be calculated for each type of call defined by distance (local, long-distance, international) and time of day as

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<sup>49</sup> Average revenue per minute of an international call should be net of outpayments to foreign operators for terminating the call.

$$\begin{array}{l}
 \text{average revenues per call minute} \\
 \times \quad \text{average number of call minutes per public pay phone} \\
 \times \quad \text{number of public pay phones in category P} \\
 \hline
 = \quad \text{outgoing call revenues of category P of public pay phones}
 \end{array}$$

The sample calculation for a hypothetical area in Section 3.5, showing in detail the different steps that need to be taken, can also serve as example for uneconomic pay phones since there are no essential differences in the procedure.

Summing up the information requirements for calculating revenues foregone described in Chapter 3, we conclude:

1. The NRA should require the USO provider to submit the following information for (a) each potentially uneconomic area, (b) each potentially uneconomic category of customers and (c) each potentially uneconomic category of public pay phones:
  - Access revenues<sup>50</sup> and outgoing call revenues
  - Incoming call revenues<sup>51</sup>
  - Called-party-pays revenues
  - Interconnect revenues<sup>52</sup>
2. Access and outgoing call revenues should be estimated on the basis of the following information to be provided to the NRA:
  - Average number of (outgoing) call minutes per line for residential and business customers, by distance and time of day, and by geotype of area
  - Average number of (outgoing) call minutes per public pay phone, by distance and time of day, and by revenue segment and location of public pay phone
  - Number of lines in each potentially uneconomic area, for residential and business customers
  - Number of lines in each potentially uneconomic category of customers
  - Number of public pay phones in each potentially uneconomic category of pay phones
  - Average access revenues per line (annualised connection fees and rentals) for different categories of customers
  - Average revenues per call minute by distance and time of day
  - Average revenues per call minute per public pay phone

Where information cannot be taken directly from the USO provider's records, it should be derived from representative customer surveys.

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<sup>50</sup> Not for public pay phones.

<sup>51</sup> May be neglected for public pay phones.

<sup>52</sup> May be neglected for public pay phones if incumbent is the universal service provider.

3. Incoming call revenues should be estimated on the basis of evidence on the relationship between outgoing and incoming calls for customers. Incoming call revenues of an area do not include revenues from intra-area calls. To enable estimates of intra-area calls, the USO provider should submit information on
  - average number of minutes from local calls per residential and business line, by time of day, and by subscriber density of area and
  - whether a single exchange area makes up the local network, or whether the local network comprises several exchange areas.
4. USO providers should also submit information on
  - called-party-pays calls and
  - interconnect calls.
5. NRAs should require the USO provider to submit evidence on the likely degree of call replacement if areas or customer categories were disconnected. Estimates on the degree of call replacement should be based on consumer surveys.

### **3.5 Sample calculation for net revenues foregone of an area**

Table 3.5-1 provides a sample calculation of revenues foregone for a particular area. In the calculation, it is assumed that

- the number of lines in the area is 3,000 lines,
- the replacement rates are 0.15 for revenues from outgoing calls and called-party-pays call, 0.05 for revenues from incoming calls, and 0.10 for interconnect calls.

The table shows for the area the net revenues foregone made up of access call revenues, outgoing call revenues, incoming call revenues, interconnect revenues and called-party-pays revenues, each after deduction of replacement call revenues.

**Table 3.5-1:** Sample calculation for annual revenues foregone of area A

	ECU	
1	Average connection fee per line (annualised)	2
2	Average rental per line	58
3	Average access call revenues per line	60
<b>4</b>	<b>Access call revenues of area (60 x 3,000)</b>	<b>180,000</b>
5	Average revenues per line from outgoing local calls	34
6	Average revenues per line from outgoing long-distance calls	53
7	Average revenues per line from outgoing international calls	9
8	Average revenues per line from outgoing calls	96
9	Average replacement call revenues per line at a replacement rate of 0.15	14.4
10	Average outgoing call revenues per line, net of replacement call revenues	81.6
<b>11</b>	<b>Outgoing call revenues of area, net of replacement call revenues (81.6 x 3,000)</b>	<b>244,800</b>
12	Average incoming call revenues per line if set at average outgoing call revenues per line (ECU 96) less average revenues per line from local calls (ECU 34)	62
13	Average replacement call revenue per line at a replacement rate of 0.05	3.1
14	Average incoming call revenues per line, net of replacement call revenues	58.9
<b>15</b>	<b>Incoming call revenues of area, net of replacement call revenues (58.9 x 3,000)</b>	<b>176,700</b>
16	Average interconnect revenues per line	2
17	Average replacement call revenues per line at a replacement rate of 0.10	0,2
18	Average interconnect revenues per line, net of replacement call revenues	1,8
<b>19</b>	<b>Interconnect revenues of area, net of replacement call revenues (1.8 x 3,000)</b>	<b>5,400</b>
20	Average revenues per line from called-party-pays calls	1
21	Average replacement call revenues per line at a replacement rate of 0.15	0,15
22	Average revenues per line from called-party-pays calls, net of replacement call revenues	0,85
<b>23</b>	<b>Called-party-pays revenues of area, net of replacement call revenues (0.85 x 3,000)</b>	<b>2,550</b>
<b>24</b>	<b>Total revenues foregone of area (sum of lines 4, 11, 15, 19 and 23)</b>	<b>609,450</b>



## 4 Net costs of USOs

### 4.1 The problem to be solved

After the discussion of potentially avoidable costs of USO services in Chapter 2 and of corresponding potentially foregone revenues in Chapter 3, it remains to derive the resulting net costs. For this, two steps are required, first deriving the *direct* net cost by bringing the two strands of analysis in Chapters 2 and 3 together, deducting from costs of USO services the relevant revenue figures, and second, to deduct from the resulting direct net cost figure the value of the indirect benefits that are flowing to the USO provider due to this status, to obtain the *overall* net cost.

Section 4.2 will discuss the steps that are needed to obtain the direct net cost of USO services. This involves the following:

- For potentially uneconomic areas, uneconomic customers and uneconomic public pay phones, the matching of per unit cost of services with relevant volumes of services and deducting from them corresponding revenues foregone.
- The determination of the areas, customers and public pay phones that would be uneconomic according to the difference between costs and revenues determined in the step above.
- For both uneconomic areas and uneconomic customers, the elimination of double counted incoming call revenue to obtain both the final number of uneconomic areas and uneconomic customers and the corresponding amounts of direct net costs.

Note that the elimination of double counted incoming call revenue can only be carried out after the uneconomic areas and customers are already identifiable - since the double counted income relates to calls made from/by them - so that for this reason the step can be undertaken only at this point in the analysis.

In Section 4.3 we will analyse how to determine the value of indirect benefits and discuss the steps that need to be undertaken.

## 4.2 Determining the direct net cost of uneconomic areas, uneconomic customers and uneconomic public pay phones

### 4.2.1 Uneconomic areas

#### 4.2.1.1 Calculation according to the simple difference between costs and revenues

The following are the elements needed to determine the direct net cost of uneconomic areas (before elimination of double counted incoming call revenue (see Section 4.2.1.2), but *after* elimination of those areas that are economic in the long run (see Section 4.3.1)):

- A listing of all *potentially uneconomic areas* each with its number of subscriber lines.
- For each of the potentially uneconomic areas, the *average annual cost per subscriber line*, either
  - for each area individually (as for example derived from an analytical cost model),
  - or
  - if areas are grouped according to density, the average for each such group (as provided by the USO provider or derived from an analytical cost model).
- *Volumes of outgoing calls*, i.e. local, national long-distance (according to different distance bands) and international calls at different times of the day, as an average per subscriber line, either - depending on availability - for
  - each of the potentially uneconomic areas individually, or
  - each group of uneconomic areas, or
  - as an average over all uneconomic areas, or
  - as a national average over all areas, uneconomic and economic ones, net of replacement calls.
- Estimates of the *volumes of incoming calls* in the same detail as for outgoing calls.
- *Volumes of interconnect calls* to and from other operators' points of presence at different times of the day, as an average per subscriber line, either - depending on availability - for
  - each of the potentially uneconomic areas individually, or
  - each group of uneconomic areas, or
  - as an average over all uneconomic areas, or
  - as a national average over all areas, uneconomic and economic ones, net of replacement calls.
- *Volumes of called-party-pays calls* at different times of the day, net of replacement calls.

- For each type of call (local, long-distance, international, interconnect, for different time zones) the corresponding *costs per minute*, which most likely will only be available as a national average cost figure.
- For each of the different potentially uneconomic areas or types of uneconomic areas, average revenue per subscriber line foregone corresponding to the volumes of services listed above.

The calculation of the avoidable net cost of an individual area A, if it were eliminated from the network, is then as follows:

$$\begin{aligned}
 & \text{Average cost of access per subscriber line } \times \text{ number of subscribers} \\
 + & \text{ Average minutes of outgoing calls per subscriber line } \times \text{ cost per minute of} \\
 & \text{calls (each for local, long-distance, and international calls and differentiated} \\
 & \text{according to relevant time zones) } \times \text{ number of subscribers, net of the cost of} \\
 & \text{replacement calls} \\
 + & \text{ Average minutes of incoming calls per subscriber line } \times \text{ cost per minute of} \\
 & \text{calls (differentiated as for outgoing calls above) } \times \text{ number of subscribers, net} \\
 & \text{of the cost of replacement calls} \\
 + & \text{ Average minutes of interconnect calls per subscriber line } \times \text{ cost per minute} \\
 & \text{of calls (differentiated according to relevant time zones) } \times \text{ number of} \\
 & \text{subscribers, net of the cost of replacement calls} \\
 + & \text{ Average minutes of called-party-pays calls per subscriber line } \times \text{ cost per} \\
 & \text{minute of calls (differentiated according to relevant time zones) } \times \text{ number of} \\
 & \text{subscribers, net of the cost of replacement calls} \\
 - & \text{ Revenues foregone if area A were disconnected} \\
 \hline
 = & \text{ Net cost avoided if area A were disconnected}
 \end{aligned}$$

The data on the cost per unit of service (per subscriber line or per call minute) will be available following the procedures discussed in Chapter 2, while the data on revenues and on call volumes (which are demand related and therefore stand in close relationship with revenues) will be available following the procedures presented in Chapter 3.

Section 4.2.4 will provide sample calculations to determine the net cost for the same hypothetical area for which sample calculations were done in Section 3.5 in respect of revenues forgone.

We conclude:

1. The data that has been compiled in the course of work to ascertain per unit costs as well as revenues of areas, as described in Chapters 2 and 3, should be used to calculate the net cost of an area.
2. The calculations should always be in terms of volumes of service (number of subscriber lines, volumes of call minutes per subscriber lines) *times* the relevant per unit cost (average cost per subscriber line for the area in question, average cost per call minute). In this way it can be assured that on the cost and revenue sides the underlying measures are consistent with each other.
3. The relevant service volumes for an uneconomic area are:
  - number of subscriber lines in the area,
  - outgoing calls per subscriber line in the area,
  - incoming calls per subscriber line in the area,
  - interconnect calls per subscriber line in the area, and
  - called-party-pays calls per subscriber line in the area,where all call volumes are reduced by number of replacement call minutes.
4. The calculations should be carried out with the set of (potentially) uneconomic areas that are left after elimination of those areas that will not be uneconomic in the long run (according to the life-cycle-effect test of Section 4.3.1).

#### 4.2.1.2 The elimination of double counted incoming call revenue from the net cost calculation for uneconomic areas

As discussed in Chapter 3, the revenue from incoming calls is part of the revenue attributed to a potentially uneconomic area. Double counting occurs because revenues from incoming calls that are themselves coming out of uneconomic areas are counted there already as outgoing calls and included in outgoing call revenue. Since the double counted component can only be known with sufficient precision after the uneconomic areas are clearly identified and since for this identification the double counted component should itself be known already, an iterative procedure is called for.

The procedure essentially consists of the following steps:

- All areas that are candidates for uneconomic area status according to the simple difference between costs and revenues should be listed. The areas should be ranked in descending order of the difference per subscriber line. The list should include at the end areas with apparent per subscriber line surpluses that may, however, upon adjustment due to double counted incoming call revenue turn into deficit areas.

- The next step consists of determining for each of the areas identified above the part of incoming call revenue that comes from the other uneconomic areas. There is to our knowledge so far no empirical information to guide one in the setting of the share of double counted incoming call revenue. Therefore an approach based on plausibility is called for. The approach that we suggest is as follows:
  - (1) Note the number of customers in all uneconomic areas considered.
  - (2) Note the share of this number in the total number of the USO provider's customer base.
  - (3) Use the assumption that in general the outgoing calls of the USO providers' customers have an equal chance to go to any other of the USO provider's customers.
  - (4) The assumption under (3) implies that in any one area an incoming call may with equal probability come from any other of the customers of the USO provider.
  - (5) Use therefore the share defined under (2) above as an estimate of the share of incoming call volume that comes from uneconomic areas.
  - (6) Use this share as an indicator for the share in incoming call revenue that is double counted and needs to be removed.
- Deducting the double counted incoming call revenue as determined above will increase the deficit. It must be verified whether this increase will shift some areas from an apparent surplus into a deficit position and make them uneconomic.
- The last step would consist in verifying whether due to a change in the number of uneconomic areas the basis for determining the share of double counted incoming call revenue has shifted which would require a (possibly only slight) readjustment of the initial correction for double counted income.

The procedure is best illustrated with an example like the one given in Table 4.2.1.2-1. The example supposes that there are 24 potentially uneconomic areas identified according to the simple difference between their costs and revenues. They are identified as potentially uneconomic because that simple difference is positive, or it is negative (meaning that there is a surplus and not a deficit) but close enough to zero that it could turn into a positive number after adjustments for double counted items. As described above, the ranking is according to the difference between costs and revenues per subscriber line (column 3) as this per customer figure is a better indicator for which potentially uneconomic areas are more likely to turn into actual net cost areas. For example areas 21 and 22 have similar absolute amounts of surplus (negative deficits, see column 4), however, the first one has a per customer surplus closer to zero than the second and is therefore more susceptible to turning into a net cost area than the other.

(The example would fit a rather small country/operator with less than two million subscriber lines. The 24 actually and potentially uneconomic areas are supposed to have about 51,000 customers (not shown in the table). The table is without its "middle section" covering uneconomic areas 4 to 15 as this part is not relevant for the

discussion and leaving it out facilitates reading the table. The shaded elements in the first line indicate the area (through its simple difference between cost and revenue and through its final net cost) that will serve as the example for which in Section 4.2.3 a sample calculation will be given.)

**Table 4.2.1.2-1:** Example calculations to eliminate double counted incoming call revenue from uneconomic areas' net costs

1	2	3	4	5	6	7	8
Area No.	Number of customers	Simple annual difference between cost and revenue		First correction for double counted revenue	Net cost of area after first correction	Second correction for double counted revenue	Net cost of area after second correction
		per customer	over customers in area				
ECU							
1	3,000	91	272,828	4,860	277,688	-572	277,117
2	2,000	88	176,637	3,240	179,877	-381	179,496
3	1,000	88	88,318	1,620	89,938	-191	89,748
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
16	3,000	12	36,000	4,860	40,860	-572	40,288
17	2,000	12	24,000	3,240	27,240	-381	26,859
18	1,000	12	12,000	1,620	13,620	-191	13,429
19	1,000	-1	-1,200	1,620	420	-191	229
20	2,000	-1	-2,400	3,240	840	-381	459
21	4,500	-1	-5,400	7,290	1,890	-858	1,032
							1,598,407
22	1,000	-6	-6,000	1,620	-4,380	-16	-4,396
23	2,000	-6	-12,000	3,240	-8,760	-32	-8,792
24	3,000	-6	-18,000	4,860	-13,140	-48	-13,188

In column 4 of the table the absolute amounts of the simple cost/revenue difference are shown (column 3 times column 2 which contains the number of customers in the area). The first round correction of these amounts for double counted incoming call revenue occurs in column 5. The amounts shown there are calculated here as 3 % of the incoming call revenue (after deduction of costs) as the assumption is that the share of the number of customers in all potentially uneconomic areas in relation to the total customer base equals this percentage. The amounts must be added to the amounts of column 4 since double counted incoming call revenue reduces costs more than allowable. Verifying the entries of column 6 showing the resulting new deficit figures, one observes for areas 19 to 21 that on account of the correction their surpluses have turned into deficits meaning that they have to be included among the actual uneconomic areas.

After the round of corrections discussed above, one needs to check whether there is the need for another round. This depends on whether the basis for double counted incoming call revenue has changed after the first round. This in turn depends on the number of uneconomic areas that are in that status after the correction. In our example this number

now includes areas 19 to 21 as the corrections turned their surpluses into deficits. Now, assume the initial double counted incoming call revenue had been based on the expectation that all 24 areas listed in the table would end up being uneconomic. Then the correction of round 1 would have included incoming call revenue from areas 22 to 24 that in fact are not uneconomic and therefore the correction would have been too large. Thus a second correction must be carried out taking back part of the first one. This is done in column 7 on the assumption that the correct share is 2.65 % and not 3 % as initially applied. This second round does in our case not lead to the reclassification of any of the newly found uneconomic areas 19, 20 or 21 as each of them continues to show positive net costs. Thus, after the second round of corrections both the final number of uneconomic areas and the total amount of the direct net cost of these areas have been established. The total direct net cost is shown by the shaded sum in column 8 after area 21.

From the above we conclude:

1. The elimination of double counted incoming call revenue increases the calculated net cost of an area. This can turn a marginally surplus area into a deficit area.
2. With no empirical data for an estimate for the share of double counted revenue due to incoming calls from uneconomic areas, a pragmatic approach is to set it equal to the ratio of subscribers in all uneconomic areas to the total number of customers of the USO provider. The reason is the assumption that each incoming call has an equal chance to come from any one customer in the USO provider's total customer base. Then the share of customers in uneconomic areas in that total base is a plausible estimator for the share of calls coming out of uneconomic areas.
3. The count of uneconomic areas on which to base the initial share of double counted incoming call revenue should include those marginal surplus areas that could turn into deficit areas after the adjustment for double counted incoming call revenue has been carried out. A second round of adjustments will then normally be necessary since not all of these marginal surplus areas will become deficit areas after the first round, which means that the initial ratio of subscribers in suspected uneconomic areas to total customers, used to estimate the double counted incoming call revenue, was too large.

#### 4.2.2 Uneconomic customers

##### 4.2.2.1 Calculation according to the simple difference between costs and revenues

The following are the elements needed to determine the direct net cost of (categories of) uneconomic customers (before elimination of double counted incoming call revenue,



see Section 4.2.2.2, but *after* elimination of those customers that are economic in the long run, see Section 4.3.1):

- A listing of all *potentially uneconomic customer categories*, categorised according to their distinguishing characteristic (which may be that they are all subscribers to a social tariff or some light user scheme; or that they have average bills within a given low range), each with its *number of subscriber lines*;
- For each of the potentially uneconomic customer categories, the *distribution of average annual cost per subscriber line* that would be avoided. The data should be compiled in a way that they indicate what proportion of each category has as avoidable costs
  - only variable costs, or
  - variable costs plus a part of sunk costs because customer categories are so clustered within economic areas that permanently eliminating them from the network would in the long run also eliminate some of this cost, or
  - the total average long run cost of providing a subscriber line, which for an individual customer in an economic area would rather be the exception.
 (See on this the discussion in Sections 2.3.1.7 and 2.3.2.4.)
- *Volumes of outgoing calls*, i.e. local, national long-distance (according to different distance bands) and international calls at different times of the day, as an average per subscriber line, either - depending on availability - for
  - each of the potentially uneconomic customer categories individually, or
  - as an average over all uneconomic customer categories, or
  - as a national average over all customers, net of replacement calls.
- Estimates of the *volumes of incoming calls* in the same detail as for outgoing calls.
- *Volumes of interconnect calls* to and from other operators' points of presence at different times of the day as an average per subscriber line, either - depending on availability - for
  - each of the potentially uneconomic customer categories individually, or
  - as an average over all uneconomic customer categories, or
  - as a national average over all customers, net of replacement calls.
- Volumes of called-party-pays calls at different times of the day, net of replacement calls.
- For each type of call (local, long-distance, international, for different time zones) the corresponding *costs per minute*, which most likely will only be available as a national average cost figure.

- For each of the different potentially uneconomic customer categories, average revenue per subscriber line foregone corresponding to the volumes of services listed above.

The calculation of the avoidable direct net cost of a customer category C, identified by its demand characteristic and its average avoidable cost, if the customers were not served, is then as follows:

$$\begin{aligned}
 & \text{Average cost of access per subscriber line } \times \text{ number of subscribers} \\
 + & \text{ Average minutes of outgoing calls per subscriber line } \times \text{ cost per minute of} \\
 & \text{ calls (each for local, long-distance, and international calls and differentiated} \\
 & \text{ according to relevant time zones) } \times \text{ number of subscribers, net of the cost of} \\
 & \text{ replacement calls} \\
 + & \text{ Average minutes of incoming calls per subscriber line } \times \text{ cost per minute of} \\
 & \text{ calls (differentiated as for outgoing calls above) } \times \text{ number of subscribers, net} \\
 & \text{ of the cost of replacement calls} \\
 + & \text{ Average minutes of interconnect calls per subscriber line } \times \text{ cost per minute} \\
 & \text{ of calls (differentiated according to relevant time zones) } \times \text{ number of} \\
 & \text{ subscribers, net of the cost of replacement calls} \\
 + & \text{ Average minutes of called-party-pays calls per subscriber line } \times \text{ cost per} \\
 & \text{ minute of calls (differentiated according to relevant time zones) } \times \text{ number of} \\
 & \text{ subscribers, net of the cost of replacement calls} \\
 - & \text{ Revenues foregone if customer category C were disconnected} \\
 \hline
 = & \text{ Net cost avoided if customer category C were disconnected}
 \end{aligned}$$

As in the case of uneconomic areas, the data on the cost per unit of service (per subscriber line or per call minute) will be available following the procedures discussed in Chapter 2, while the data on revenues and on call volumes will be available following the procedures presented in Chapter 3.

The sample calculation in Section 4.2.4 showing the steps leading to the net cost for a hypothetical area can also serve as example for the calculation of the net cost for a customer category or a segment thereof.

We conclude:

1. The data that has been compiled in the course of work to ascertain per unit costs as well as revenues of potentially uneconomic customer categories, as described in Chapters 2 and 3, should be used to calculate the net cost of an area.

2. If customers identified on a first count as belonging to an uneconomic customer category live in uneconomic areas they should be excluded as they have already been taken into account when uneconomic areas were considered.
3. Customer categories should be classified into different segments according to the extent that their avoidable costs, if not served, would differ.
4. The calculations should always be in terms of volumes of service (number of subscriber lines, volumes of call minutes per subscriber lines) *times* the relevant per unit cost (average cost per subscriber line, average cost per call minute). In this way it can be assured that on the cost and revenue sides the underlying measures are consistent with each other.
5. The relevant service volumes for an uneconomic customer category or segment are:
  - number of subscriber lines in the customer category or segment,
  - outgoing calls per subscriber line in the customer category or segment,
  - incoming calls per subscriber line in the customer category or segment,
  - interconnect calls per subscriber line in the customer category or segment, and
  - called-party-pays calls per subscriber line in the area customer category or segment,
 where all call volumes are reduced by number of replacement call minutes.
6. The calculations should be carried out with the set of (potentially) uneconomic customer categories that are left after elimination of those customers that will not be uneconomic in the long run (according to the life-cycle-effect test of Section 4.3.1).

#### 4.2.2.2 The elimination of double counted incoming call revenue from the net cost calculation for uneconomic customers

Determining the number of uneconomic customers and the amount of the net cost caused by them should be done *after* the uneconomic areas are known because this simplifies the procedure. The procedure regarding uneconomic customers in economic areas is more complex than the one for uneconomic areas as the search must be conducted over two dimensions. The procedure must look at potentially uneconomic customers on account of the average amount of the revenue they generate as well as on account of the avoidable costs and find those matches that end up with a net cost. In doing this the problem of double counted incoming call revenue must also be taken into account.

The procedure essentially consists of the following steps:

- Customer categories that are candidates for uneconomic customer status should be identified according to the characteristic which may qualify them as uneconomic.

- If the listing has been prepared in a way to include uneconomic customers that live in uneconomic areas identified earlier (see Section 4.2.1), care should be taken to remove these from the list.
- Each such customer category should be segmented according to the amount of cost that would be avoided if that segment were not served any more.
- For each segment of each customer category calculate the simple difference between costs and revenues.
- All segments of customer categories that are candidates for uneconomic status according to the simple difference between costs and revenues should be ranked in descending order of the difference per subscriber line. Included at the end should be segments with apparent per subscriber line surpluses that may upon adjustment due to double counted incoming call revenue achieve deficit status.
- The next step consists of determining for the customers in the segments identified above the part of incoming call revenue that comes from other uneconomic customers. We use the same approach that in Section 4.2.1.2 was applied to uneconomic areas:
  - (1) Note the total number of uneconomic customers considered.
  - (2) Note the share of this number in the total number of the USO provider's customer base.
  - (3) Use the assumption that in general the outgoing calls of the USO providers' customers have an equal chance to go to any other of the USO provider's customers.
  - (4) The assumption under (3) implies that for any customer an incoming call may with equal probability come from any other of the customers of the USO provider.
  - (5) Use therefore the share defined under (2) above as an estimate of the share of incoming call volume that comes from uneconomic areas.
  - (6) Use this share as an indicator for the share in incoming call revenue that is double counted and needs to be removed.

Deducting the double counted incoming call revenue as above will increase the deficit, and in particular may shift some customer segments from a surplus into a deficit position and make them uneconomic.

- The last step would consist in checking whether due to the correction the number of uneconomic customers has changed and whether therefore the basis for determining the share of double counted incoming call revenue has shifted. If this is the case it requires a (possibly only slight) readjustment of the initial correction for double counted incoming call revenue.

Double counted revenue due to calls between uneconomic customer segments and uneconomic areas must also be taken into account. This has not been done so far as at

the time uneconomic areas were discussed, the number of uneconomic customer segments were not yet known, and above the treatment of double counted incoming call revenue was treated symmetrically to the case of uneconomic areas for easier understanding. The additional correction could be handled in two ways. One could proceed (a) by removing here from uneconomic customers' incoming call revenues the share originating with uneconomic areas and (b) by turning back to the calculations relating to uneconomic areas' double counted incoming call revenue done in Section 4.2.1.2 and apply the further correction there. The other way would be to do both corrections here by removing here from uneconomic customers' incoming call revenues the share that is due to calls originating with uneconomic areas *and* by correcting uneconomic customers' outgoing call revenues for that part of calls that are terminating in uneconomic areas. The latter approach is actually the more convenient one as it saves the trouble of taking up uneconomic areas again. From this follows:

- From the uneconomic customers' incoming call revenue should be deducted the share that is originating with uneconomic areas. The share to be used should, as before, be determined according to the number of customers in all uneconomic areas to the total number of the USO provider's customer base. The assumption, as before, is that if incoming calls have an equal chance to come from any customer of the USO provider, the likelihood that they come from uneconomic areas stands in relation to the share of all customers in these areas.
- From the uneconomic customers' outgoing call revenue should be deducted the share that is terminating in uneconomic areas. The share to be used should also be determined according to the number of all customers in uneconomic areas to the total number of the USO provider's customer base. The reason here is similarly that if uneconomic customers' calls have an equal chance to go to each of the USO provider's customers, the likelihood is that the share going to uneconomic areas relates to the share of customers in these areas.

The procedure is illustrated by the example in Table 4.2.2.2-1. The table consists of two parts, the first, part A, showing different customer categories and their segmentation according to levels of avoidable costs, the second, part B, ranking the different customer segments according to the level of the apparent per customer deficit. In part A we assume that there are three customer categories that may give rise to net costs of USO provision: a light user scheme (LUS) customer category, a customer category with average monthly bills of 5 to 10 ECU, and a customer category with average monthly bills of 10 to 15 ECU. Each is segmented according to the cost that may be avoidable, the assumption here being that for most of the uneconomic customers only variable costs could be expected to be avoidable (7 ECU per month), for a smaller number of the customers also a certain share of the sunk plant cost (9 ECU per month), and only for a still smaller number the total average long-run cost (13 ECU per month). Given the assumed characteristics of the three customer categories, only two segments of the

second category, and only one segment of the third category have actual deficits according to the simple difference between average revenue and avoidable costs.

In columns 7 to 10 of part B, the corrections are carried out. In column 7 the double counted incoming call revenue due to calls among the uneconomic customers under review themselves is shown. It is calculated at an assumed share of 2.8 % that results according to the assumed share of the uneconomic customers in the USO provider's total customer base (the rate is chosen to be consistent with the 2.65 % that resulted for the number of customers used in the discussion concerning uneconomic areas, see Table 4.2.1.2-1). Column 8 makes the correction for double counted incoming call revenue originating in the uneconomic areas giving rise there to outgoing call revenue. It is calculated at the rate of 2.65 % that we obtained in Table 4.2.1.2-1 after the second round of corrections. Column 9 finally corrects for the uneconomic customers outgoing calls to uneconomic areas calculated at the rate of 2.65 % of assumed outgoing call revenue. All three components reduce the revenue that would be foregone and therefore increases the net cost of each customer segment considered. The result is shown in column 10. We observe that in the example all of the customer segments that initially showed surpluses (negative deficits) remain this way so that there is no reason for an additional round of corrections. Thus as final result we have identified the uneconomic customer segments in economic areas as well as the total amount of direct net cost that they cause, shown as the shaded figure in column 10 after the last customer segment with a positive net cost.

**Table 4.2.2.2-1: Example calculations to eliminate double counted call revenue from uneconomic customer categories' net costs**

1	2	3	4	5	6	7	8	9	10
Designation of customer category	Number of customers	Average monthly revenue	Average monthly avoidable cost	Simple difference between cost and rev. on annual basis		Corrections for			Net cost of customer segment after corrections
				per customer	over customers in segment	double counted incoming call revenue internal to customer category	double counted incoming call rev. originating in uneconomic areas	outgoing call revenue terminating in uneconomic areas	
		ECU							
<b>A</b>									
Light user scheme (LUS) customers									
segment 1	2,500	4.5	13	8.5	255,000				
segment 2	5,000	4.5	9	4.5	270,000				
segment 3	20,000	4.5	7	2.5	600,000				
Customer category with 5-10 ECU monthly revenue									
segment 1	5,000	7.5	13	5.5	330,000				
segment 2	10,000	7.5	9	1.5	180,000				
segment 3	40,000	7.5	7	-0.5	-240,000				
Customer category with 10-15 ECU revenue									
segment 1	5,000	12.5	13	0.5	30,000				
segment 2	10,000	12.5	9	-3.5	-420,000				
segment 3	40,000	12.5	7	-5.5	-				
					2,640,000				
<b>B</b>									
LUS customers segment 1	2,500	4.5	13	8.5	255,000	840	795	398	257,033
5-10 ECU customers segment 1	5,000	7.5	13	5.5	330,000	1,680	1,590	795	334,065
LUS customers segment 2	5,000	4.5	9	4.5	270,000	1,680	1,590	795	274,065
LUS customers segment 3	20,000	4.5	7	2.5	600,000	6,720	6,360	3,180	616,260
5-10 ECU cust'rs segment 2	10,000	7.5	9	1.5	180,000	3,360	3,180	1,590	188,130
10-15 ECU cust'rs segment 1	5,000	12.5	13	0.5	30,000	1,680	1,590	795	34,065
									1,703,616
5-10 ECU cust'rs segment 3	40,000	7.5	7	-0.5	-240,000	13,440	12,720	6,360	-207,480
10-15 ECU cust'rs segment 2	10,000	12.5	9	-3.5	-420,000	3,360	3,180	1,590	-411,870

10-15 ECU cust'rs segment 3	40,000	12.5	7	-5.5	-	13,440	12,720	6,360	-
					2,640,000				2,607,480

From the above we conclude:

1. With no empirical data for an estimate for the share of double counted revenue due to incoming calls from other uneconomic customers, a pragmatic approach is to set it equal to the ratio of the number of customers in uneconomic categories to total number of customers of the USO provider. The reason is the assumption that each incoming call has an equal chance to come from any one customer in the USO provider's total customer base. Then the share of customers in uneconomic categories in that total base is a plausible estimator for the share of calls coming from all these uneconomic customers.
2. The calculations for the elimination of double counted incoming call revenue for uneconomic customers should be done after uneconomic areas are known. This facilitates the carrying out of adjustments due to double counted incoming call revenue caused by the interaction between uneconomic customer groups and uneconomic areas.

#### 4.2.3 Uneconomic public pay phones

The following are the elements needed to determine the direct net cost of uneconomic public pay phones (*after* elimination of those pay phones that are economic in the long run, see Section 4.3.1):

- A listing of all *potentially uneconomic public pay phones* categorised according to relevant distinguishing characteristics (which may be that they are prone to heavy wear and tear (vandalism); or are located at places where they can generate only low average revenues).
- For each of the potentially uneconomic categories of pay phones, the *distribution of average annual cost per pay phone* that would be avoided. The data should be compiled in a way that they indicate what proportion of each category has as avoidable costs
  - only the costs of the booth and the terminal equipment plus maintenance and repair, and no part of the local plant as this could not have been avoided at the time of network construction, or
  - the costs as above plus the sunk costs of the local plant because the pay phones are sufficiently independent investment decisions that these costs could also have been avoided.



- *Volumes of outgoing calls*, i.e. local, national long-distance (according to different distance bands) and international calls at different times of the day, as an average per pay phone, either - depending on availability - for
  - each category of the potentially uneconomic public pay phones individually, or
  - as an average over all uneconomic public pay phones, or
  - as a national average over all public pay phones, net of replacement calls.
- *Incoming calls* should be a *negligible quantity* for public pay phones so that no activity as regards collecting their volumes should be initiated.
- For each type of call (local, long-distance, international, for different time zones) the corresponding *costs per minute*, which most likely will only be available as a national average cost figure.
- For each of the different potentially uneconomic categories of public pay phones, average revenue per pay phone corresponding to the volumes of services listed above.

The calculation of the avoidable direct net cost of a category P of public pay phones, identified by its demand characteristic and its average avoidable cost, if the service over these public pay phones were discontinued, is then as follows:

$$\begin{array}{l}
 \text{Average cost of the relevant category (or subcategory) of public pay phone } \textit{times} \\
 \text{number of pay phones} \\
 + \quad \text{Average minutes of outgoing calls per pay phone } \textit{times} \text{ cost per minute of calls} \\
 \quad \text{(each for local, long-distance, and international calls and differentiated according} \\
 \quad \text{to relevant time zones) } \textit{times} \text{ number of pay phones, net of cost of replacement} \\
 \quad \text{calls} \\
 - \quad \text{Revenues foregone if service over category P of pay phones were discontinued} \\
 \hline
 = \quad \text{Net cost avoided if category P of pay phones were eliminated from the network}
 \end{array}$$

As in the case of uneconomic areas and uneconomic customers, the data on the cost per unit of service (per public pay phone or per call minute) will be available on following the procedures discussed in Chapter 2, while the data on revenues and on call volumes will be available on following the procedures presented in Chapter 3.

Since incoming call revenue for public pay phones can be considered a negligible quantity, there is no need to eliminate double counted incoming call revenue.

The sample calculation in Section 4.2.4 showing the steps leading to the net cost for a hypothetical area can also serve as example for the calculation of the net cost for public pay phones.

What is left to do is to list the different categories of pay phones each with its direct net cost as calculated according to the above procedure (due to its simple structure there is no token example for this list). Total direct net cost of uneconomic areas, customers and pay phones is then the sum over the amount on this list plus the amounts shown according to Tables 4.2.1.2-1 and 4.2.2.2-1.

From the above we conclude

1. The data that has been compiled in the course of work to ascertain per unit costs as well as revenues of potentially uneconomic public pay phones, as described in Chapters 2 and 3, should be used to calculate the net cost of public pay phones.
2. Calculations should always be in terms of volumes of service (number of public pay phones, volumes of call minutes per public pay phone) *times* the relevant per unit cost (average cost per public pay phone in question, average cost per call minute). In this way it can be assured that on the cost and revenue sides the underlying measures are consistent with each other.
3. The relevant service volumes for uneconomic public pay phones are:
  - number of public pay phones,
  - outgoing calls per public pay phone,
  - interconnect calls per public pay phone, and
  - called-party-pays calls per public pay phone,where all call volumes are reduced by number of replacement call minutes.
4. The calculations should be carried out with the set of (potentially) uneconomic public pay phones that are left after elimination of those that will not be uneconomic in the long run (according to the life-cycle-effect test of Section 4.3.1).

#### 4.2.4 Sample calculation for the direct net cost of an area

This section serves to present a sample calculation of the direct net cost of an area. It supposes to reflect the calculations that led to the net cost of area 1 in Table 4.2.1.2-1 *before* correction for double counted incoming call revenue. The revenue set against the cost will be that from Table 3.5-1. The volumes of calls underlying the cost calculation are supposed to come from the set of data that had to be collected for the revenue calculations shown in Table 3.5.-1.

The details of the example are as follows:

- There are 3,000 customers in the area.
- The average cost of a subscriber line is 20 ECU per month.

- Per minute costs of calls correspond to cost estimates reported in a study carried out for Germany.<sup>53</sup> We assume that long-distance calls are over only one distance band (50-300 km) and that the per minute cost of international calls is the cost to the nearest international gateway (net of the settlement rate component), assumed to be equal to the cost of the distance band used for the long-distance calls.
- Per minute cost for interconnection calls is at 85 % of the cost of local calls.
- Per minute costs for called-party-pays calls are set equal to an assumed average of the costs of local and long-distance calls.
- The replacement rates are 0.15 for outgoing calls and called-party-pays calls, 0.05 for incoming calls, and 0.10 for interconnect calls. These rates are in agreement with those used for the foregone revenue calculation in Table 3.5-1.

In the main body of the table here, the calculation for the direct net cost of area 1 of Table 4.2.1.2-1 is shown, *before* correction of double counted incoming call revenue. The corresponding correction is done at the end of the table in one step by deducting the amount found in Table 4.2.1.2-1.

**Table 4.2.4-1:** Sample calculation for the direct net cost of area A

		ECU
1	Average annual cost per line	240
2	<b>Access costs of area (240 x 3,000)</b>	<b>720,000</b>
3	Minutes of outgoing local calls during peak time <i>times</i> relevant cost per minute (500 x 1.07 c)	5.35
4	Minutes of outgoing local calls during off-peak time <i>times</i> relevant cost per minute (800 x 1.07 c)	8.56
5	Minutes of outgoing long-distance calls during peak time <i>times</i> relevant cost per minute (200 x 4.97 c)	9.94
6	Minutes of outgoing long-distance calls during off-peak time <i>times</i> relevant cost per minute (400 x 1.76 c)	7.04
7	Minutes of outgoing international calls during peak time <i>times</i> relevant cost per minute (20 x 4.97 c)	0.994
8	Minutes of outgoing international calls during off-peak time <i>times</i> relevant cost per minute (40 x 1.76 c)	0.70
9	Costs of outgoing calls as an average per line	32.59
10	Costs of outgoing replacement calls as an average per line at a replacement rate of 0.15	4.89
11	Outgoing call costs, net of replacement call costs as an average per line	27.70
12	<b>Outgoing call costs of area, net of replacement call costs (27.70 x 3,000)</b>	<b>83,099</b>

<sup>53</sup> See García and Hackbarth (1996).

13	Minutes of incoming local calls during peak time <i>times</i> relevant cost per minute (250 x 1.07 c)	2.68
14	Minutes of incoming local calls during off-peak time <i>times</i> relevant cost per minute (400 x 1.07 c)	4.28
15	Minutes of incoming long-distance and international calls (differentiated according to line 5 to 8 and averaged) <i>times</i> relevant cost per minute (660 x 2.83 c)	18.68
16	Costs of incoming calls as an average per line	25.63
17	Costs of incoming replacement calls as an average per line at a replacement rate of 0.05	1.28
18	Incoming call costs, net of replacement call costs as an average per line	24.35
19	<b>Incoming call costs of area, net of replacement call costs (24.35 x 3,000)</b>	<b>73,050</b>
20	Minutes of interconnect calls during peak time <i>times</i> relevant cost per minute (50 x 0.90 c)	0.45
21	Minutes of interconnect calls during off-peak time <i>times</i> relevant cost per minute (100 x 0.90 c)	0.90
22	Costs of interconnect calls as an average per line	1.35
23	Costs of interconnect replacement calls as an average per line at a replacement rate of 0.10	0.14
24	Interconnect call costs, net of replacement call costs as an average per line	1.21
25	<b>Interconnect call costs of area, net of replacement call costs (1.21 x 3,000)</b>	<b>3,630</b>
26	Minutes of called-party-pays calls during peak time <i>times</i> relevant cost per minute (20 x 2.50 c)	0.50
27	Minutes of called-party-pays calls during off-peak time <i>times</i> relevant cost per minute (40 x 1.20 c)	0.48
28	Costs of called-party-pays calls as an average per line	0.98
29	Costs of called-party-pays replacement call costs as an average per line at a replacement rate of 0.15	0.15
30	Costs of called-party-pays calls, net of replacement call costs as an average per line	0.83
31	<b>Called-party-pays costs of area, net of replacement call costs (0.83 x 3,000)</b>	<b>2,499</b>
32	<b>Total avoidable costs of area (sum of lines 2, 12, 19, 25 and 31)</b>	<b>882,278</b>
33	Revenues foregone of area (see Table 3.5-1)	- 609,450
34	<b>Total direct net costs of area (before correction for double counted incoming call revenue)</b>	<b>272,828</b>
35	Correction for double counted incoming call revenue	+ 4,289
36	<b>Total direct net cost of area (after correction for double counted incoming call revenue)</b>	<b>277,117</b>

### 4.3 The indirect benefits of the USO

While the direct net costs determined in Section 4.2 measure the impact on the performance of the firm that derive directly from the services identified as uneconomic, the indirect benefits refer to positive effects on this performance that come about because providing USO services has repercussions on the firm's other business. The monetary value of these effects needs to be determined and deducted from direct net costs of universal service to obtain the overall net cost (or benefit) to the USO provider.

The following have been identified as potential indirect benefits:

- life cycle effects,
- enhancement of corporate reputation,
- effects of increased ubiquity,
- access to full range of telephone usage, and
- advertising benefit of public pay phones.

Each of them will be discussed below.

#### 4.3.1 Life cycle effects

The "life cycle effect" refers to the effect of basing a decision on the net present value (NPV) of the business proposition in question, instead of on the current difference between costs and revenues. The business proposition would be to serve particular areas or customer groups or to maintain pay phones that are potentially uneconomic, taking into account the NPV of the expected business over the relevant future period. For this purpose, projections over this future period of both costs and revenues have to be made and the decision be taken on the basis of the difference between the sums of these cost and revenue streams discounted to the present time. One should essentially proceed along the lines discussed in Chapter 2.3.1.4 where we analysed how depreciation policy can have the effect of showing a current deficit where on a NPV basis there is in fact a positive balance. One would in particular need projections of demand over the relevant future. This would appear not too hazardous since telecommunications services belong at the present time to those activities for which healthy growth rates can safely be predicted.

These dynamic effects have different implications for customer groups and public pay phones, on the one hand, and for areas, on the other, as we will see in the following.

*Life cycle effects as regards potentially uneconomic customer groups*

Analysys in its report to Oftel<sup>54</sup> describes the business practice in other businesses which have always been competitive and which nevertheless are characterised by the fact that at any one moment they maintain business accounts with customers that are currently uneconomic. The reason that these business relationships are not severed resides in the fact that a large proportion of them will turn economic in the future, or more precisely, that the proportion of the customers that will turn economic is large enough that it is justified to maintain the relationships with all of them at the current time.

As suggested by Analysys, one should include into the group to be considered economic despite current net cost all those who may be expected to show a positive balance after five years. This is therefore the critical question: Is it possible to separate apparent uneconomic customers according to whether (a) they will possibly turn economic in the future and (b) they would never do so? If this can be done, the group identified under (b) should definitely be classified as uneconomic. In respect of the group under (a), a judgement would have to be made whether a large enough fraction of these customers should be expected to turn economic within the relevant future period so that their overall NPV would be positive. If the answer is positive, this whole customer group must be classified as economic since it is impossible to pick among that group only those individual ones that are going to fulfill the promise.

Analysys argued in respect of the UK that under competitive conditions BT would find it impossible to identify any of the customers according to these criteria and therefore recommends that none of the 2.2 million customers found uneconomic on the basis of the current net cost calculation should in the longer-run perspective be so classified.

Although we believe that the judgement would be similar in many other Member States, we also believe that the case cannot be prejudged in general. The classification would have to reflect the situation of the Member State in question. The network operator may be in a position to produce the data allowing to make the (a) - (b) separation described above and for the (a) group to carry out the evaluation whether a large enough fraction of them would turn economic within five years. In such a case, one could come to the conclusion that not only all the customers classified under (b), but that also the whole (a) group should be considered as uneconomic.

When the network operator is not able to produce the data needed to carry out the above analysis, all uneconomic customers classified as uneconomic according to the current direct net cost calculation should be considered as economic. We concur here with Analysys<sup>55</sup> that in such a case the USO provider should be disallowed to claim costs for uneconomic customers since it is unable to identify these customers.

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<sup>54</sup> Analysys (1995), pp. 26-29.

<sup>55</sup> Analysys (1995), 29.

Finally, it is important to note that the analysis discussed here must already have been completed *before* starting the determination of the total direct net cost of uneconomic customers as discussed in Section 4.2.2. The sorting that we discussed there should be carried out only with those customers that are uneconomic according to the "life cycle test". Remember that this sorting has to be carried out in order to identify all uneconomic customers after taking double counted incoming call revenue into account. Proceeding in a different order would unnecessarily complicate the whole process as it could mean that the iterative procedure used in Section 4.2.2 may have to run through additional iterations.

#### *Life cycle effects as regards potentially uneconomic public pay phones*

In respect of public pay phones it has been noted for the UK that a substantial fraction of them exhibit revenue streams over the years that vary considerably from one year to the other. From this follows that a pay phone showing a deficit according to the current net cost calculation may have in future years substantially larger revenues and therefore may on a NPV basis be economic.

As in the case of uneconomic customers, the critical question is whether it is possible to separate uneconomic pay phones in the two categories of (a) those that will possibly turn economic in the future and (b) those that would never do so? If this can be done, the group identified under (b) should definitely be classified as uneconomic. In respect of the group under (a), a judgement would have to be made whether a large enough fraction of these pay phones should be expected to turn economic within the relevant future period so that their overall NPV would be positive. If the answer is positive, this whole group of pay phones must be classified as economic since it is impossible to pick among that group those individual ones that are going to fulfill the promise.

Analysys picked a figure of 25 % of the pay phones found uneconomic on the initial count as being economic on the NPV evaluation. As in the case of uneconomic customers, we believe that the situation cannot be prejudged in general. The precise classification would have to reflect the situation of the Member State in question. The network operator would have to be able to produce the data allowing to make the necessary classification. Again as in the case of uneconomic customers, one could come to the conclusion that not only all the pay phones classified under (b), but that the whole group (a) should be considered as uneconomic.

As in the case of uneconomic customers, when the network operator is not able to produce the data needed to carry out the above analysis, all uneconomic pay phones classified as uneconomic according to the current direct net cost calculation should be considered as economic. The USO provider should be disallowed to claim costs for uneconomic pay phones if it is unable to identify those that are in fact uneconomic.

*Life cycle effects as regards potentially uneconomic areas*

The situation with potentially uneconomic areas differs from uneconomic customers and pay phones insofar as in respect of each of them we have an entity that is large enough that it is worthwhile to investigate whether that entity individually will become economic over the foreseeable future. As in the case of uneconomic customers, one should evaluate the business prospect of the area in question over a five-year future period, taking into account the development of costs as well as of revenue.

Analysis found for the UK that of the 375,000 lines found to be uneconomic on the basis of current direct net cost, 210,000 turned economic when calculated on a NPV basis, although the effect on the total amount of the net cost was much smaller since only those areas were affected that initially were only marginally uneconomic. We strongly believe that the effect would be similar in other Member States and that the impact on the total amount of net costs could in several cases be more pronounced, for example when it is the question of newly connected areas that show promise of rapid development.

As in the case of uneconomic customers, the sorting necessary to identify the uneconomic areas after taking double counted incoming call revenue into account, discussed in Section 4.1.2, should for the same reason be carried out only with those areas that according to the "life cycle test" are uneconomic.

We conclude:

1. The possibility of properly applying life cycle effects to the classification of uneconomic customers and public pay phones depends heavily on the capability of the network operator to provide data that allows the identification of those categories of customers/pay phones that may possibly be economic after five years on a NPV basis. It will further depend on the evaluation of whether of the category for which this is true a large enough fraction will in fact be economic under this evaluation so that it would be worthwhile to continue serving the whole group.
2. In the absence of the information necessary for carrying out this evaluation, the whole group of each of uneconomic customers and pay phones according to the direct net cost measure should be classified as economic.
3. Each area found uneconomic according to the direct net cost calculation should be examined according to whether they would remain so taking the development of cost of service delivery and revenues over the next five years into consideration and carry out the calculation on a NPV basis.
4. It should be expected that a substantial share of areas found uneconomic on account of current net cost will be classified as economic when examined on an NPV basis.



5. The sorting of uneconomic areas and customers taking into account double counted incoming call revenue should be carried out *after* the life cycle tests of this section has filtered out the areas and customers that on an NVP basis are not uneconomic.

#### 4.3.2 Enhancement of corporate reputation

Being the USO provider is generally well reputed so that for this reason one should expect the USO provider to gain an enhancement of its corporate reputation. This would not be a marginal effect. The size would depend on the number of customers that would honour the USO function with additional loyalty in the face of advantageous offers from competitors.

Oftel also considers this effect to be quite substantial because the perception of the operator by all of its customers, and by the customers of other operators, is affected. It acknowledges at the same time the difficulties of properly quantifying the resulting benefit. Apparently based on an expert evaluation, Oftel considers the value of the effect on corporate reputation to equal approximately 20 % of the advertising and marketing expenditure of BT's retail operations.<sup>56</sup> This assessment derives from the idea that the enhancement of corporate reputation is worth the amount of money that would have to be spent by the USO provider in order to obtain a comparable standing with customers.

While we propose below a different approach - which we think is more adequate - Oftel's approach should be used in the interim until a better one can be applied. As regards the concrete percentage figure for the share of the advertising and marketing budget, we would suggest to obtain advice from an expert on the matter. In general we would recommend to apply a percentage figure that takes note of the relation of that budget to the USO provider's turnover. If that relation is lower than in BT's case - which is about 3.3 % - the percentage to estimate the benefit should correspondingly be higher than 20 % and *vice versa*. The reason is that in those cases where the network operator in question has so far engaged in advertising and marketing on a relatively low level, the percentage of 20 % would appear too low to properly reflect the benefit, and of course *vice versa* if there are particularly heavy advertising and marketing efforts. Put differently, it may actually be better to express the benefit as a percentage of the relevant sales figure. If in BT's case Oftel had proceeded this way it should have evaluated the benefit BT gains from its USO status as being worth 0.65 % of its retail sales in order to get the same estimate as with 20 % of the advertising and marketing budget.

A more direct approach than relying on the expenditure for advertising and marketing would be to measure directly to what degree customers extend a greater loyalty to the USO provider, and what commercial benefit the latter derives from this greater loyalty.

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<sup>56</sup> See Oftel (1997), p. 33.

This would involve carrying out consumer surveys in which representative samples of consumers are faced with hypothetical choices between offers from different telephone companies, one of them being the USO provider who is clearly identified as such. Provided it is carefully designed, such consumer research can yield reliable results.

We believe that there would be value for NRAs to initiate consumer research along this line. There are indications that the results would yield a substantially larger benefit in terms of enhanced corporate reputation than is expressed by a 20 % share of the advertising and marketing budget or a 0.65 % share of turnover.<sup>57</sup> It could even realistically be expected that the results imply a significant USO net benefit in lieu of a net cost making the USO a privilege instead of a burden.<sup>58</sup> From this follows that NRAs would be well advised to concentrate efforts on determining the value of indirect benefits *before* engaging in an elaborate cost determination exercise.

Based on this discussion we conclude:

1. The benefit from USO provider status in terms of corporate reputation should be expected to be quite substantial.
2. If there is no other indicator, one should use as a measure of the benefit a percentage of the USO provider's advertising and marketing budget, like the 20 % share of BT's corresponding expenditure used by Oftel, or a share of the turnover of the USO provider, which, to correspond to the 20 % of the advertising and marketing budget, would in the BT case have been 0.65 %.
3. NRAs should initiate consumer research in order to measure directly to what degree customers extend a greater loyalty to the USO provider, and what commercial benefit the latter derives from this greater loyalty. It should be expected that the results would yield a substantially larger benefit in terms of enhanced corporate reputation than is expressed by a 20 % share of the advertising and marketing budget or a 0.65 % share of the USO provider's turnover.

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<sup>57</sup> A consumer research project like the one suggested would have been beyond the scope of the present study. Nevertheless we would like to report the results from answers to three questions that were put to a representative sample of more than 2,000 German residents, as part of a consumer survey designed for a different purpose though also addressing telecommunications services. The results show that a range of between 10 % to 30 % of the subjects, depending on age, education and other socio-demographic characteristics, would consider switching from Deutsche Telekom to a competitor *not at all* or only *at a substantial price difference*, because of the enhanced reputation that Deutsche Telekom enjoys due to its USO status. Let us take this result as suggestive and apply it to Deutsche Telekom's sales with residential customers (in 1997 about 14 billion ECU). Doing a quick calculation of what share of that business could according to the above percentages be considered "safe", and taking a share of that business that would otherwise be threatened by competitors, one arrives at an estimate of the benefit that would surpass by a multiple the 20 % share of advertising and marketing expenditure used by Oftel, respectively, the 0.65 % of turnover as suggested by the authors in the main text.

<sup>58</sup> As a case in point, Oftel finds that BT enjoys benefits from its USO the value of which are about double the direct net cost calculated for it, see Oftel (1997), pp. 31-35.

### 4.3.3 Ubiquity

Ubiquity provides a marketing benefit to the network operator that is offering services nation-wide since all customers know that they can order telephone services from it no matter where they are on the national territory. The operator to which this characterisation generally applies is the incumbent network operator.

In particular, ubiquity is of value if customers move to an area where there are competing suppliers. A proportion of households will not be aware of the existence of alternative suppliers and will choose the incumbent operator as its supplier although it would have chosen a competing supplier had it been aware that it served the area. Over time as those customers get informed about competing suppliers, they will tend to switch away from the USO provider. The benefit of ubiquity is the present value of profit that is obtained from those customers in the period before they switch to a competing supplier.

The stock of lines gained each year as a result of ubiquity can be calculated as follows:<sup>59</sup>

	Number of households that have a choice between the USO provider and competing access providers
x	Share of households that move location during the year
x	Share of households that do not know about existence of competing access providers
x	Share of households that choose the USO provider but would have chosen a competitive access provider if fully informed
=	
	Stock of lines gained from ubiquity

Ubiquity may confer a substantial benefit. The relevant question in the present context is whether the gains from ubiquity would be significantly affected if the incumbent operator no longer met USOs and withdrew service from uneconomic areas. In such a situation one would need to consider several cases differentiated according to which types of areas may be involved when customers are moving:

- For customers moving from economic areas to other economic areas nothing changes regarding their perception of the incumbent's ubiquity when the incumbent operator ceases to serve uneconomic areas. This is so because the incumbent continues to serve the areas to which the customers are moving.

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<sup>59</sup> See Oftel (1997), note 3.

- For customers moving to uneconomic areas not served any more by the incumbent, there is no choice that the moving customer could make in favour of the incumbent because the latter has - voluntarily - pulled out of the area. Again the perception of ubiquity that the operator values is not affected.
- For customers moving from uneconomic areas to economic areas there may be an effect on people's choice due to the change in ubiquity of the incumbent if the area from which the customers are moving away is now served by other operators. These people are likely to be aware of alternatives in the areas they are moving to.

The last case is the only one where a change in the incumbent's status as USO provider affects its ubiquity with any consequence. It is, however, also one very likely to involve a very small fraction of people. The incumbent will thus remain quasi-ubiquitous and the advantage that it enjoys in terms of people's perception of its ubiquity *vis-à-vis* competing providers is hardly if at all affected.

Benefits of ubiquity are thus predominantly related to being a large, well-established, market dominant national operator. The gains would still exist even though the incumbent were no longer the USO provider. The calculation of the stock of lines gained as a result of ubiquity, as described above, would only insignificantly be affected. We therefore argue that the benefits from ubiquity cannot be regarded as an indirect benefit of USO provision and should not be set against the direct net cost of universal service.

We conclude:

1. Ubiquitous presence of a network operator must be considered to confer on it a substantial benefit.
2. This benefit must in the case of the incumbent network operator be attributed to its status of a large, well-established, market dominant national operator. The effect would not cease to exist if the incumbent as USO provider no longer provided service to uneconomic areas. In such a situation the advantage that the incumbent enjoys in terms of people's perception of its ubiquity *vis-à-vis* competing providers would hardly diminish.
3. Therefore, benefits from ubiquity cannot be regarded as an indirect benefit of USO provision and should not be set against the direct net cost of universal service.

#### 4.3.4 Access to full range of telephone usage data

The incumbent network operator has because of its dominant market position a superior knowledge about how customers use the telephone. This is a significant marketing benefit as there is less need to purchase market research if new products are to be launched and investment proposals to be evaluated. As is true in respect of ubiquity, this

effect is primarily related to the incumbent being a large, market dominant national operator.

The fact that the incumbent operator is also the USO provider adds little to it. If the incumbent withdrew its USO services it would lose the information for a set of areas, customers and pay phones that it elects on its own not to serve or provide any more. From the latter observation follows rather immediately that the operator must not value this information very much. Access to this extra knowledge that becomes available when providing the USO services in question does not appear to be a benefit worth taking into account when calculating the overall net cost of the USO.

We conclude:

1. Access to the full range of telephone usage data provides a substantial benefit to the incumbent network operator.
2. This benefit, however, is predominantly related to being a large, market dominant national operator and would prevail even if the incumbent withdrew service from uneconomic areas, customers and pay phones.
3. Therefore, benefits from this effect cannot be regarded as an indirect benefit of USO provision and should not be set against the direct net cost when calculating the overall net cost of the USO.

#### 4.3.5 Advertising benefit of serving public pay phones

A benefit of public pay phones is the value of the advertising of the operator's logo on call boxes. Depending on the location of the public pay phone, the benefit could be substantial. The largest advertising benefit is generated by pay phones located in city centres. However, those pay phones normally do not create a direct financial universal service cost and are economic. The advertising benefit, therefore, is unrelated to the provision of USOs and cannot be counted as an indirect effect of USOs. Only the advertising benefit of uneconomic public pay phones should be regarded as an indirect benefit related to being the USO provider that has to be set against the direct financial costs of uneconomic pay phones.

The advertising benefit could be roughly approximated as

- Number of uneconomic public pay phones (after taking account of life cycle effects)
- x Average advertising benefit per uneconomic public pay phone

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= Advertising benefit foregone if service were withdrawn from uneconomic public pay phones

Uneconomic public pay phones are those that create a direct net cost in the relevant year and that remain unprofitable even after life cycle effects are taken into account. The average advertising benefit should be estimated using as a proxy the price for an equivalent advertising presence in the relevant area.

We conclude:

1. Public pay phones that are uneconomic (after taking account of life cycle effects) create an advertising effect that would be foregone if these pay phones were withdrawn. This indirect effect should be set against the direct net costs of uneconomic public pay phones.
2. The cost of comparable advertising presence at the relevant location should serve as a proxy for the advertising benefit of a pay phone.

#### 4.3.6 Concluding observation on indirect benefits

The values of the various indirect benefits of USO provider status, as assessed according to above discussion, should be summed and set against the total direct net costs of uneconomic areas, customers and public pay phones, as derived in Section 4.2. The total value of these benefits may be sufficiently large to reduce substantially the overall net cost of the USO, if not outweigh it completely.

As an example, Oftel calculated the direct net cost of the USO for BT to be about 45 to 80 million pounds sterling. Against this it set an estimated total value of indirect benefits ranging from 102 to 151 million pounds sterling. Hence, Oftel concluded that BT has no proven case of an undue financial burden placed on it because of the USO.<sup>60</sup>

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<sup>60</sup> See Oftel (1997), pp. 31-34.

## 5 Financing the Net Costs of USOs

### 5.1 Introduction

Chapter 5 of the report looks at specific universal service financing schemes. Member States that consider it necessary to share the net costs of USOs through a specific mechanism may either use a Universal Service Fund (USF) or a system of supplementary charges paid by operators interconnecting with the USO provider.<sup>61</sup>

Section 5.1 lays out the particular requirements that specific universal service financing schemes should meet: efficiency, market neutrality and non-discrimination, continuity of funding, objectivity, transparency and proportionality. We do not address financing of USOs out of general taxes, where all tax paying entities contribute. It should, however, be noted that in terms of efficiency and market-neutrality, financing of USOs out of general taxes is preferable to specific universal service financing schemes where only the telecommunications industry or parts of it contribute.

Section 5.2 highlights the case for a USF where contributions are based on gross revenues net of certain deductible payments (usually termed *net revenues*). This section shows that other contribution bases fare worse in terms of efficiency and market-neutrality and some of them are clearly contrary to Community Law. The EU framework allows Member States to impose contributions on all organisations operating public telecommunications networks and/or publicly available voice telephony services.<sup>62</sup> Section 5.2 demonstrates why alternative fund designs where the scope of contributing operators is narrower should not be applied given the requirements laid down in Section 5.1.

Section 5.3 analyses the disadvantages associated with a system of supplementary charges added to interconnection payments and argues that such a regime, if a positive overall net cost of universal service in fact exists, should only be applied for a short period of time and be replaced by a USF.

Section 5.4 provides a sample calculation that shows the allocation of payments under a USF and a system of supplementary charges.

### 5.2 Requirements for funding schemes

Specific universal service financing schemes should respect the following requirements. First, funding schemes should *minimise allocative efficiency losses* that result from

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<sup>61</sup> Article 5(2) Interconnection Directive in common with Full Competition Directive. Besides specific universal service financing schemes, the universal service burden may also be financed directly or indirectly by the State. Analysis of this alternative is not within the scope of the report.

<sup>62</sup> Article 5(1) Interconnection Directive.

operators passing on the financial burden to customers *via* price increases. In order to minimise such efficiency losses, the net cost of USOs should be allocated across the broadest possible base.

Second, financing schemes should be able to *generate the necessary funds in a continuous way*. In particular, the chosen contribution base should be broad and stable enough to ensure the necessary contributions over time.

Third, financing schemes should *minimise distortions to the competitive process and avoid discrimination*. Payments into the scheme should be neutral with regard to market players, services, vertical structure, and technologies.<sup>63</sup>

- *Neutrality with regard to market players*: Contributions should be assessed on market players proportionate to an appropriate measure of economic activity. Graduated contribution schemes in which particular groups of operators would be either exempted or allowed to make discounted contributions would not be competitively neutral.
- *Neutrality with regard to applications and content*: Funding schemes should not favour any particular use of telecommunications services over others (e.g., local calls over long-distance calls).
- *Neutrality with regard to vertical structure*: Funding schemes should not favour integrated provision of services over unbundled provision (e.g., integrated network over interconnection), or vice versa. In order to ensure structural neutrality, funding schemes must avoid accumulations of contributions upon contributions across multiple stages.
- *Technological neutrality*: Funding schemes should not favour any type of transmission technology over another (e.g., mobile over fixed). The contribution charged should be independent of the type of transmission technology used.

Fourth, the principles of financing schemes and the outcome of their application should be *objective* and *transparent*. Operators must be able to perceive what they will be required to contribute to funding. It is indispensable that the principles of cost sharing are clearly defined and made public in advance.

Fifth, financing schemes should be *practicable* and keep the administrative burden and related costs to the necessary minimum. Operators liable to contribute to funding should be easily identifiable and the basis for assessing contributions should be easy to measure and validate. A potential trade-off between goals is likely to exist between efficiency and market neutrality on the one hand and practicability of the scheme on the other hand. When devising a funding scheme, this trade-off between different objectives

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<sup>63</sup> See also Noam (1993).



should be carefully weighed given the level of net USO costs to be allocated amongst market players in a particular Member State.

Sixth, financing schemes should impose incentives for a *cost efficient provision of USOs*. As we have argued in Chapter 2.2, efficiency incentives are provided if the calculation of the USO provider's compensation is based on forward-looking costs and revenues. They should also allow in the long run for the time when efficiency incentives can be further strengthened by putting out to tender the task of meeting USOs in order to determine the USO provider(s) and the required compensation(s). This kind of competition for USOs requires funding schemes that are neutral with regard to who the USO provider is and which allow to designate other USO providers than the market dominant operator.

Finally, financing schemes should be *proportional* and give rise to competitive distortions only to the extent that this is unavoidable when ensuring universal service objectives.

We conclude:

1. Specific universal service financing schemes should be devised in a way that
  - minimises efficiency losses,
  - safeguards the continuity of funding,
  - respects the need for market neutrality and avoids discrimination,
  - ensures objectivity and transparency,
  - ensures practicability,
  - provides incentives to decrease the cost of USO provision over time, and
  - meets the need for proportionality.
2. A trade-off between efficiency and market neutrality on the one hand and practicability of the scheme on the other hand is likely to exist. When devising a funding scheme, any trade-off should be carefully weighed.
3. It should be noted that the costs of a financing scheme in terms of efficiency losses, competitive distortions and administrative costs can be substantial. Given those costs, Member States should not implement specific universal service financing schemes as long as competitive pressures imposed on the USO provider are small and do not endanger its financial viability.

### **5.3 The case for a net revenues-based Universal Service Fund (USF)**

#### **5.3.1 Contributing organisations**

The EU framework allows Member States to share the net USO costs amongst all organisations operating public telecommunications networks and/or publicly available

voice telephony services.<sup>64</sup> Hence, organisations liable to contribute to a USF can encompass

- organisations that operate fixed public telephone networks and/or fixed public telephone services as well as
- organisations that operate public mobile telephone networks and/or public mobile telephone services.

Organisations that do not operate public telecommunications networks and/or publicly available voice telephony services are excluded from funding. Such organisations, for example, include

- private network operators offering corporate networking or closed user group services,
- service providers offering data communications or value-added services (such as e-mail), and
- service providers offering enhanced voice telephony services such as video-conferencing, voice mail services, and voice enquiry/reply services such as home-banking or tele-shopping.

*A priori*, Member States that implement a USF should not additionally restrict the scope of organisations liable to contribute to the fund. Exempting particular groups of operators would further narrow the basis of the fund which could lead to efficiency losses and pose problems for the continuity of funding. Narrowing the scope of contributing operators could also violate neutrality requirements, result in discrimination and distort the pattern of investment in the industry.

However, practicability suggests to exempt *smaller operators* from contributions. Restricting the scope of contributing organisations to those above a certain threshold level of economic activity would strengthen the practicability of the mechanism and keep administrative costs down.<sup>65</sup> The disadvantages of an exemption would be small and justified by the administrative costs avoided.<sup>66</sup>

We see no reason for exempting other groups of organisations. In particular, exemption of *mobile telephony operators* would not be justified by practicability concerns. Excluding them would unnecessarily narrow the basis of the fund and lead to inefficiency. It would favour a particular type of technology and service over others (mobile telephony over

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<sup>64</sup> Article 5(1) Interconnection Directive.

<sup>65</sup> It has also been argued that exemptions should be provided to encourage market entry and growth of new competitors. However, we do not consider a Universal Service Fund to be a proper instrument for supporting new market entry.

<sup>66</sup> Exemption of smaller operators is treated in more detail in section 5.3.2.4.

fixed link telephony). In view of the forecast convergence, an exemption of mobile telephony operators would not be competitively neutral and discriminate against operators of fixed public telephone networks.

We conclude:

1. All organisations operating public telecommunications networks and/or publicly available voice telephony services should contribute to the fund. Only smaller operators should be exempted from contributions. While the disadvantages of an exemption would be small, the benefits in terms of increased practicability and lower administrative costs would be high.
2. Exemptions on other grounds add nothing to the practicability of the system while creating inefficiency and market distortions. Exemption of mobile telephony operators would not be competitively neutral, distort investment incentives and discriminate against operators of fixed telephone networks in a situation where markets converge.

### 5.3.2 Basis for assessing contributions

#### 5.3.2.1 Volume, profit or revenues-based?

In the wide-ranging discussions regarding sharing mechanisms for the cost of the USO, the following measures have been proposed as a basis for assessing contributions to a USF:

- timed traffic volume,
- number of subscribers
- profits,
- gross revenues,
- retail revenues and
- gross-revenues net of certain deductible payments made to other organisations that contribute to the fund (usually termed net revenues).

As we argue in the following, the last measure provides a neutral and non-discriminatory basis for allocating the net universal service costs. The other ones are associated with severe disadvantages and should not be used.

Use of *timed traffic volume* as measured in call minutes would violate market neutrality in several respects and be particularly distorting. Given those distortions outlined in more

detail below, call minutes cannot provide a competitively neutral basis and could discriminate against certain groups of operators:

- First, call minutes do not provide a basis that is neutral with regard to use of telecommunications networks. For example, a minute of a long-distance call would bear the same USO charge as a minute of a local call even though its value would be higher.
- Second, call minutes are not neutral with regard to vertical structure. Dividing minutes from interconnect calls equally between operators involved in carrying out the call, as it is sometimes done, does not solve the problem. The result is arbitrary since individual interconnecting operators may add telecommunications value to a very different extent.
- Third, it is difficult to see how call minutes can be used for services other than voice telephony.

*Number of subscribers* even fares worse against the four neutrality requirements. A system based on the number of subscribers would seriously disadvantage operators that predominantly serve low-volume users, such as households. It is clearly discriminatory in a way that would hardly be compatible with Community Law.

*Profit* is sometimes regarded as a suitable basis for a tax because of its neutrality with regard to the combination of inputs. However, a profit-based contribution would provide incentives for firms to artificially reallocate costs to business areas that are subject to contributions, to make their profits appear small. As a consequence, cost allocation procedures would have to be closely monitored by the NRA. A profit-based approach is, therefore, likely to create an unnecessarily large administrative burden. Furthermore, because competition reduces profits, any profit-based contribution base would erode over time. As the burden is passed back to a diminishing group of non-competitive services, the fund could fail to cover the USO provider's net universal service cost. Hence, any profit-based approach would encounter serious difficulties and would not be able to safeguard the continuity of funding.

Compared to traffic volume, number of subscribers or profits, a revenue-based measure is obviously preferable. However, care must be taken in appropriately defining the measure. Retail revenues or gross revenues should not be used as the contribution basis for the following reasons.

Assessing contributions on *retail revenues* would be comparable to a single-stage sales tax collected at end-user level. Retail revenue-based contributions would, in fact, meet an important requirement: neutrality with regard to vertical structure. Since contributions would only become due at the interface with the end-user customer, there would be no accumulation of contribution upon contribution. We do question, however, the practicability of a retail revenue-based scheme. Measuring retail revenues would require

a clear separation of sales to end-users (retail sales) from sales to other telecommunications organisations involving many definitional problems. The complexity of the system would significantly add to the administrative burden of both NRA and contributing firms. We, therefore, do not consider the retail revenue-based approach as a preferable solution.

If contributions were simply based on *gross revenues* (comparable to a sales tax), the contribution basis would also include (a) interconnection payments received from other operators of public telecommunications networks, (b) payments received from resellers and (c) payments received for leased lines. Gross revenues-based contributions would virtually violate all neutrality requirements and would discriminate against operators with a low degree of vertical integration. For example, a new operator of a voice telephony service that uses interconnection with the dominant operator would be taxed twice: directly on its gross revenues and indirectly on interconnection payments made to the incumbent. Clearly, gross revenues are not an appropriate basis for assessing contributions.

The way to avoid multiple contributions is to make payments for interconnection, wholesale services and leased lines deductible from gross revenues. However, if such payments were made to an organisation not contributing to the fund, they should not be deductible. There is no reason to subtract payments to organisations that are exempted from the scheme since such payments do not already incorporate a contribution to the fund. In consequence, *gross revenues net of payments made to other contributing operators for interconnection, wholesale services and leased lines* is the appropriate basis for assessing contributions. It is neutral with regard to market players, services, vertical structure and technologies and it is non-discriminatory.

As an intermediate result, we conclude:

1. Contributions into a USF should be based on gross revenues (before taxes), net of payments made to other organisations contributing to the USF for interconnection, wholesale services and leased lines (exclusive of taxes). This is the only measure that meets the need for market neutrality and non-discrimination on the one hand and for practicability on the other hand.
2. Using retail revenues would not be a practicable approach because it would give rise to complex definitional problems and impose a significant administrative burden on operators and NRAs.
3. Gross revenues, call minutes, and number of subscribers should not be used as a basis for assessing contributions since those measures violate virtually all neutrality requirements and are discriminatory in a way that make them incompatible with Community Law.

4. Any profit-based approach would provide incentives for firms to artificially reallocate costs, encourage distortions and would not be able to ensure the continuity of funding.

#### 5.3.2.2 International services

In case of international services, operators in several countries are involved in providing the services. There are two options for dealing with these services when establishing the contribution base "gross revenues net of deductible payments".

- First option: The domestic operator's gross revenues are defined to include the *payments received from foreign operators* for terminating international or cross-border calls, which may be either payments received under the international settlement system or interconnection payments made by the foreign operator. In case of *outgoing* international calls, only the revenue portion received by the domestic operator is taken into account. In other words, the domestic operator's revenue portion would comprise *revenues billed to customers net of payments made to foreign operators*. Such payments could be payments under the international settlement system or interconnection payments. This option is not recommended for the reasons given below.
- Second option: The domestic operator's gross revenues are defined to include all revenues generated by domestic customers in originating international or cross-border calls. In contrast, revenues from *incoming* international calls are excluded from contributions to the USF. The full revenue of *outgoing* calls enters into the contribution base, i.e. payments to operators in other countries for the termination of calls (payments under the international settlement system or interconnection payments) are not deductible.

By choosing the first option, a share of the universal service cost in a Member State would be allocated to customers in other countries that benefit from being able to make calls to and receive calls from uneconomic areas/customers in that Member State. Such subsidies would in principle be justifiable since call and network externalities also benefit international callers in other countries. The problem, however, is that, on a political level, contributions of operators in one country to the USF of another country may cause concerns. For example, problems may arise if one Member State relies on market forces to ensure universal service whereas in another Member State a USF is implemented to impose substantial contributions on liable organisations. Member States and other countries might engage in lengthy arguments about reciprocal contributions. The second option avoids those problems by placing contributions only on services provided to domestic customers. Any USO cost in a Member State is fully financed by that Member State's operators and customers. The contributions that according to the first option would be borne by foreign callers are approximately assumed by domestic

callers in that the *full* revenues of outgoing calls enter into the contribution base and are thus subject to the levy.

In order to take account of international services we make our conclusions of the preceding section more concrete as follows:

When assessing contributions into the USF, domestic gross revenues should be defined to include revenues from international services billed to domestic customers. Revenue received from terminating international calls should not be included.

### 5.3.2.3 Which customers, which services?

Having defined "gross revenues net of deductible payments" as the relevant contribution base, the customers and services to be included remain to be specified. First, a contribution should not be assessed on net revenues from uneconomic customers if regulatory constraints prevented the USO provider from passing on the burden to those customers. The reason is that any price increase for those customers would violate the affordability criterion. If such regulatory constraints existed the USO provider would have to spread the total amount of contributions to be paid over its economic customer base. With intense competition, this might not be fully feasible and problems for the financial viability of the USO provider could emerge. Hence, the USO provider should be allowed to deduct net revenues attributable to uneconomic customers from its total net revenue figure.

In order to carry out the deduction, (a) uneconomic areas/customers must be identified, (b) revenues billed to uneconomic areas/customers must be measured and (c) interconnect payments made to other operators for terminating calls from uneconomic customers must be estimated. Since these data are also necessary for costing of USOs, they are already available and do not lead to an additional administrative burden. Deduction of the net revenues of uneconomic areas/customers is a straightforward exercise.

A second question is which service revenues should be included in the contribution base of liable operators. Service revenues that should be included are revenues from voice telephony services (fixed and mobile), interconnection services (fixed and mobile), wholesale services (fixed and mobile), and leased lines services. A complication arises from the fact that the EU framework excludes certain operators from contributing to a USF. These are operators that are not offering the above services but are providers of corporate networking and closed user group services, data communications, value added services, or enhanced voice telephony services. Since such operators are not liable to contribute to the USF, the revenues of liable operators from comparable services should also be excluded from the contribution base.

In contrast, wholesale and leased lines services that a liable operator delivers internally to its downstream business areas offering the mentioned value-added services should be included. The reason is that non-liable providers of these services will contribute indirectly to the USF when they buy wholesale services or leased lines services from liable network operators since the latter will try to pass on any levy to their customers. Downstream value added service operations of liable operators should therefore similarly contribute by being internally charged with this levy on the network services they use. Otherwise the independent value added service providers would be discriminated against. Including these internal sales of wholesale and leased lines services in the contribution base is then a logical consequence of this requirement. In order to make the calculation of internal charges transparent, all operators liable to contribute to the USF should provide the necessary separated accounting information.

It should be noted that the added complexity identified above could be of a temporary nature. Structural separation of basic network/telephony services and other services (value-added services, data communication services, corporate networks, etc.) seems to become the norm in many Member States. With corporate networking, closed user group services, data communications, value-added services, or enhanced voice telephony services being provided by subsidiaries of network operators, internal revenues will be substituted by market revenues and calculation of the contribution base will be facilitated.

We conclude:

1. When assessing contributions into the USF, net revenues from uneconomic customers under the USO should not be included in the USO provider's contribution base if regulatory constraints prevented it from passing on contributions to those customers. Net revenues from uneconomic customers should be derived from data already generated and used for the calculation of universal service costs.
2. Net revenues from corporate networking and closed user group services, data communications, value-added services, and enhanced voice telephony services should not be included in the contribution basis. However, internal revenues from providing network services within the company to business areas that provide value-added services, data communication services, corporate networking, etc. should be included. To ensure transparency, all operators liable to contribute to the USF, should provide separated accounting information.

#### 5.3.2.4 Allowance

In order to ensure the practicability of the scheme, organisations whose contribution to the fund is smaller than the cost of collection should not be liable to make contributions. The threshold should be defined in terms of a certain level X of net revenues. Hence,



operators that are small in terms of gross revenues would not have to contribute to the fund. Also, operators that do not sufficiently add telecommunications value in terms of net revenues such as many resellers would be exempted from contributions. As an immediate consequence, the number of entities subject to contributions would decrease and the practicability of the fund be strengthened. It must be noted that organisations exempted from contributions contribute indirectly to the fund when using network services of facilities-based telecommunications operators (which are assessed for contributions). It is only the added telecommunications value that is not subject to a contribution.<sup>67</sup>

There are two alternatives of exempting smaller operators which result in a different allocation of net universal service costs amongst market players:

- First, operators with net revenues not exceeding the threshold X could simply be exempted from contributions. The net universal service costs would be allocated amongst organisations (with net revenues of more than X) in proportion to their net revenues.
- Second, all organisations could have an allowance for the first X units of net revenues. The net universal service costs would be allocated in proportion to net revenues, less the allowance of X.

The second alternative is preferable to the first one since it treats all operators in the same way. Care must, however, be taken to set the threshold X at a value that is related to the administrative costs that can be avoided by exempting a competitor from contributions.<sup>68</sup>

We conclude:

To strengthen the practicability of the USF, operators whose net revenues are below a threshold level X should be exempted from contributions. An allowance for the first X units of net revenues is the appropriate procedure to implement the exemption in a non-discriminatory way.

Summing up the previous sections, the contribution base of each operator should be calculated as follows:

*Gross revenues of operator, before taxes, from*

- fixed voice telephony services (national and outgoing international)

<sup>67</sup> It should be noted that the Interconnection Directive also provides thresholds as regards the obligation for accounting separation. See Interconnection Directive Annex VI referring to Article 8(1) and (2).

<sup>68</sup> Avoided administrative costs should be interpreted to comprise both the NRA's and the operator's costs.

- mobile voice telephony services (national and outgoing international)
  - interconnection services
  - wholesale services
  - leased line services
- + *Internal revenues from providing wholesale and leased line services (or the corresponding internal network services) within the company to downstream business areas that provide value-added services, data communication services, corporate networking, etc. (provided that the revenues are not already included in the first item)*
- *Expenditures, exclusive of taxes, for*
- wholesale services
  - interconnection services (exclusive of incoming international traffic)
  - leased-lines services
- *Net revenues from uneconomic areas/customers/public call boxes, exclusive of taxes if regulatory constraints prevented the USO provider from passing on contributions to those customers (deduction for USO provider only)*
- *Allowance of X*
- 
- = *Base for assessing operator's contribution into USF*

#### **5.4 Disadvantages of supplementary charges added to interconnection payments**

As an alternative funding scheme, the EU framework envisages a system of supplementary charges in addition to interconnection payments.<sup>69</sup> With such an approach, the USO provider shares its net USO cost with other operators interconnecting with its network. Whereas interconnecting operators pay an *explicit* supplementary charge in addition to their interconnection payments, the USO provider *implicitly* charges a share of the net USO cost to itself. Transparency requires that the USO provider's own implicit contribution is made public.

The traditional understanding is that supplementary charges are based on the *number of access minutes* provided by the USO provider to interconnecting operators. The USO provider implicitly contributes on the basis of the *number of call minutes* of its customers, where it is required that its internal calls are timed twice, both when they originate and terminate. For one, the same arguments against this contribution base hold here that we discussed in the context of the USF, i.e. that allocating the net USO

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<sup>69</sup> See Art. 5(2) Interconnection Directive.

costs on the basis of number of minutes does not meet the requirement for neutrality in respect of all the relevant parameters: market players, services, technology, and vertical structure. In addition the following caveats apply:

- First, there is no convincing solution to the double contribution problem. Even if calls that are internal to the USO provider's network were timed twice (at the origination and termination side), structural neutrality would not really be ensured. Giving an interconnect call half the weight of a call internal to the USO provider's network is purely arbitrary and is unlikely to reflect the telecommunications value that an interconnecting operators adds. Neutrality with regard to vertical structure (the degree of vertical integration) would not be ensured.
- Second, a system of supplementary charges creates inefficient incentives to avoid interconnection, and it discriminates against the USO provider. Competitors are liable to contribute to funding only to the extent that they use the USO provider's network. Calls that are internal to the competitors' networks or interconnect calls that only involve competitors of the USO provider do not enter into the basis on which charges are levied. Supplementary charges to interconnection payments discriminate against the USO provider, and severely distort investment incentives. To reduce USO contributions, operators may interconnect with local access providers that are not USO providers, or vertically integrate into local access even though the (resource) cost of interconnection with the USO provider were lower. If competitors increasingly bypassed the USO provider's network, the continuity of funding would be endangered.

Alternatively, the net universal service costs could be allocated between USO provider and interconnecting operators on the basis of *net revenues* as defined.<sup>70</sup> Such a basis for calculating supplementary charges would avoid some of the problems associated with minute-based charges: First, in contrast to minute-based charges, net revenue-based charges are neutral with regard to services and network use. Second, they do not create a double contribution problem. Third, an operator would only be able to avoid net revenue-based charges if it did not interconnect at all with the USO provider, a scenario which is unlikely in the short and medium term. And finally, net revenues are more easy to validate by the regulatory authority than call minutes.

In fact, supplementary charges based on net revenues lead to the same allocation of contributions as a net-revenue based USF if the following two conditions hold:

- There is only one USO provider (the market dominant operator).

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<sup>70</sup> A priori, net revenues are defined as gross revenues of voice telephony, interconnection, wholesale and leased-lines services (before taxes) less expenditures for interconnection, wholesale and leased-lines services bought from other contributing operators. Possibly, net revenues from serving uneconomic areas/customers/payphones will have to be excluded from the USO provider's contribution base. See section 5.3.2.

- All organisations providing public telecommunications networks and/or publicly available voice telephony services are interconnecting with the USO provider.

To demonstrate that the first condition must hold, assume for a moment that there are two USO providers (the market dominant operator and a smaller operator) as well as a number of other organisations without USOs. Furthermore assume that all organisations, including the smaller USO provider, are interconnected with the incumbent USO provider. The incumbent would then be able to spread its net USO costs amongst all organisations since it is interconnecting with all others. In contrast, the smaller USO provider would only be able to share its net USO costs with the incumbent since it has no further interconnection relationships. The resulting allocation of net universal service costs would be different from that with a USF.

The second condition is also straightforward. Obviously, organisations not interconnecting with the USO provider cannot be made liable to contribute to funding. An example is a non facilities-based reseller which would have to contribute to a USF whereas it could not be made liable to pay a supplementary charge since it buys wholesale services. With resellers not participating in funding under a system of supplementary charges, the resulting allocation of contributions is, of course, different to that of a USF. The difference to a USF would, however, probably be small since resellers would contribute only small amounts to the USF because of their relatively small net revenue basis.

Hence, if the conditions above held, a system of supplementary charges would be similar to a virtual USF where organisations make contributions directly to the USO provider and a system of supplementary charges can therefore be justified. In the longer run, however, even with a net-revenues based contribution basis, a system of supplementary charges has two disadvantages that render this approach inferior to the USF:

- First, a system of supplementary charges creates inefficient incentives to build up an alternative infrastructure to avoid interconnection and supplementary charges.
- Second, a system of supplementary charges to interconnection payments typically relies on the market dominant operator as USO provider and offers little opportunities for putting USOs out to competitive tendering. Competition for USOs would not be feasible.

We conclude:

1. In general, a system of supplementary charges added to interconnection payments is inferior to a USF. It creates inefficient incentives to avoid interconnection and violates market neutrality requirements, in particular, if supplementary charges are based on call minutes. If competitors bypassed the USO provider's network, the continuity of funding would be endangered. A system of supplementary charges

also ties provision of USOs to the market dominant operator and provides little opportunities for putting USOs out to competitive tendering.

2. Given the problems involved in a system of supplementary charges to interconnection payments, such a scheme can only be temporarily justified in the immediate aftermath of full liberalisation, i.e., in a situation normally marked by the following characteristics:
  - There is one dominant operator in the market.
  - All organisations providing public telecommunications networks and/or publicly available voice telephony services are interconnecting with the market dominant operator (with the exception of non-facilities-based resellers which, by definition, do not interconnect but buy wholesale services).
3. If a Member State temporarily applies a system of supplementary charges, the following requirements should be met:
  - USOs should be solely imposed on the market dominant operator.
  - All operators interconnecting with the USO provider should contribute to the funding of universal service. There should be no exemptions for particular groups of interconnecting operators such as mobile telephony operators.
  - The net universal service cost should be allocated among the universal service provider and interconnecting operators on the basis of net revenue, that is, gross revenues of voice telephony, interconnection, wholesale and leased-lines services less deductible expenditures for interconnection, wholesale and leased-lines services. In contrast, given their distortionary and discriminatory nature, call minutes should not be used as a basis for supplementary charges to interconnection payments. Because of their discriminatory nature, call minutes are incompatible with Community Law.

## 5.5 Sample calculation

### 5.5.1 Universal Service Fund

How would a given amount of net universal service costs be allocated amongst liable operators if contributions to a USF were based on net revenue? For an illustration, we provide a sample calculation that is based on the assumptions that after liberalisation

- the incumbent (operator A) will retain a dominant market position;
- there will be two more nation-wide network operators (operators B and C) with a significant market share as well as a smaller one (operator D);

- in addition there will be 10 other organisations (4 regional network operators and 6 service providers) that are liable to contribute to funding (that is, with net revenues above ECU 0.5 mio.);
- all operators liable to contribute to the USF have structurally separated other services from the basic network and voice telephony business, so there is no need to assess internal revenues from providing network services within the same firm;
- the new competitors will all heavily rely on the incumbent's infrastructure;
- USOs will only be imposed on the incumbent operator (operator A);
- USOs will cause a net universal service cost of ECU 100 mio. to the incumbent operator A;
- the incumbent operator A will be able to generate a net revenue of ECU 500 mio. from its USO customers (out of a total net revenue of ECU 26,090 mio.).

Table 5.5.1-1 shows a hypothetical distribution of gross revenues and deductible payments for operators liable to contribute to the USF. These are assumed to be four larger operators, designated by "A", "B", "C" and "D", and a group of smaller ones grouped under "others". Columns (1) to (5) contain gross revenues from retail services (national and international), wholesale services, interconnection, and leased lines. Columns (7) to (9) show the deductible expenditures, that is, expenditures for wholesale services, interconnection and leased lines.

It should be noted that the total of interconnect revenues (column 4, last line) must be equal to the total of interconnect expenditures (column 8). Moreover, the sum of wholesale revenues (column 3) must be equal to the sum of expenditures for wholesale services (column 7). In contrast, total expenditures made for leased-lines services (column 9) must not necessarily be equal to total revenues of leased-lines services (column 5) since such services are also provided for corporate networks and other closed user groups which are not liable to contribute to the USF. Because of this inequality, the sum of retail revenues (columns 1 and 2) differs from the sum of net revenues (column 11) by 15 mio. ECU.

Each operator's contribution basis is calculated as

- Retail revenue national (column 1)
- + Retail revenue international (column 2)
- + Revenues from wholesale services (column 3)
- + Revenues from interconnection (column 4)
- + Revenues from leased lines (column 5)

- Expenditures for wholesale services (column 7)
  - Expenditures for interconnection services (column 8)
  - Expenditures for leased lines services (column 9)
  - Net revenues from USO customers (deduction only for USO provider) (column 12)
  - Allowance of ECU 0.5 mio. (column 13)
- 
- = Operator's basis for contributions to the USF (column 14)

Note that, besides operators A, B, C and D, there are 10 other operators assumed to be liable to contribute to the fund which explains this group's total allowance of ECU 5 mio. (10 times ECU 0,5 mio. in column 13).

Columns (15) and (16) show the allocation of the net universal service costs among the operators as a percentage of the total and in ECU. The USO provider A accounts for the overwhelming share of funding (84.38 %), whereas operators B and C pay a share of 6.10 % and 5.44 %. Operator D's share is 1.60 % and the remaining 10 operators contribute a total of 2.49 %. Assuming that the overall net cost of the USO amounts to 100 mio. ECU, the USO provider covers 84.4 mio. ECU itself. Operators B, C and D contribute to the fund 6.1, 5.4 and 1.6 mio. ECU, respectively. Individual contributions by other operators are very small.





### 5.5.2 Supplementary charges to interconnection payments

In Table 5.5.2-1 we provide also a sample calculation for a system of supplementary charges. The underlying scenario is the same as above. It is also assumed that net revenues is the basis for calculating supplementary charges and the implicit contribution of the USO provider. The resulting allocation of contributions shown in columns (15) and (16) is slightly different compared to a USF. Since a USO charge can only be imposed on interconnecting operators, pure service providers are not included in the table as organisations liable to contribute to funding of USOs. The group of other operators, therefore, only comprises 4 regional network operators but no service providers.

As Table 5.5.2-1 shows, the effect of excluding pure service providers from funding is small. The USO provider A now contributes a slightly higher share of 84.79 % (instead of 84.38 % under the USF). Operator B's share is 6.13 % (instead of 6.10 %), operator C's share amounts to 5.47 % (instead of 5.44 %), and operator D contributes 1.61 % (rather than 1.60 %). Hence, it can be concluded that a system of supplementary charges results in a similar allocation of net USO costs once a net revenues base is taken. The reason is that with net revenues-based contributions, service providers are liable to contribute only small amounts to the USO cost so that leaving them out under a supplementary charges regime only makes a small difference. The major difference to a USF then is that under a system of supplementary charges payments are made directly to the USO provider.

**Table 5.5.1-1:** Allocation of net universal service cost among operators under a Universal Service Fund

op	Gross revenues (mio. ECU)						Deductible payments (mio. ECU)				net revenues (mio. ECU)	net revenues USO cust'rs (mio. ECU)	allow ance (mio. ECU)
	retail national	retail internat'l	w hole-sale	inter-connect	leased lines	total	w hole-sale	inter-connect	leased lines	total			
	1	2	3	4	5	6	7	8	9	10	11	12	13
A	20,500	3,000	500	1,700	800	26,500	0	375	35	410	26,090	500	0.5
B	2,000	250	300	170	50	2,770	0	620	300	920	1,850	0	0.5
C	2,000	250	150	170	50	2,570	0	620	300	920	1,650	0	0.5
D	600	50	100	30	10	790	0	205	100	305	485	0	0.5
oth's	2,100	100	0	50	10	2,260	1,050	300	150	1,500	760	0	5
total	27,200	3,650	1,050	2,120	870	34,890	1,050	2,120	885	4,055	30,835	500	7

Note: Amounts to be contributed to the Universal Service Fund (column 16) are calculated on the assumption of a net US

**Table 5.5.2-1:** Allocation of net universal service cost among operators under a system of supplement interconnection payments (sample calculation)

op	Gross revenues (mio. ECU)						Deductible payments (mio. ECU)				net revenues (mio. ECU)	net revenues USO cust'rs (mio. ECU)	allow ance (mio. ECU)
	retail national	retail internat'l	w hole-sale	inter-connect	leased lines	total	w hole-sale	inter-connect	leased lines	total			
	1	2	3	4	5	6	7	8	9	10	11	12	13
A	20,500	3,000	500	1,700	800	26,500	0	375	35	410	26,090	500	0.5
B	2,000	250	300	170	50	2,770	0	620	300	920	1,850	0	0.5
C	2,000	250	150	170	50	2,570	0	620	300	920	1,650	0	0.5
D	600	50	100	30	10	790	0	205	100	305	485	0	0.5
oth's	900	100	0	50	10	1,060	0	300	150	450	610	0	2
total	26,000	3,650	1,050	2,120	870	33,690	0	2,120	885	3,005	30,685	500	4

Note: Amounts to be contributed to the USF (column 16) are calculated on the assumption of a net USO cost of ECU 100. Besides operators B, C and D, there are 4 other operators which interconnect with the universal service provider A. This group of operators of ECU 2 mio. in column 13.

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