

Office of the Director of
**Telecommunications
Regulation**

The Development of Long Run Incremental Costing for Interconnection

Consultation Paper

Document No. ODTR 99/17

March 1999

Oifig an Stiúirthóra Rialála Teileachumarsáide
Office of the Director of Telecommunications Regulation
Abbey Court, Irish Life Centre, Lower Abbey Street, Dublin 1.
Telephone +353-1-804 9600 *Fax* +353-1-804 9680
Web: www.odtr.ie

TABLE OF CONTENTS

1	INTRODUCTION	1
2	BACKGROUND	2
2.1	Legislative and Regulatory Context.....	2
2.2	The Irish Telecoms Market.....	3
3	OBJECTIVES FOR LRIC-BASED INTERCONNECTION CHARGES	4
5	ISSUES IN ESTIMATING LRIC	6
5.1	The Scope of LRIC Estimations	6
5.2	Methodological Issues.....	9
5.3	Cost Issues	12
5.4	Process Issues.....	14
	ANNEX 1: GLOSSARY OF TERMS	17
	ANNEX 2: EU REGULATORY FRAMEWORK	19
	ANNEX 3: COST CONCEPTS	22

1 INTRODUCTION

Regulation of the telecommunications sector in Ireland, in accordance with National and EU legislation, is carried out by the Director of Telecommunications Regulation ("the Director"). A key issue of importance to the sector is that of interconnection and how interconnection tariffs are calculated. In 1998, the Director and her Office ("ODTR") carried out a series of consultations and audits of the services and charges set out in Telecom Éireann's Reference Interconnect Offer. This led to the publication of two position papers in November (ODTR 98/52 & ODTR 98/60) which set out the availability of those services and the corresponding tariffs. The rates as set out in those documents were calculated on a fully allocated historical costs basis.

The Director signalled her intentions to consult the industry on the introduction of Long Run Incremental Costs (LRIC) as a basis for calculating interconnection tariffs in ODTR 98/52¹.

The ODTR now wishes to obtain the views of interested parties on LRIC and invite comments on the key issues addressed in this paper.

Comments should be submitted in writing before 5pm on Friday, **30th April 1999** to:

Maeve O'Reilly
Office of the Director of Telecommunications Regulation
Abbey Court
Irish Life Centre
Lower Abbey Street
Dublin 1
Tel: +353-1-804-9600
Fax: +353-1-804-9680
Email: oreillym@odtr.ie

All comments are welcome, but it would make the task of analysing responses easier if comments reference the relevant question numbers from this document. In order to promote further openness and transparency the ODTR will, in its report on the consultation, summarise the responses received. In order to satisfactorily answer many of the questions raised in this consultation paper, the Director believes that confidential business information will be of enormous value to her office. She encourages this information to be forwarded with replies and requests that it is included in a separate annex and clearly marked "Confidential". Information of this nature will only be made available to ODTR staff and will not be disclosed to third parties.

The ODTR will analyse the comments received, take them into consideration in its review of long run incremental costing, and, in late May, issue a further document setting out the proposed way forward.

This consultative document is not a legal document and does not constitute legal, commercial or technical advice. The Director is not bound by it. The consultation is without prejudice to the legal position of the Director or to her rights and duties to regulate the market generally.

¹ "Interconnection Rates in the Irish Telecommunications Sector", ODTR 98/52, November 1998.

2 BACKGROUND

In this section, we set out the legislative and regulatory context for interconnection costing, and describe the relevant aspects of the Irish telecommunications market.

2.1 Legislative and Regulatory Context

Across the EU, steps are being taken to ensure effective inter-operability and interconnection of competitive telecommunications networks and services. Telecommunications markets have been fully liberalised in most of the EU since 1 January 1998 and in Ireland since 1 December 1998.

The provision of interconnection on fair and efficient terms is widely recognised as an essential requirement for the creation of a competitive market. This is because operators in a competitive market need to terminate calls on other operators' networks and to receive calls originated on other operators' networks. Interconnection charges can account for a substantial proportion of operators' costs. It is therefore important that interconnection charges are soundly derived from appropriate costs and give proper economic signals to operators to guide their investment decisions.

Directive 97/33/EC of the European Parliament and Council establishes the legal and regulatory framework for the interconnection of telecommunications networks within the EU.² The provisions of the Directive are transposed into Irish law by Statutory Instrument No.15 of 1998, signed by the Minister for Public Enterprise, which sets down the manner in which the Directive's principles are to apply in Ireland.³ EU Commission Recommendation of 8 January 1998 and Communication of 19 March 1998 provide detailed guidelines to National Regulatory Authorities (NRA's) on the implementation of cost-orientated interconnection charging. Where implemented elsewhere in Europe and the US, the introduction of LRIC has resulted in interconnect reductions of between 10% and 30% dependent on the existing level of efficiency of the incumbent operator. The relevant EU directives and recommendations are described in Annex 2 to this paper.

Under the legislation, a telecommunications industry operator providing fixed public telephone networks and designated as having Significant Market Power (SMP) is required to publish a Reference Interconnect Offer (RIO) which is based on market needs and to which the Director may direct changes.

The Directive also requires operators with SMP to demonstrate that their interconnection charges are set on the basis of objective criteria and follow the principles of transparency and cost orientation. The Commission recommends that the most appropriate approach to interconnection charges is one based on Long-run Incremental Costs (LRIC).⁴

To assist in ensuring that these rates fairly reflect the associated costs, the legislation also requires transparency in and access to the accounts of such organisations. "Accounting Separation and Publication of Financial Information for Telecommunications Operators" is currently the subject of a separate ODTR consultation document (ODTR 99/10).

² Council Directive 97/33/EC on interconnection in telecommunications with regard to ensuring universal services and interoperability through application of the principles of Open Network Provision (ONP).

³ The European Communities (Interconnection in Telecommunication) Regulations, 1998, SI No 15 of 1998.

⁴ European Commission Recommendation on Interconnection, 8 January 1998.

The Director now wishes to progress implementation of LRIC-based interconnection charging in Ireland. To assist in the programme of work and to identify the best way forward, both in terms of the methodology to be adopted and of the approach to modelling, the Director invites submissions from interested parties on the matters identified in the sections below.

Interconnection charges are the charges that telecom operators pay for the use of other operators' systems. Controls on retail prices – the prices charged to final customers, including domestic customers - are the subject of a separate ODTR consultation exercise.

2.2 The Irish Telecoms Market

In October 1998, following consultation, the Director determined that Telecom Eireann (and only Telecom Eireann) has SMP in the fixed public telephone and services sector.⁵ The Director can review her determination of SMP status at any time.

Telecom Eireann must therefore, *inter alia*, as described above, publish a RIO to include a statement of the rates at which other licensed operators may interconnect to its network and demonstrate that its interconnection charges are cost orientated.

There are currently four interconnect agreements for the fixed network, between Telecom Eireann on the one hand and (respectively) Esat Telecom, MCI Worldcom, Ocean Communications, and Cable and Wireless on the other. However, as there are currently more than 35 licensees, the number of interconnecting parties can be expected to increase in the future.⁶ The terms for these interconnection arrangements are based on the RIO published by Telecom Eireann.

⁵ "Significant Market Power in the Irish Telecommunications Sector", ODTR, October 1998.

⁶ There are two classes of operators: basic licence (for operators not requiring numbers or engaging in voice telephony) and general licence (for operators requiring numbers and engaging in voice telephony), with an Annex with conditions for operators with SMP.

3 OBJECTIVES FOR LRIC-BASED INTERCONNECTION CHARGES

Pricing of interconnect is receiving increasing attention as part of the development of the competitive liberalised telecommunications environment and in the context of the objective to make Ireland a international hub for leading edge telecoms and e - commerce services. Other specific objectives to which ODTR may pay regard when considering the implementation of LRIC for interconnection charges include:

encouraging efficient competition. Efficiency can be defined in a number of ways. Productive efficiency and allocative efficiency are *static* concepts of efficiency.⁷ However, in a fast-growing market like telecommunications, greater weight may be given to the need to encourage new entry to secure efficiency in the longer term (*dynamic* efficiency).

sending economic signals that promote efficient forward-looking investment decisions which take account of developments in technology and services. Two types of investment are particularly relevant: investment by Telecom Eireann in the existing network; and investment by other licensed operators (OLO's) in competing networks. According to standard economic theory, pricing for interconnection on the basis of long-run marginal costs (or at short run marginal costs plus an allowance for the cost of congestion) will generally provide the correct incentives towards efficient investment decisions. Where capacity is plentiful, marginal costs will be low, which will encourage interconnection with the existing network rather than the building of new networks. As demand increases, and the need for expansion or reinforcement of the existing system draws closer, and/or the costs of congestion become greater, the marginal costs of interconnection will increase. New entrants may then be provided with an incentive to invest in competing networks where it is cost-effective to do so. Quality of delivery issues may also affect decisions to build or buy.

enabling reasonable cost recovery by the incumbent. As a result of economies of scale, the marginal costs of interconnection will generally be below average costs. Interconnection charges are therefore sometimes set to allow the incumbent to recover a proportion of fixed costs, to the extent that they are deemed to be 'efficient' and attributable to the service concerned.

facilitating effective means of interconnection. Interconnection charging should enable competing operators to interconnect with the network in any reasonable way, particularly in ways that encourage innovation and the development and effective use of new services.

being sufficiently transparent for potential entrants to have confidence that the basis of charging is cost oriented, and the methodology sufficiently stable to enable all parties in the industry to develop efficient forward-looking plans.

being non-discriminatory and non-preferential. This means that interconnection charges should not discriminate amongst potential new entrants, nor between new entrants and the incumbent itself. This will generally mean that the incumbent network operator is required to charge its own retail operations on the same basis that it charges new entrants, and that interconnection charges in any circumstance should be related to the costs imposed by that interconnection.

⁷ Productive efficiency occurs when goods and services are produced at minimum cost. Allocative efficiency occurs when prices reflect marginal costs.

- Q3.1. Do you agree with the ODTR's view on the objectives of LRIC based interconnection charges?**
- Q3.2. Will the introduction of LRIC based interconnection influence decisions regarding the building of alternative network infrastructure? How important is quality and capacity of existing infrastructure relevant to the buy or build decision?**
- Q3.3. Are there any elements of the LRIC approach which are particularly important to these decisions?**

4 ISSUES IN ESTIMATING LRIC

This section sets out the issues associated with the estimation of the long-run incremental cost of interconnection in Ireland on which views are being sought as part of this consultation process. It does not address the broader issues of what other costs may be recovered through interconnection charges or issues relating to the structure of interconnection charges. These and other issues will be addressed through the RIO consultation (ODTR 99/16) and other consultation exercises.

This document is concerned principally with the estimation of LRIC for the core (conveyance) network.⁸ The issues on which we are seeking views are set out below under four broad headings:

- The scope of LRIC estimations (Section 4.1).
- Methodological issues (4.2).
- Cost issues (4.3).
- Process issues (4.4).

4.1 The Scope of LRIC Estimations

This section addresses the scope and definition of the services for which LRIC for conveyance services needs to be estimated.

Division between access and core network

In order to calculate LRIC for conveyance services, it is necessary to define the boundary between the access network and the core network. Determining whether a network element falls within the access or core network can be done by considering whether investment would be driven by the number of subscribers connected to the network or by the number and length of calls made. In the former case, the component will generally be included in the access network. In the latter, it will be included in the core network.

Telephone lines from the customer's premises are terminated on a line card. Given that line cards are customer-specific and not call-related, the number of line cards depends on the number of lines. It is therefore the initial view of the ODTR that line cards normally define the border between the core and access networks.

The division between the access network and core network is complicated by the growing use of fibre in the core and access networks. Networks are now beginning to run fibre to the street cabinet. Such developments can alter the nature of the services being offered to subscribers.

Q4.1.1 Do you agree that the boundary between the conveyance (core) network and the access network can presently be drawn at the line cards? If not, please give your reasons why and what alternative would be more appropriate?

⁸ The European Commission has recommended that "interconnection charges should not include any component relating to the direct cost of the subscriber-dedicated components of the local loop". The local loop is in any case subject to a separate consultation exercise by ODTR.

Scope of conveyance services

As noted earlier in the document, TE, as a network operator with SMP, is required to publish a RIO which provides a description of interconnection offerings broken down into components according to market needs, and the associated terms and conditions including tariffs. TE and ODTR have been engaged in a process of discussion and modification of the RIO and a revised RIO has recently been consolidated and published. ODTR will be consulting publicly on further revisions that may be required. It is important that the coverage of LRIC charges is consistent with the ODTR's approach to RIO's.

Q4.1.2 Do you agree with the ODTR that LRIC should (as a minimum) be estimated for the PSTN conveyance services specified in the RIO?

The current RIO includes a number of other services which make use of more than just the PSTN conveyance network (e.g., directory enquiry services, emergency services). It also currently excludes other services for which the estimation of LRIC may be desirable (e.g., Internet services, leased line services).

The need for LRIC to be estimated for such services may depend on the extent to which such services are competitive or potentially-competitive, as opposed to non-competitive and bottleneck services. Even so, estimates of LRIC for competitive services are likely to be required in order to enable ODTR to examine any possible anti-competitive charging by TE that may arise in future.

Q4.1.3 Do you agree with ODTR's initial view that LRIC estimation is also required for all other services specified in the RIO, and for Internet and leased line services? If not, why not?

The costs imposed on the network by different forms of interconnection service are determined by the components utilised by each of these services. ODTR thus believes that a network elements-based approach should be taken to the calculation of LRIC, based on the derivation of costs for the different components of the network, such as primary and tandem switches.

For example, if a competitor receives local exchange interconnection from an incumbent, the incumbent will be required to provide capacity only in its local exchanges and transmission links between local exchanges and remote concentrators. In this case, the competitor does not impose any additional costs on the incumbent's tandem switches. However, if the competitor received single or double tandem interconnection, then the cost implications for the incumbent's tandem switches and associated transmission links should be included, with more costs being incurred in the case of double tandem than in the case of single tandem.

The linkage between the cost of network elements and service costs is provided by "routing factors", which specify the average number of each network element used by a particular type of service. Telecom Eireann should be able to estimate routing factors from routine traffic sampling.

It is the ODTR's view that the network elements for which LRIC calculations will be required include:

- Remote concentrator/switching units;
- Remote to primary transmission facilities;
- Primary switching;
- Primary to tandem⁹ transmission facilities;
- Tandem switching;
- Inter-tandem transmission facilities; and
- International gateway switching.

Q4.1.4 Do you agree with this classification of the network elements for which LRIC calculation is required? If not, what other classification may be appropriate?

⁹ Tandem includes a tertiary switch.

4.2 Methodological Issues

The size of the increment

The size of the increment can be defined as either the incremental cost of the interconnecting traffic or as total traffic.

Defining the size of the increment as interconnecting traffic would result in the incumbent operator bearing all service-specific fixed costs associated with conveyance. Since service-specific fixed costs are likely to be significant and will include, for example, the fixed costs associated with the local exchange itself (as distinct from the concentrator), and most duct costs on routes used by the transmission network, using interconnection traffic to measure the size of the increment could lead to under-recovery of the incumbent's costs.

The EU therefore recommends the use of the total service as the increment in defining LRIC. Raising interconnection charges above marginal costs in this way will also tend to encourage investment in competing networks, although this may not necessarily always be justified purely in static efficiency terms.

Historically, the PSTN was designed to carry narrow-band services (voice grade telephone calls including slow speed fax and data services that operate in the voice band). Increasingly, digital transmission facilities will be carrying a range of services affording potential economies of scale and of scope. ODTR believes that a LRIC model should take into account the existence of such a range of services in assessing the dimensioning of SDH transmission facilities. The range of forward-looking services may include migration of some narrow band data from the PSTN to separate streams within the core network, as well as a range of data offerings (including leased services) to other operators, Internet service providers and to end customers.

Q4.2.1 Do you agree with the EU recommendation that the increment should be defined as the total service? If not, what alternative approach do you suggest, and why?

Q4.2.2 Does a valid case exist for defining the size of the increment as the cost of interconnecting traffic only? If not, why not?

Modelling approach

There a number of possible approaches to estimating forward-looking LRIC. The two most common approaches are:

- *Top-down*: which uses aggregate accounting data from the management accounts, adjusts them for current rather than historic costs, and allocates costs to different services based on the relationships between costs and volumes. This approach requires assumptions to be made about the scope for efficiency improvements.
- *Bottom-up*: which involves the development of engineering-economic models which are used to calculate the costs of particular network elements and in turn particular services. This approach also requires estimates to be made of the costs of efficient, forward-looking technology and efficient operating costs.

There are potential problems with both top-down and bottom-up models. Top-down models tend to be based on existing costs and, unless care is taken, may thus include inefficiencies in operational practices. They can produce very different results according to the precise assumptions on which they are based.

Bottom-up models are data intensive, but can result in underestimation of costs unless careful attention is given to assumptions on capital costs, utilisation levels and other inputs. Underestimation itself is not an inherent weakness of the methodology.

The approach adopted may have implications for efficient investment in networks. If a top-down methodology implicitly assumes current levels of efficiency, and fails to make sufficient allowance for efficiency improvements necessary to match the costs of an efficient new entrant, interconnection costs as estimated may be too high. On the other hand, a bottom-up model that underestimated interconnection costs by taking too optimistic a view of future costs might inappropriately penalise Telecom Eireann and/or deter the development of competing networks.

Both top-down and bottom-up models have their strengths and weaknesses. ODTR is minded to give greater weight to the results of a realistic bottom-up approach, as this would probably be more likely to reveal the scope for efficiency improvements. However, the top-down model also uses relevant data, and both approaches should be used and the results reviewed to come to appropriate conclusions.

Q4.2.3 Do you agree that LRIC should be calculated using both a ‘top-down’ and a ‘bottom-up’ approach?

Approach to developing a bottom-up model

Bottom-up models estimate the costs of rebuilding the incumbent’s network using optimal technology. If a bottom-up methodology is adopted, it can be approached on either a “scorched node” basis or a “scorched earth” basis.¹⁰

The scorched node basis assumes that optimal technologies would be employed to perform equivalent functions at existing nodes, and that optimal transmission technologies would be used to connect up these nodes.

In contrast, the scorched earth basis assumes that optimally-sized switches would be employed at locations optimal to the overall transmission design, as if the network was being redesigned on a greenfield site. However, designing and agreeing an optimal network is not a straightforward or uncontentious task.

The objective of following either of the two approaches is to ensure that the incumbent has the right incentives to invest efficiently in its own network in the future, and that new entrants receive the correct economic signals that assist them in deciding between building their own networks or paying for interconnection with the incumbent’s network.

¹⁰ Similar issues must be faced in using a top-down approach.

The scorched node approach can be modified in order to replicate a more efficient network than is currently in place. This could be achieved by changing the nature of some nodes (e.g., from a local exchange to a concentrator) in order to achieve a more efficient forward-looking network.

The modified scorched node approach is thus a hybrid between a scorched earth and scorched node approach. It takes the existing node location as given (and thus recognises the historical evolution of the network), but optimises the equipment at the nodes, as well as optimising the transmission equipment connecting these nodes.

Q4.2.4 Should bottom-up models adopt a “scorched earth” approach, a “scorched node” approach, or a “modified scorched node” approach as suggested here? Please give reasons for your preferred approach.

Q4.2.5 What implications would you expect the various approaches to have in the context of TE’s conveyance system?

Forward-looking technology

The bottom-up approach requires a forward-looking assumption to be made about the technologies that would be adopted by an efficient operator making investment decisions now.

Views are sought on what technologies should be assumed for switching and transmission. Generally, we expect increased digitalisation is likely to lead to a reduction in the number and level of switches and an increased integration of these switches.

The ODTR's view on the main technological developments is that an efficient operator would use SDH rings with add/drop multiplexers to connect the local and tandem/tertiary switches¹¹, that switching would be based on digital switching technology¹², and there will be two levels of switching in the switching hierarchy.

Q4.2.6 What technology should be assumed for (a) switching and (b) transmission in calculating LRIC for an efficient forward-looking network operator?

¹¹ The additional bandwidth required for SDH is offset by its inherent advantages over existing PDH transmission systems. SDH increases the potential for remote network management with fast, flexible provisioning, comprehensive protection mechanisms and end-to-end performance monitoring.

¹² Many European countries have replaced, or are in the process of phasing out, analogue switching, so digital switching can be safely considered forward looking for the PSTN. The next generation of switching – ATM – although being increasingly deployed in many developed networks, may be too far in the future for our purposes as this technology is still some way from *common* usage.

4.3 Cost Issues

LRIC calculations will need to make allowance for three broad categories of cost:

- operating expenditure (e.g., labour costs, materials costs, power costs);
- the costs of capital maintenance (i.e., depreciation), and
- a return on capital employed (which may be calculated by applying the cost of capital to the appropriate asset value).

The cost of capital and the treatment of depreciation are to be the subject of separate ODTR consultation exercises. Here we focus on issues raised by the remaining categories of cost.

Basis for asset valuation

In order to provide the correct economic signals for forward-looking investment decisions, interconnection charges should be based on the current economic value of assets. Modern equivalent asset values (MEAVs) represent the costs of replacing existing assets with modern assets that would perform the same function. Basing interconnection prices on historic costs would tend to give a higher cost than would be incurred in parts of the network where there has been significant technological process, such as local switches and transmission equipment. This is also the view of the Commission.

ODTR's view therefore is that LRIC calculations should be based on current cost values (MEAV), rather than historic asset values. Current cost asset values should be adopted regardless of whether a top-down or bottom-up approach to LRIC modelling is adopted.

Q4.3.1 Do you agree with ODTR's view that LRIC should be calculated on the basis of current cost assets values? If not, why not?

Efficiency

The ODTR concurs with the Commission's recommendation that interconnection charges should be set on the basis of the level of costs that would be incurred by an efficient operator. A bottom-up modelling approach implicitly assumes a level of best practice operating and capital cost efficiency. A top-down modelling approach requires explicit estimates to be made of the scope for efficiency improvements.

Quantification of LRIC using a top-down modelling approach will thus require efficiency studies to be carried out. These typically require (at least) a comparative efficiency analysis of Telecom Eireann with other competitive telecommunications operators.

Q4.3.2 Views are invited on what aspects of efficiency the modelling should address and on what measures of efficiency may be appropriate.

Common fixed costs and shared fixed costs

As shown in Figure 4.1 of Annex 3, incremental costs defined on the basis of the total service as the increment, include fixed costs specific to the conveyance service (“service-specific fixed costs”) where their inclusion has been justified. There are two other types of fixed cost that may also be relevant to interconnection charges:¹³

- **Shared fixed costs** – fixed costs associated with the supply of a group of services comprising more than one, but less than all, of a firm’s services. Examples include trenches which are shared between the access network and the core network, and transmission link costs in the core network which are shared between leased line and PSTN services.
- **Common fixed costs** – fixed costs associated with the supply of all services produced by a firm. Common fixed costs typically include the company’s headquarters salaries.

In principle, a LRIC model using a total service definition implies that shared fixed costs and common fixed costs are not included in cost estimates for interconnection services. The Commission has suggested that interconnection charges may include a mark-up to recover a proportion of such costs.

If no such costs are recovered, Telecom Eireann may face a shortfall between revenues and (an efficient level of) costs. If all such costs are recovered through interconnection charges, TE may over-recover revenue in total (depending on how other services are priced). In a competitive market, a proportion of such costs (as would be incurred by an efficient operator) would be recovered.

Q4.3.3 Do you agree that LRIC based charges should recover service specific fixed costs where these have been adequately justified? If not, why not?

Q4.3.4 To what extent, if any, should common fixed costs and shared fixed costs be included in the estimation of LRIC? Please provide your justification for this view.

¹³ We do not consider here joint costs – which we have defined as costs which are variable and which are shared by two or more (possibly all) of a firm’s services. Joint costs refer to any variable costs which can not be directly attributed to a particular service. In Figure 4.1 we assumed, for simplicity, that all variable costs were directly attributable to a particular service. In practice, some variable costs will usually need to be apportioned between different services. Since joint costs are, by definition, variable, they ought in principle to be included in any calculation of forward-looking marginal or incremental costs, however the increment is defined.

4.4 Process Issues

Modelling options

Telecom Eireann currently prepares accounts and management information on the basis of their Service Cost and Profitability System (SCP). This model allocates and apportions the costs and incomes of the company, using a series of apportionment rules, to network elements and ultimately to services.

Telecom Eireann plan to replace SCP by April 2000 with a Financial Support System (FSS) model. This model will be more detailed than the SCP model, with visibility down to local exchange components.

TE have provided ODTR with an initial LRIC Implementation Plan, with the following milestones:

- Design and system specifications to be completed by June 1999.
- Building of LRIC system to be completed by December 1999.
- Testing of LRIC systems to be completed by March 2000.
- Data Assembly starting in June 1999 and to be completed by June 2000.

The Plan, as presented in high level terms, concentrates on processes and systems rather than on assumptions and theory. Detailed specification of the methodology is expected to flow from confirmation of regulatory and internal user requirements.

Telecom Eireann currently intends to build a separate LRIC model which would run in parallel with the FSS, rather than becoming an integral part of it. TE state that this is to ensure the development of the LRIC model is not delayed by the ongoing development of their financial systems, and vice versa. Telecom Eireann need to be able to reconcile the LRIC model with the FSS and regulatory accounts in a clear and transparent manner.

In order to implement LRIC, a number of alternative possible ways of organising the modelling are possible. These include:

- TE produces a top-down model (as a minimum);
- TE produces a bottom-up model (as a minimum);
- TE produces both a top-down model and a bottom-up model;
- TE produces (at the minimum) a top-down model and ODTR produces a bottom-up model.

In addition, with any of the above options, third parties, such as potential new entrants, may also wish to undertake their own modelling of TE's interconnection costs.

Timetable

The timetable and plan for the development of LRIC needs to be sufficiently thorough to ensure the model is robust enough to deliver the goals of efficient competition. However, prolonged delay and uncertainty relating to interconnection is likely to be unhelpful in achieving this objective. The initial views of the ODTR on the timetable proposed by TE is that it may not be sufficiently ambitious and could potentially be accelerated to prioritise the modelling of core network data.

The ODTR itself is involved as part of a wider EU project to develop a generic bottom up LRIC model, which can be adapted for use by National Regulatory Authorities. Work on the generic model is expected to be completed by October 1999.

Q4.4.1 By which time is it reasonable to expect Telecom Eireann to have completed LRIC modelling to be used as a basis for interconnection?

Q4.4.2 In order to enable reconciliation with other financial information, TE will be required to calculate top-down LRIC estimates in accordance with the principles determined by ODTR as a result of this consultation exercise. However, bottom-up models may give more realistic assessments of the relevant efficiency levels. Do you agree that a bottom-up methodology should also be modelled? Please give reasons to support your views.

Q4.4.3 If so, who should be responsible for the bottom-up modelling: TE, ODTR or other parties? Should the planned EU model be used as a basis for any bottom up approach?

Possible formation of Industry Working Group

ODTR is keen to build upon participation from across the industry in the consultation and therefore to assess interest in establishing an Industry Working Group to assist in the development of a national approach to LRIC estimates.

Such a working group could help ensure that the estimates were both up-to-date and relevant to interconnection services actually sought by one operator from another. The working group could also bring their experience to bear on the following issues:

- efficiency studies;
- MEAVs;
- cost-driver relationships (which are critical in top-down models);
- forward-looking technological assumptions;
- capacity issues; and

- assumptions about depreciation and asset lives.

It would be important that the working group's activities took account of the overall timetable and did not introduce unnecessary delays. Any such working group would not have access to material which is appropriately confidential to Telecom Eireann.

Q4.4.4 Is there a need for wider industry involvement in the development of TE's LRIC estimates (e.g., through a working group which includes representatives of interconnecting parties and customers). What form might such arrangements take?

Q4.4.5 Would you be prepared to participate in such a working group and if so in what capacity?

Workshop

Views are also sought on whether it would be useful for ODTR to host an industry workshop to present and, where necessary, clarify the LRIC estimation issues outlined in this consultation document.

Q4.4.6 Would a LRIC workshop be useful? If so, when should it be held? Please indicate your interest in attending.

ANNEX 1: GLOSSARY OF TERMS

Avoidable costs. The costs that would be avoided were output to reduce, or not to increase, by a defined amount.

‘Bottom-up’ LRIC models: Models which use engineering-economic relationships to calculate the costs of different network elements and, in turn, particular services.

Common fixed costs: Fixed costs associated with the supply of all services produced by a firm.

Current Cost Accounting (CCA): Financial accounts prepared on the basis of the current value of a company’s assets.

Economies of scale: Economies of scale are said to exist if the average cost per unit declines as the volume of output increases.

Economies of scope: Economies of scope occur due to the presence of common and shared fixed costs or of joint costs.

Fully Allocated Costs: The costs that would arise for each service provided by an operator if an appropriate share of all of the operator’s costs were allocated to each service.

Historic Cost Accounting (HCA): Financial accounts prepared on the basis of the cost of a company’s assets when they were purchased, adjusted for depreciation.

Increment: The output over which costs are being measured.

Incremental costs: The additional costs that would result from a defined increment to demand.

Interconnection: The physical and logical linking of telecommunications networks in order to allow users of one network to communicate with users of another network.

ISDN: Integrated Services Digital Network – an integrated, hierarchical approach to access, switching and transmission allowing end-to-end digital connectivity.

Joint Costs: Costs which vary with the level of output and which are shared between two or more (possibly all) services (and so are not directly attributable to a particular service).

Long run: The period over which all factors of production, including capital, are variable.

Long Run Incremental Costs (LRIC): The incremental costs that would arise in the long run with a defined increment to demand.

Long Run Average Interconnection Costs (LRAIC): The term used by the European Commission to describe LRIC with the increment defined as the total service.

Marginal cost: The increase in the forward-looking cost of a firm caused by an increase in its output.

Modern Equivalent Asset Value (MEAV): The cost of replacing existing assets with current assets that would perform the same function.

Modified scorched node assumption: A modelling assumption that takes the existing node location as given but optimises the equipment at those nodes (as well as optimising the transmission equipment).

PSTN: Public Switched Telephony Network – A generic term for the collection of networks which provide fixed line basic telephony services.

Reference Interconnect Offer (RIO): A document required to be produced by each telecommunication operators providing fixed service public telephone networks and designated as having Significant Market Power (SMP) to set out interconnect offerings and rates.

Scorched earth assumption: A modelling assumption that optimally-sized switches are employed at locations optimal to the overall transmission design, as if the network was being optimally redesigned on a ‘greenfield’ site.

Scorched node assumption: A modelling assumption that optimal technologies are employed to perform existing functions at existing nodes, and that optimal transmission technologies are used to connect up these nodes.

Service-specific fixed costs: Fixed costs specific to the service concerned.

Shared fixed costs: Fixed costs associated with the supply of a group of services comprising more than one, but less than all, of a firm’s services.

Short run: The period over which at least one factor of production, usually capital, is fixed.

SMP - Significant Market Power.

Stand Alone Cost: The cost incurred in providing a service in isolation.

‘Top-down’ LRIC models: Models which use aggregate accounting data from the management accounts, adjusted for current rather than historic costs, and allocate costs to different services based on the relationship between volumes and costs.

Total Service Long Run Incremental Cost: See Long Run Average Incremental Cost.

ANNEX 2 EU REGULATORY FRAMEWORK

In this Annex, we summarise the EU regulatory framework for telecommunications insofar as it sets out the principles for interconnection to be implemented at national level under the supervision of the NRAs.

A2.1 EU Directive

Directive 97/33/EC of 30 June 1997 (the “Interconnection Directive”) sets out the overall framework for open network provision in telecommunications. In relation to interconnection charging, the preamble to the Directive (recital 10) states:

“...pricing for interconnection is a key factor in determining the structure and the intensity of competition in the transformation towards a liberalised market...organisations with significant market power must be able to demonstrate that their interconnection charges are set on the basis of objective criteria and follow the principles of transparency and cost orientation and are sufficiently unbundled in terms of network and service elements offered...publication of a list of interconnection services, charges, terms and conditions enhances the necessary transparency and non-discrimination...flexibility in the methods of charging for interconnection traffic should be possible, including capacity-based charging...the level of charges should promote productivity and encourage efficient and sustainable market entry, and should not be below a limit calculated by the use of long-run incremental cost and cost allocation and attribution methods based on actual cost causation, nor above a limit set by the stand-alone cost of providing the interconnection in question...charges for interconnection based on a price level closely linked to the long-run incremental cost for providing access to interconnection are appropriate for encouraging the rapid development of an open and competitive market...”

These concepts are elaborated in the Articles to the Directive.

A2.2 EU Recommendation

The *Commission Recommendation on Interconnection of 8 January 1998 (Part I – Interconnection Pricing)* provides greater detail as to the basis on which interconnection charges should be set for the pricing of call termination on the networks of operators designated by their NRA as having significant market power (“notified operators”).¹⁴ Amongst the recommendations are:

- “Interconnection costs should be calculated on the basis of forward-looking long-run average incremental costs, since these costs closely approximate those of an efficient operator employing modern technology.”
- “It is recommended that where charges lie outside the range of...[a set of ‘best current practice charges’ established by the Commission]...national regulatory authorities use their rights under Article 7(2) of the Directive 97/33/EC to request full justification of the proposed charges and, if appropriate, to require retrospective changes to interconnection charges.”

¹⁴ In its decision document of October 1998, “Significant Market Power in the Irish Telecommunications Sector”, ODTR 98/47 determined that TE has SMP in the fixed, interconnect and leased line markets, and states that the designation of SMP will be re-examined in 1999 when the Irish market has been liberalised.

- “The use of forward-looking, long-run incremental costs implies a cost accounting system using activity-based allocations of current costs, rather than historic costs. It is recommended that NRA’s set deadlines for the notified operators for the implementation of new cost accounting systems based on current costs, where such systems are not already in place”.

The document further states that interconnection charges which are based on forward-looking long-run average incremental costs “may include justified ‘mark-ups’ to cover a portion of the forward-looking joint and common costs of an efficient operator, as would arise under competitive conditions.”

In relation to the cost of access (the “local loop”), the Recommendation states that “it follows from the principle of cost orientation that since the provision of interconnection does not lead to any increase of costs in the dedicated components of the local loop of the terminating network, the calculation of interconnection charges should not include any component relating to the direct cost of the subscriber-dedicated component of the local loop.”

The implications of this recommendation for the scope of LRIC costing for interconnection are discussed in Section 5.

A2.3 EU Communication

The *Commission Communication on Interconnection Pricing of 19 March 1998* sheds further light on the particular cost concept recommended by the Commission for interconnection pricing. It is clear that it is intended that interconnection charges should be set on the basis of current, rather than historical, asset values:

“In a competitive market, the price a firm pays for an asset or investment is not what governs its return. From the moment the investment is made...the asset’s value to the firm depends on what the firm can do with that asset. It can either sell the asset to the highest bidder or it can use the asset to produce a good or service which the firm sells to generate an income.

“The goods or services produced with the help of that asset usually face competition from close substitutes produced by competitors. If any of those competitors has superior efficiency – such that it is able to supply a superior quality/price package to consumers – other less efficient market players will need to respond accordingly, rather than continue pricing on the basis of their embedded or historic costs. In other words, firms are compelled to look forward to survive, rather than backward to their original investments.”

It is also clear that the Commission envisages the increment implicit in LRIC to be the total service:

“The forward-looking approach is implicit when identifying and measuring the economic or ‘real’ costs (i.e., LRIC) associated with the increment in output. In the particular case where the increment is a single unit, incremental costs will be the same as marginal costs. In the short run, the size of any increment is limited by the capacity of the firm’s existing productive assets. The long-run, however, is the time horizon in which the firm could adjust (downwards or upwards) all of its inputs, including the size of each and any of its productive plants, to meet a decrement or increment in the volume of production. Thus, the entire investment cost entailed in any point of interconnection, and any investment in network and switching capacity required to handle interconnected traffic, would be avoidable, and thus captured by the long run incremental cost measure. The total of all such measures, including the incumbent operator’s own increment in traffic, would then form the total of all incremental interconnection costs. This figure would be divided up in a fair and transparent manner between the notified operator and those interconnecting, with the result that the cost of interconnection to any party is the long run average incremental cost (LRAIC).”

A2.3 Extent of EU/International Implementation of LRIC

The European Commission has recently presented a report, based on data to October 1998, on the extent of the implementation of the EU telecommunications regulatory package.¹⁵ The Commission assessment of interconnection is that “a significant number of interconnection agreements are already in place in the Community. There is evidence that interconnection charges are beginning to converge on best practice charges...”. Where there are concerns, they relate to the excessive length of negotiations, the scarcity of agreements in the fixed line telephony market, the inadequacy of reference interconnection offers and the lack of transparency relating to cost accounting systems.

The Commission Recommendation of 15 October 1997 provides (at Table 1 of that document) a summary of current and planned cost methodologies for calculating interconnection charges in already liberalised markets. Even at that early stage, interconnection charges based on forward-looking long run incremental costs was already implemented or planned for Australia, Denmark, Sweden, the United Kingdom and the USA.

DGXIII of the European Commission has launched a study on the preparation of an adaptable bottom-up costing model for interconnection. The outputs of this study will be a model that should be of direct benefit to NRA's in their understanding and negotiation of interconnection costs and oversight of interconnection agreements. To assist this work, a working group of experts from NRA's (including ODTR) has been created, the inaugural meeting of which was held in Brussels in early March. Members of the working group outlined steps which were already in hand to provide guidance or to determine LRIC-based interconnect charges in their own Member State. It is evident that whilst some Member States are in a position where they have developed both top-down and bottom- other Member States see 1999 as a year in which considerable progress will be made towards LRIC models.

¹⁵ “Fourth Report on the Implementation of the Telecommunications Regulatory Package”, Communication from the Commission, 1998.

ANNEX 3 COST CONCEPTS

This section describes and explains the cost concepts relevant to making a decision on the best way of calculating LRIC.

Marginal cost refers to the increase in the forward-looking costs of a firm caused by an increase in its output.¹⁶ Marginal cost includes those forward-looking costs which vary with the volume of output of the service concerned. Marginal costs may be short-run or long-run.

The short-run marginal cost (SRMC) is the change in forward-looking costs when at least one factor of production (usually capital) is fixed. It thus excludes costs such as the cost of existing poles and duct in the transmission network. Given that, under this definition, capacity can not be increased in response to an increase in demand, SRMC should be supplemented by an estimate of congestion costs (e.g., the “cost” of poorer reliability) in order to derive an estimate of the true economic costs imposed by the increase in demand. Long-run marginal cost (LRMC) is the change in cost when all factors are variable, so includes the cost of any future increase in capacity that may be required as a result of the increase in demand.

Incremental costs and **avoidable costs** can be forms of marginal cost. Incremental costs refer to the additional costs that would result from a defined increment to demand. Avoidable costs are a similar concept, except that they refer to the costs that would be avoided were a unit of demand not met. Both can be defined in the short-run or long-run context. Economists often use the terms marginal costs, incremental costs and avoidable costs relatively interchangeably.

Marginal, incremental and avoidable costs have in many contexts been calculated on the basis of changes in demand that are relatively small in relation to the size of existing demand (e.g., an increase or decrease of 10 per cent). Reference is sometimes made to a “small but significant” change in demand.

The **total service incremental cost**, an alternative concept, can be defined as the additional costs that would be incurred in providing a service compared to the costs in the absence of that service. If economies of scope with other services are ignored, it is an average cost equivalent to that faced by a new entrant to a market.¹⁷ Since it treats capacity as variable, it is implicitly a long-run concept. It is sometimes referred to as total service long run incremental cost (TSLRIC).

This is the concept recommended by the Commission, for which it uses the term **long run average incremental cost (LRAIC)**.

In practice, total service incremental cost for incumbent operators is most sensibly calculated by considering the costs that would be avoided were an existing service not provided. By defining the increment as the total service, total service incremental cost differs from traditional marginal cost measures, in that it includes allowance for the fixed costs specific to the service concerned (“service-specific fixed costs”).

¹⁶ This definition covers reductions as well as increases in output. However, in order to simplify the exposition, the text here refers only to increments.

¹⁷ Economies of scope arise when the combined total cost of providing two or more services is less than the sum of the costs of providing those services separately.

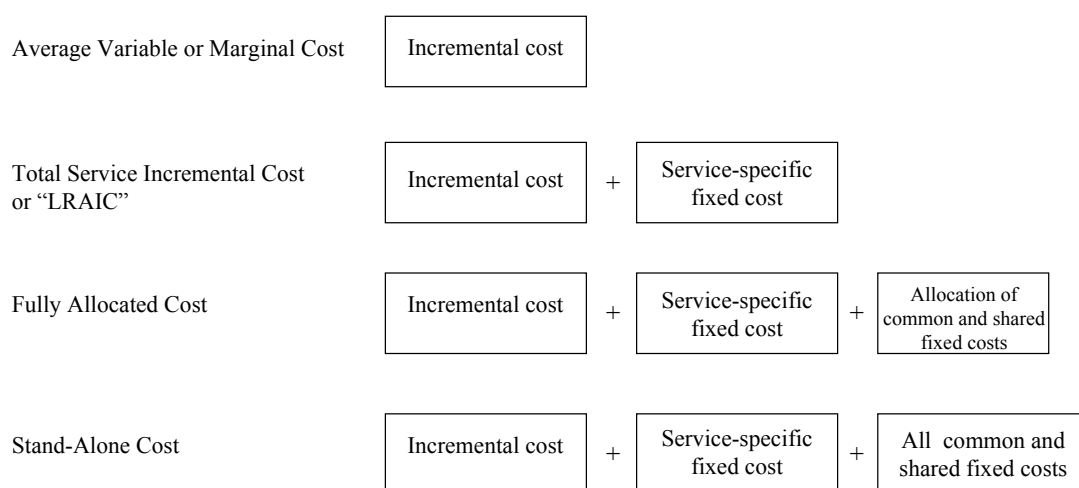
Total service incremental cost includes service-specific fixed costs but normally excludes fixed costs which may be common or shared across different services – for example, between access and conveyance.

If *an appropriate share* of such costs is included in the cost definition, the resultant cost concept is the **fully allocated cost** (the remainder of such costs being allocated to other services).

If *all* common and shared fixed costs are included, the resultant cost concept is the **stand alone cost** – the cost that would be incurred were this service produced in isolation.

The relationship between these cost concepts, with the increment defined as the whole service (e.g., conveyance), is shown in simplified form in Figure 4.1.¹⁸

Fig 4.1
The Relationship Between Cost Concepts



Notes: Increment defined as the total service
 All variable costs assumed to be directly attributable (i.e., no joint costs)
 Average Variable cost will equal Marginal cost when the marginal cost does not vary with the scale of output

¹⁸ “Common ” and “shared” fixed costs are defined fully in Section 5. They are fixed costs which are shared between two or more (possibly all) of a firm’s services. “Joint costs” we define as costs which are shared between two or more services, but which vary in response to a change in output of any of the services. In Figure 4.1, we implicitly assume that all variable costs are directly attributable to particular services, so that there are no “joint costs” in this stylised example.
