Report on the comparison of cost models used to compute interconnect conveyance rates charged by eircom.

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Foreword

In Decision Notice- D7/01, the ODTR undertook to issue a report to the industry on the comparison between the Industry Bottom-up LRIC model and eircom*'s* top-down LRIC cost model for the financial year ending 31st March 2000. The attached report outlines the comparison process and changes to both models as a result of this comparison and lists specific changes and modifications recommended to eircom's top down model. The ODTR have entered into discussions with eircom on the implementation of these recommendations.

I consider that this publication brings to a conclusion this part of the LRIC model development and that the LRIC Industry Advisory Group for the core network has served its purpose. The office intends to address the outstanding issues described in the report and will continue to keep this area under review and may seek further industry input in the future.

Etain Doyle,
Director of Telecommunications Regulation

1 Introduction

In Decision Notice D7/01, ODTR indicated that a comparison between the Industry Bottom-up LRIC model and eircom'*s* top-down LRIC cost model would be carried-out in respect of the financial year ending 31st March 2000 and a report would be published on the main issues. This report outlines the Top Down/Bottom Up comparison process and changes to both models as a result of this comparison and the subsequent review of eircom's RIO submissions.

The role of the Top Down/Bottom Up comparison and the resulting revision to these models and the sequence of events leading to the setting of RIO rates are shown below:

- eircom presented their Separated Accounts for 1999/2000 to the ODTR at the end of 2000.
- Both eircom and the ODTR built their respective top down/bottom up LRIC models.
- A comparison was undertaken of eircom's top down and the ODTR's bottom up model by NERA on behalf of the ODTR.
- Revisions to the Bottom up model were made, resulting from the top down/bottom up comparison. These are documented in section 4.
- Revisions to the Top down model, resulting from this top down/bottom up comparison were directed to eircom..
- ODTR received eircom's RIO (May 2001) submission, which set final rates for the period from 01/12/98 to 30/11/99 and interim rates for the period 01/12/99 to 31/03/00.
- ODTR received eircom's Separated Accounts for 2000/2001, which formed the basis for setting interim rates for the periods from 01/12/99 to 31/03/00 and from 01/04/00 to 31/03/01.
- The ODTR directed eircom to make further revisions to its top down model as a result of an analysis of the RIO submission.
- ODTR received eircom's RIO (March 2002) submission, which set final rates for the periods from 01/12/99 to 31/03/00 and 01/04/00 to 31/03/01.
- ODTR is now waiting a further RIO submission from eircom which will set revised interims for the period from 01/04/01 to 31/03/02 and interim rates for the period from 01/04/02 to 31/03/03.

The main purpose of the top down/bottom up comparison review of the *eircom's* top down model was to identify any areas requiring modification or revision in order to ensure compliance with the regulations. In addition, during its review of *eircom's* RIO pricing proposals, modifications have been identified by ODTR and *eircom* has been directed to incorporate those of significance into the top down model and include them in its submission of its proposed rates. Those recommendations made by NERA which have already been the subject of directions to eircom and which have been acted upon are not covered in this report which includes only those recommendations not yet, or not fully, implemented by eircom.

As a result of the comparison exercise, ODTR also identified changes in the bottom up model and produced revised cost estimates using these inputs which were used in the evaluation of *eircom's'* pricing submissions.

The bottom up model will continue to be used as an input to the analytical review of LRIC based core conveyance interconnect rates proposed by *eircom.*

1.1 Legislation

References to relevant EU and Irish law are contained in Appendix 1.

1.2 Process for Comparison of Cost Models

The activities involved in carrying out the comparison of the cost models were undertaken by ODTR supported by industry specialists: - National Economics Research Associates (NERA) and Telecommunications Consultancy United Kingdom (TCUK).

Section 2 is primarily descriptive, setting out the workings of eircom's top down LRIC model. Section 3 sets out the conclusions and identifies proposals for modifications and changes to the model. Section 4 deals with a comparison of both models and consequent recommended changes to the bottom up model.

2 Review of eircom's Top Down Model

2.1 Introduction

This section outlines the key findings of a report prepared by *National Economic Research Associates (NERA)* on behalf of the ODTR. The following provides a summary of work undertaken in connection with the review of eircom's top down LRIC model.
The main purpose of the review was to identify any weaknesses and to recommend any necessary changes in both models. The secondary purpose was to collect information concerning inputs into the eircom top down model that would facilitate the process of comparing the results of the top down and bottom up models and explaining the differences.

The review of eircom's top down model focused on the following main areas, each of which is discussed below:

- the system for allocating costs to the core network;
- accounting policies;
- the derivation of current cost (CCA) asset values and depreciation;
- The derivation of LRIC from fully allocated costs.

The conclusions and recommendations arising from the review are detailed in Section 3.

The review of each of the above areas consisted of the following main stages:

- presentations by eircom on the main areas of methodology;
- question and answer sessions to confirm the ODTR's understanding of key concepts and their application;
- requests for analytical information to see actual hard numbers and formulae used
- Attempts to "drill down" into the models to see how network component costs have actually been built up and costs allocated.

2.2 Cost Allocation System

eircom's cost allocation system has been developed to enable the introduction of CCA inputs and to allow the subsequent derivation of LRIC for different network components. The new fully allocated costing model, called Tele-Com-Pass (TCMP) is basically a development and enhancement of the SAP profit model. A highly simplified overview of the allocation process, focusing on the core network, is provided below for each of the main areas of cost. Its purpose is to provide details of the process involved, the allocation bases that are used and the surveys and studies that are relied upon. The conversion of fully allocated CCA costs to LRIC using cost-volume relationships is discussed later in this section.

2.2.1 Switching Costs

The model takes switch depreciation data from the fixed asset register (FAR) and posts it to auxiliary network elements (ANEs). There is an ANE corresponding to each category of equipment in each type of switch in each exchange area.[1] There are also ANEs relating to CDCS (billing).

Direct maintenance costs (pay and non-pay) are recorded by exchange area and type of switch. They are then split between different categories of equipment on the basis of a survey of the time spent by technical staff. In 1999/00 the survey covered a six week period in February and March and involved 67 access network/customer service teams and an average of 48 core network technicians. The survey data allows the maintenance costs associated with each ANE to be derived. Maintenance related overhead costs including the costs of operation of equipment, supervision and transport are allocated to ANEs in proportion to maintenance costs.

Capital related overhead costs (e.g. the costs of network planning, design and configuration) are allocated to ANEs using the previous year's additions to GBV, which, like depreciation, can be directly identified with individual ANEs using data from the FAR.

Network accommodation costs are allocated to ANEs on the basis of floor space surveys. In 1999/00 a total of 104 exchange sites were surveyed. Network power costs are allocated to ANEs on the basis of a survey of inventories of equipment at exchange sites. 86 exchange sites were surveyed in 1999/00. The steady state rate of power consumption for each piece of equipment is applied to the equipment inventory data to obtain the power costs attributable to different categories of equipment in different types of switch.

The costs of the different switching ANEs are then allocated to switching network elements (NEs).[2] To do this, a study was carried out by switch manufacturers, on behalf of eircom, which identified, for

[1] The defined categories of equipment are exchange line terminations, trunk terminations, core hardware/operating software, applications software, interconnection, ancillary equipment, public voicemail, and switching spares. The switch types are AXE RSU, AXE Primary, AXE Secondary, E10 RSU, E10 Primary, E10 Secondary, Tertiary, SSE and OPS. The resulting ANEs have the following structure: AXE RSU line termination costs in exchange area 1, E10 Primary applications software costs in exchange area 2, AXE Primary trunk terminations in exchange area 3 and so on.

[2] For each switch type (AXE RSU, AXE Primary etc) in each area, the different categories of equipment costs are split into line sensitive, traffic sensitive and call sensitive components and then the line sensitive costs are all aggregated together, the traffic sensitive costs are all aggregated together and so on. The resulting NEs have the following format: traffic sensitive AXE RSU costs in exchange area 1, call sensitive E10 Primary costs in exchange area 2 and so on.

each category of switch equipment in each type of switch, the proportion of costs that was traffic driven, call driven and line driven.

Switching network management costs are separately identified as being either related to traffic, in which case they are allocated to the traffic sensitive NEs of parent switches (i.e. not RSUs), or to signalling, in which case they are allocated to the call sensitive NEs of parent switches. The basis for allocation is a study of total minutes and calls per exchange.

For the purposes of producing regulatory accounts, the NEs are grouped together into a smaller number of network components (i.e. Subscriber Unit, Primary Switch, Secondary Switch, Tertiary Switch) where the call and traffic sensitive costs are added together.

2.2.2 Transmission Costs

2.2.2.1 Length dependent costs

Depreciation data from the fixed asset register (FAR) can be directly posted to transmission ANEs. There are length dependent ANEs, separately identified for Dublin and Provincial, for repeater buildings, underground trunk cable (PCM, fibre and coaxial) and overhead trunk cable (PCM, fibre and coaxial). For both underground and overhead junction cable, there are ANEs for different types of cable in each exchange area. There are also inter Dublin-Provincial ANEs for each type of underground and overhead cable. These are referred to as indirect ANEs.

On the basis of studies of core network, access network and customer service maintenance, it is possible to allocate maintenance pay and non-pay costs to ANEs. Maintenance related overhead costs, including the costs of operation of equipment, supervision and transport, are then allocated to ANEs in proportion to maintenance costs.

Capital related overhead costs (e.g. the costs of network planning, design and configuration) are allocated to ANEs using last year's additions to GBV, which, like depreciation, can be directly identified with individual ANE's using data from the FAR.

Duct costs are identified by exchange area and surface type. They are allocated to the access and core networks on the basis of site surveys in 106 exchange areas. The surveys identify whether duct is core, access or shared. Due to time constraints, shared duct was split 50:50 between access and core in 1999/2000. Vacant duct was not identified. The costs of poles are also identified by exchange area. The process of allocating ANE costs to NEs is complicated and is described in summary here.

Essentially, for each of PCM, fibre and coaxial cable and also for duct and poles, the ANEs are pooled and then allocated to NEs on the basis of weighted kilometre units. The process is carried out separately for Dublin and Provincial. The NE cost categories include length dependent PSTN transmission for each type of network route (RSU to Primary, Secondary to Tertiary and so on) and different types of non-PSTN transmission including ATM, Dassnet, private circuits and frame relay. These are all separately identified as Dublin or Provincial. Adding together the Dublin and Provincial figures gives total length dependent costs for each type of network route.

An important point to note is that, as a result of the pooling of ANE costs, geographical variations in costs (including, in the case of duct, variations in cost by surface type) are not taken into account. Duct costs vary substantially between city centres and elsewhere and the cost of digging duct on a grass verge is much cheaper than digging it in a paved area. Such pooling is therefore bound to lead to some inaccuracy in the allocation of duct costs.

2.2.2.2 Non-length dependent costs

Depreciation data from the fixed asset register (FAR) are directly posted to ANEs. There are ANEs for each exchange area for test equipment, different types of PDH equipment[3], different types of SDH equipment[4] and radio link equipment[5].

On the basis of studies of core network, access network and customer service maintenance, it is possible to allocate maintenance pay and non-pay costs to the different ANEs. Maintenance related overhead costs, including the costs of operation of equipment, supervision and transport, are then allocated to ANEs in proportion to maintenance costs.

Capital related overhead costs (e.g. the costs of network planning, design and configuration) are again allocated to ANEs using last year's additions to GBV, which, like depreciation, can be directly identified with individual ANE's using data from the FAR.

The costs of the test equipment ANEs and the transmission network management ANEs are allocated over the PDH, SDH and radio link equipment ANEs in proportion to NBV.

As with switching, network accommodation costs are allocated to ANEs on the basis of the floor space surveys previously described. Similarly, network power costs are allocated to ANEs on the

[3] There are, for each exchange area, separate ANEs for the following types of equipment: coaxial line equipment, fibre line equipment, PCM line equipment, multiplexers, HDSL and ADSL equipment and analogue to digital conversion equipment.

[4] For each exchange area, separate ANEs exist for SDH equipment and cross connect equipment.

[5] Separate ANEs exist for towers, antennae, radio equipment and power used by radio equipment, again in each exchange area.

basis of the survey of inventories of equipment at exchange sites. The steady state rate of power consumption for each piece of equipment is applied to the equipment inventory data to obtain the power costs attributable to different categories of equipment in different types of switch.

The process for allocating ANE costs to NEs is as follows. First the costs of PDH, SDH and radio link equipment are allocated to PDH, SDH and radio link line systems of different sizes. This is done separately for Dublin and provincial area's using information on the constituent elements of the line systems and the current costs of these constituent elements. The second stage of the process is to allocate the different line system costs to NEs based on information on the number of 2MB of capacity of each line system category and size used by each NE (again taken from the TNAS database). It can be seen that the NE cost categories include non-length dependent PSTN transmission for each type of network route (RSU to Primary, Secondary to Tertiary and so on) and different types of non-PSTN transmission including ATM, Dassnet, private circuits and frame relay.

2.2.3 Other Costs

2.2.3.1 Non-network accommodation

Each of the 220 non-network buildings is a cost centre. There is an annual survey of which activity is carried out in each non-network building and the space that each activity occupies. For buildings shared by network and non-network activities there is also a survey of the space occupied by each activity. This means that non-network accommodation costs can be allocated to activities, which in turn are allocated to ANEs and thence NEs and network components.

2.2.3.2 IT and procurement costs

IT and procurement costs are allocated on an activity-by-activity basis. Procurement costs are apportioned over maintenance costs according to the type of cost involved. For example, procurement labour costs are allocated in line with maintenance pay costs, procurement purchase costs are allocated in line maintenance purchase costs (which are a sub category of maintenance non-pay costs) and so on. Pay related IT costs are allocated in line with pay costs, while other IT costs are allocated to the activities that they support.

2.2.3.3 Finance and human resources

Finance and human resources (HR) costs can, to a substantial extent, be identified as being network or non-network related. This arises from the way that these functions are organised within eircom. Those costs that are network related are allocated in line with pay costs.

2.2.3.4 Corporate services and "manage the business" costs

These costs, where they do not relate to a specific business unit, are allocated in line with pay costs.

2.2.4 Working capital

2.2.4.1 Stocks

There are few if any stocks.

2.2.4.2 Cash balances

These are apportioned in line with total expenditure (i.e. operating expenditure plus capital expenditure)

2.2.4.3 Debtors

In preparing its CCA regulatory and LRIC accounts, eircom treats all network services as if they were sold to outside businesses. Interconnect debtors and creditors are allocated in total to Core Network and recovered from other units in proportion to the interconnect charges incurred by that unit as a proportion of total interconnect charges.

2.2.4.4 Creditors

Trade creditors are allocated to activities and network elements on the basis of operating expenditure, capital creditors are allocated on the basis of capital expenditure and payroll creditors are allocated in line with pay costs. Other creditors are allocated using bases appropriate to the particular creditor type. Interconnect creditors are handled along with interconnect debtors as described in section 2.2.4.3 above.

2.2.4.5 Provisions

Provisions are allocated to activities and network elements using bases appropriate to the particular charge.

2.2.5 Current cost depreciation and holding gains and losses

Supplementary depreciation (the difference between current cost (CCA) depreciation and historic cost depreciation), CCA book values and holding gains[6] for all ANEs and activity cost centres are

[6] If the price of an asset falls (increases), the net holding loss (gain) is the net replacement costs (i.e. the **NBV** in CCA terms) at the beginning of the year times the % fall (increase) in the asset price.

calculated off line using CCA asset valuations, data from the FAR and information about asset price changes. They are then uploaded into TCMP in the required format.

2.2.6 Cost of capital

The cost of capital is applied to the NRC of each network component.

2.2.7 Redundancy charges

The redundancy charges associated with different areas of the business are known and those associated with the network are then spread in line with pay costs.

2.2.8 Exceptional charges

In 1999/00, a variety of exceptional charges were allocated across different parts of eircom's business, including network components. The major items of cost in this category were the name change from Telecom Eireann to eircom, preparation for Y2K, the IPO , the involvement with KPN/Telia and preparation for joining the Euro .

2.2.9 Routing Factors

In order to produce unit costs of network components it is necessary to have information on the number of minutes of use made of each component. This information is derived using routing factors, which show, for each type of call, the average use made of each type of network component.
Taking a fictitious example, a call terminating on eircom's network and interconnecting at a secondary switch might on average need to pass through one secondary switch, one primary to secondary transmission link, one primary switch and 0.7 RSU to primary transmission links (i.e. 30% of such calls are to lines directly connected to a primary switch). If these routing factors are multiplied by the number of minutes of traffic that interconnect at a tandem switch and terminate on eircom's network, the number of minutes of use of each network component by this type of call is obtained. If the exercise is repeated for all types of call, the total minutes of use of each network component is known.

Once the total number of minutes of use is known, it is a simple matter to derive the unit cost of each network component. These unit costs, together with routing factors, give the costs per minute of different types of call.

Eircom obtains its information on call volumes from it's:

- call data collection system (CDCS), which contains data on incoming and outgoing interconnection traffic, free phone calls, VPN traffic, charge card calls and traffic from other operators to eircom's special services exchange;
- corporate data warehouse (CDW), which contains information on local calls and national calls, broken down between ordinary phones and payphones, calls to internet service providers, calls to Northern Ireland, the UK and other international destinations, and the first leg of premium rate calls;
- telecommunications information management system (TIMS), for the second leg of premium rate calls;
- Telecommunications information system (TIS) for operator assisted calls.

Routing factors are obtained from samples of CDCS and CDW traffic data. These provide information regarding the origin, destination, number and duration of different types of call. Together with network planning data on routing plans, exchange look up data (i.e. how an exchange will route a particular call) and ISP numbers, and information on eircom and other operator number ranges, it is possible to derive routing factors.

2.3 Accounting Policies

The ODTR had no significant concerns regarding the accounting policies other than in respect of the asset lives assumed. Our view was that the asset lives used by eircom were too short, particularly in the case of digital switching equipment, switch software and copper and fibre cable. Eircom have now used ODTR recommended asset lives in arriving at all interim and final conveyance rates.

2.4 CCA Asset Valuation and Depreciation

In order to provide estimates of LRIC using a top down model it is necessary to value assets on a CCA basis and adjust depreciation accordingly.

2.4.1 Valuation Methods

eircom has used four different bases for valuing assets in a CCA framework:

- historic costs;
- indexation;
- absolute valuation
- Modern equivalent asset.

These are first discussed in general terms, followed afterwards by a short description of the issues raised by eircom's application of these methods to different types of asset.

2.4.1.1 Historic costs

Where there has been no material change in asset price between purchase date and valuation date, or where the asset life is short, historic costs are used (i.e. there is no CCA valuation). For example, eircom uses historic costs in the case of PCs and mainframe computers.
Indexation

eircom applies indexation to historic values in cases where there is no technological change but costs are significant. The main example is land and buildings, which are also re-valued at 5 year intervals.

2.4.1.2 Absolute valuation

This is used by eircom when there is some technological change but the asset concerned can still be purchased. It involves multiplying the existing quantity by the current price. It is, for example, used by eircom to value optical fibre and vehicles. .

2.4.1.3 Modern equivalent asset (MEA)

This is a standard approach to asset valuation where technology has changed and the existing asset can or would no longer be purchased. In such cases, the cost of a functionally identical modern asset should be used. eircom uses this valuation method for some items of digital switching equipment and transmission equipment.

In defining a modern equivalent asset (MEA), eircom (like BT) uses a three year planning horizon to reflect what is reasonably foreseeable. This is an acceptable approach provided that the company's expectations are reasonable. If, however, its plans regarding the introduction of particular types of asset are unrealistically fast or slow, this could lead to a false definition of modern equivalent assets. This is a subject to which we return when discussing the particular case of transmission equipment.

A second important point is that any significant change in the functionality of the MEA means that the latter provides the services of the existing asset plus something extra. Hence, for valuation purposes, the cost of the modern asset should be adjusted downwards ("abated") to take account of the fact that the existing asset does not possess the extra functionality.

A related point is that the aim of CCA valuation should be to reflect the economic value of the asset (which is determined by the associated future revenues less operating costs). If the operating costs of the existing asset are materially different from those of the MEA, it is necessary to abate the valuation accordingly. In its Accounting Policy document, eircom states that:

"If there is a material difference in operating costs …….the MEA valuation of the existing asset is adjusted accordingly".

2.4.2 Application of Valuation Methods

However, from our discussions with eircom it is clear that no such adjustments have in fact been made. This is surprising given that one would normally expect the operating costs of newer assets to be lower than those of existing ones. It is also a source of some concern as the absence of such adjustments will tend to result in the overstatement of asset valuations where MEA is applied.
A number of issues are thrown up by eircom's application of the different valuation methods and these are discussed below.

2.4.2.1 Switches

Some of the existing AXE switches are no longer available, while newer models have superseded the others. eircom has assumed that the newest type of switch (AXE P86 v 2) is the MEA, although this seems a reasonable approach to take at this time, what is not clear is the implication for functionality and operating costs and hence whether there is a need to adjust the MEA value. This issue will be subject to further review in the future.

The existing CSED switches only provide basic PSTN services and not ISDN. If eircom were re-equipping its network, it would purchase CSND switches instead, as these allow basic and primary rate access ISDN lines to be provided along with ordinary exchange lines. This means that the functionality of the new switches is greater than that of the old ones and hence this should be reflected in the valuation. Again this will be reviewed in future submissions.

2.4.2.2 Transmission equipment

For SDH equipment eircom uses absolute valuation based on its most recent contract prices.
SDH equipment is used as the MEA for routes where PDH equipment is scheduled to be replaced by SDH within 3 years. The National Transmission Plan envisages that all 565 Mbit routes and 60% of 140 Mbit routes will employ SDH within 3 years. Based on an analysis of costs when developing the bottom up model, this looks to be an inefficiently low level of SDH equipment and can be expected to raise the value of assets and hence costs above the efficient level. However, it should be noted that, when valuing PDH equipment that is not scheduled for replacement by SDH within 3 years, eircom uses 1997 PDH prices indexed using the SDH price trend. This means that the value of PDH

equipment is lower than if up to date equipment had been used. It also means that the extent of transmission equipment overvaluation is reduced.

2.4.2.3 Duct and cable

Absolute valuation is used for duct and cable, except in the case of co-axial cable, where optical fibre is used as the MEA, and copper cable, where historic costs are indexed.

For duct, eircom has survey data on physical track distance, surface type and the number of bores and boxes. Current prices are then applied taking account of surface type. The main problem that we identified is that valuation does not take into account the fact that some duct bores are not used. The existence of unused duct bores could mean that the actual amount of duct and size of trench is greater than is necessary. However, in contrast to the approach that it adopts towards vacant building space, eircom values all duct and trench and makes no reduction to allow for vacant duct bores.

There are questions about the valuation process in the case of cable and the impact will be assessed and will also be subject to a further review.

2.4.2.4 Land and buildings

Land and buildings were revalued using price indices provided by Lisney. These indices show separate price movements for the Dublin area and the rest of Ireland. They were applied to values for 1998, the year in which a general revaluation was undertaken as part of the preparation of eircom's published historic cost (HCA) accounts.

Many buildings have some degree of vacant space, often reflecting the fact that they were built to accommodate analogue switching equipment, which has a larger footprint than the equivalent digital equipment that is now used throughout the network. This means that the volume of building space exceeds that required by an efficient operator. In order to produce a valuation of buildings consistent with that of an efficient operator, it is necessary scale down the CCA value of each building asset by the ratio of vacant to total space. In other words:

CCA value of building = HCA valuation × price index × (1 – vacant space/total space)

eircom follows this procedure in the case of exchange buildings, where vacant space is valued at zero. Vacant space is defined as the difference between actual space and what will be required in 3 years time (the planning horizon). Vacant space in non-network buildings is not taken into account.

It is questionable whether it is appropriate to define vacant space using a lead time as long as 3 years. While it is normal practice, when defining required capacity, to allow a margin to cope with planned growth, the lead times assumed are normally much less that 3 years. Moreover, it is questionable whether requirements can be forecast accurately that far ahead. Based on forecast space required in 3 years time, 24% of eircom's exchange capacity is vacant and hence 76% is valued. If the calculation is applied to the existing use of space, and no allowance is made for additional future requirements, the equivalent figures are 28% and 72%.[7] The valuation based on space used in 3 years time is 4.3% higher than the valuation based on existing space use.

Given that some allowance for growth in space use ought to be built into the valuation, the above figure overstates the extent to which eircom has overvalued land and buildings. In addition, eircom has argued that in estimating the extent of existing vacant space it has tended to be conservative and has not allowed for the impact of collocation associated with local loop unbundling or for ADSL installation needs.

2.4.2.5 Other assets

No other issues arose as a result of our review of eircom's CCA asset valuations.

2.4.3 Depreciation and Holding Gains

The preparation of CCA accounts in a particular year involves starting with historic cost information and:

- revaluing the fixed asset base (see the previous section);
- calculating the holding gains (or losses) resulting from any price movements during the year;
- Adjusting the book entries for depreciation so that they reflect the current cost of assets. This adjustment has an impact on annual depreciation charges and hence on the calculation of the net replacement cost of assets (i.e. the net book value revalued at current cost).

NERA reviewed eircom's treatment of holding gains (or losses) and depreciation.

2.4.3.1 Holding gains/losses

Eircom calculates holding gains (or losses) as follows:

$$\textit{Gross holding gain} = GRC_{closing} - GRC_{opening} - \textit{additions} + \textit{disposals (at current cost)}$$[8]

$$\textit{Net holding gain} = \textit{Gross holding gain} - \textit{backlog depreciation}$$

[7] These are unweighted averages of the figures for different exchanges that were provided to us by eircom.
[8] The GBV of disposals is multiplied by the ratio $\boldsymbol{GRC_{opening} / GBV_{opening}}$ for the asset concerned.

These formulae accord with standard practice. A negative figure would represent a loss rather than a gain. It was possible to review off line calculations where these formulae had been implemented for different classes of asset.

2.4.3.2 Depreciation

Eircom uses two different methods to calculate CCA depreciation and related items:

- ratio method;
- Roll forward method.

The choice of method used varies from asset to asset.

2.4.3.3 Ratio method

Essentially the ratio method adjusts the HCA book entries by the GRC/GBV ratio. More specifically:

$CCAAccDep_{opening} = HCAAccDep_{opening} \times \mathrm{GRC}_{\mathrm{opening}} / GBV_{opening}$

$CCAAccDep_{closing} = HCAAccDep_{closing} \times GRC_{closing} / GBV_{closing}$

$Backlog\ depreciation = (1 - NBV_{opening} / GBV_{opening)} \times Gross\ holding\ gain$

$CCA\ depreciation = CCAAccDep_{closing} - CCAAccDep_{opening} - Backlog\ depreciation$

$\quad - RetirementsAccDep \times \mathrm{GRC}_{opening} / GBV_{opening}$

2.4.3.3.1 Roll Forward Method

The roll forward method calculates holding gains, CCA opening accumulated depreciation and backlog in exactly the same way as the ratio method. The differences lie in the calculation of the annual CCA depreciation charge and the closing accumulated depreciation, which is shown below:

$CCA\ depreciation = HCA\ depreciation + (GRC_{opening} + GRC_{closing}) / (GBV_{opening} + GBV_{closing})$

$CCAAccDep_{closing} = CCAAccDep_{opening} + CCA\ depreciation + Backlog\ depreciation$

2.4.3.4 Comparison of the two methods

eircom's view is that the ratio method is the appropriate choice where the volume of assets is relatively stable and changes in GRC stem from price fluctuations. If there are high levels of recent additions to the asset base, this will "distort the calculation". In such cases, or if a particular asset category has sub-categories with a marked range of asset lives, the roll forward method should be used.

During its presentations to us, eircom provided a worked example that was intended to show that, when a large number of additions are made to an asset class during the year, use of the ratio method will give an unrealistic picture. However, we discovered that there was an error in the calculations and eircom's point was not demonstrated and therefore we remain to be convinced about this point.

NERA modelled and analysed the comparative performance of the two methods in the face of asset price changes. They found that when asset prices are falling the roll forward method gives a higher depreciation charge and vice versa when asset prices are rising (see Table 2.7).

Table 2.7
Impact on CCA Depreciation Charges

Asset prices falling	Roll forward method charge > Ratio method charge
Asset prices rising	Roll forward method charge < Ratio method charge

The reason for the different impact of the two methods is that, with the roll forward method, HCA depreciation is adjusted by the weighted average of the opening and closing GRC to GBV ratios and hence the impact of any price change within a given year is dampened.
NERA also looked at the impacts of the two methods on mean capital employed and hence the cost of capital. In this case, they found that when asset prices are falling the roll forward method gives a lower value for mean capital employed and vice versa when asset prices are rising (see Table 2.8).

Table 2.8
Impact on CCA Mean capital Employed

Asset prices falling	Roll forward method charge < Ratio method charge
Asset prices rising	Roll forward method charge > Ratio method charge

The reason for the differences is that the two methods generate different figures for closing accumulated depreciation, which in turn produces different figures for closing net replacement cost (NRC) and hence mean capital employed.
In looking at the two methods, we note that while the CCA depreciation charge under the roll forward method is calculated using a GRC to GBV ratio that is a weighted average of the opening and closing positions, the same is not true for the calculation of backlog depreciation. A consistent position would be achieved if the backlog depreciation were calculated using a similar weighted average. It would also mean that closing accumulated depreciation and hence mean capital employed would be the same for both the ratio and roll forward methods.

2.4.3.5 Implication of the use of the different methods

As noted in the previous section, the relative impacts of the two methods on depreciation charges and mean capital employed (and hence cost of capital) work in opposite directions. However, the depreciation effect dominates the cost of capital effect. This implies that there could be a possible distortion between the two methods and eircom could choose for each asset class the depreciation method that generated the highest depreciation charge.[9] However, there is no evidence that this has actually happened.

2.4.4 Derivation of LRIC Methodology

Once eircom has derived fully CCA costs for different network components, the final step is to translate these into LRIC costs.

This process involves:

- Starting with eircom's total group costs and identifying the costs that would remain if only the access and core networks continued to operate (i.e. if all the rest of eircom's activities were to cease). These costs are the "stand alone" costs of the combined access-core network business;
- Calculating the costs that would be avoided if, starting with the stand alone combined access-core network, eircom were to cease to provide an access network. These avoided costs are the LRIC of the access network;
- Calculating the costs that would be avoided if, starting with the stand alone access-core network, eircom were to cease to provide a core network. These avoided costs are the LRIC of the core network, which will be sub-divided into the LRIC of different network components;
- Deriving common fixed costs as the difference between the cost of the stand-alone combined access-core network and the sum of LRIC for the access network and LRIC for the core network. In other words:

  $$CFC = SAC_{Access\ and\ Core} - (LRIC_{Access} + LRIC_{Core})$$

  where CFC is common fixed costs and SAC is stand alone cost
- top down LRIC costs for the core network are then derived as core LRIC plus a proportionate percentage mark up to recover common fixed cost where the mark up is:

  $$\{CFC / (LRIC_{Access} + LRIC_{Core})\} \times 100\%$$

A key step in this process is the derivation of cost-volume relationships, which identifies what happens to costs when the volume of a particular activity is reduced or ceased altogether.

Using cost-volume relationships (CVRs), LRIC can be split into two parts:

- Variable costs, which decline as the volume of the driver of those costs declines. For example the number and hence cost of switch ports declines with the volume of traffic (which is the driver of switch port costs);

[9] As mentioned previously, the holding gain (or loss) is the same under both methods.

- Fixed costs, which are incurred in order to provide the minimum level of output. Examples include the first processor unit in each switch and the need for a minimum of one STM1 line system per SDH transmission link. These fixed costs can in turn be classified as either:
  - component specific fixed costs (i.e. they are specific to only one network component), an example being the first processor unit in a secondary switch; or
  - Intra-core common fixed costs, which are specific to the core network but are common to more than one network component, an example being the costs of a minimum core duct network. These costs are allocated as a pro rata mark up on LRIC for the network to which they are common. In other words, minimum duct costs are allocated across transmission components but not switching components.

If one were measuring LRIC for something less than a whole service (e.g. for setting floors for volume discounts) it would be important to separate out the variable and component specific fixed costs. However, in the present context no such separation is necessary because interconnection charges are set on the basis of total service LRIC. Component specific fixed costs and variable costs are both included in the LRIC statements in eircom's accounts. Intra-core common fixed costs are included in the distributed LRIC statements in eircom's accounts and represent the difference between LRIC and distributed LRIC.

The derivation of the main cost-volume relationships (CVRs) in eircom's model is discussed in summary form below.

2.4.5 Derivation of Main CVRs

2.4.5.1 Switch capital costs

CVRs covering capital costs (NRC, depreciation, holding gains and capex driven costs – pay and non-pay) are derived for each type of switch. The process is as follows:

- start with fully equipped CCA switch costs;
- apply engineering simulation models to calculate how equipment requirements and costs decline as the volume of each cost driver is progressively reduced to zero;
- Identify the costs required to provide the minimum level of capacity.

There are CVRs for lines. Equipment specific to lines is not part of the core network and these costs are therefore excluded. There also CVRs for traffic, with the costs of equipment relating to call attempts treated as an increment specific fixed cost (i.e. a minimum requirement). Traffic related CVRs are derived for AXE and E10 concentrators and different varieties of switch.[10]

2.4.5.2 Transmission equipment capital costs

CVRs covering capital costs (NRC, depreciation, holding gains and capex driven costs – pay and non-pay) are derived for each main type of transmission equipment. The process is as follows:

- start with a 100% network (CCA costs);
- Identify the minimum capacity requirement. This will be one 2 Mbit PDH line system per existing PDH link and one STM1 line system per existing SDH link plus cross connect equipment. It is assumed that routing diversity must be maintained at the minimum level to ensure that quality of service is maintained;
- progressively reduce the required capacity on each link to the minimum level;
- Identify the costs required to provide the minimum level of capacity.

There are CVRs for PDH, SDH, PCM and radio systems. Eircom provided us with detailed descriptions of CVRs and their derivation covering each of these areas. The methodology appeared to be appropriate and did not raise any substantial issues.

It should be noted that intra-core common fixed costs represent a substantial part of total costs.

2.4.5.3 Cable capital costs

CVRs covering capital costs (NRC, depreciation, holding gains and capex driven costs – pay and non-pay) are derived for copper and fibre cable. The process is as follows:

- start with a 100% network (CCA costs);
- Identify the minimum capacity requirement on a transmission link. For PCM this is a 10+ 10 cable, for copper, it is an 80 pair intervented junction cable and for fibre a four pair cable. It is assumed that connectivity between all current points of eircom presence is maintained and that routing diversity is also maintained to ensure that quality of service is not reduced;
- progressively thin the cables on each link to the minimum level;
- Identify the costs required to provide the minimum level of capacity.
-

eircom provided us with detailed descriptions of CVRs and their derivation covering copper and fibre cable. The methodology appeared to be appropriate and did not raise any substantial issues.

Intra-core common fixed costs represent a substantial part of total costs.

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[10] The CVRs are composite ones in that they are combined relationships for different sizes of switch etc.

2.4.5.4 Duct costs

For duct costs, the process is similar. Here it is assumed that the minimum network has the geographical coverage and trench length of the existing network (to maintain existing connectivity and routing diversity) and that the minimum network has one core bore.[11] The costs of the minimum network are little different from those of the maximum network meaning that most duct costs are intra core common fixed costs.

eircom provided us with a detailed explanation of the duct CVR. The methodology appeared to be appropriate and did not raise any substantial issues.

2.4.5.5 Cost Dependencies - Use of weighted NRC to derive LRIC

Many types of cost are driven by other costs rather than directly by volumes of traffic etc. For a number of these, weighted NRC is used as the cost driver. For example, network land and buildings capital costs are a function of floor space required, which in turn is determined by the quantity of equipment housed in the buildings. The latter is proxied by the weighted NRC of the equipment housed in the buildings.

eircom has data on the use of floor space and hence the network building capital costs "caused" by different equipment types. The ratio of building capital costs to NRC can therefore be calculated for each type of equipment. If this is divided by the ratio of building capital costs to NRC for all types of equipment combined, a weighting factor showing relative intensity of use of building capital costs is derived for each type of equipment.[12] The associated weighting factor is then multiplied by the NRC of the equipment concerned. The result is weighted NRC for each type of equipment.

This is then used as the cost driver and it is assumed that the CVR between network building capital costs and weighted NRC is a straight line through the origin (i.e. there are no fixed costs or economies of scale).

If all SDH transmission equipment costs were avoided, for example, this method would correctly lead to all network building capital costs related to transmission equipment being avoided. However, there are two possible concerns:

- if eircom wanted to identify what would happen given say a 10% reduction in the amount of SDH transmission equipment, which it might want to do if it were introducing discounts for network or retail services, it is not clear whether it would necessarily obtain the correct answer. If the SDH transmission equipment that would be avoided in these circumstances had a network building capital cost to equipment NRC ratio that was different from that for SDH transmission equipment in general, the use of the CVR based on weighted equipment

[11] It is assumed that there are also 4 access bores. This number is the same as the existing figure because what is being measured the incremental cost of the core network and its components.

[12] For example, if SDH transmission equipment requires £1.20 of building capital cost per £1 of equipment **nrc** but all equipment taken together requires £1 of building capital cost per £1 of equipment **NRC**, SDH transmission equipment has a weighting of 1.2.

NRC would not give the correct answer. Given that NRC is affected both by age and type of assets, such an eventuality cannot be ruled out;

- While it might be argued that the previous problem is not relevant to the current modelling of interconnection costs, the same sort of problem exists where there are significant intra core common fixed costs. For example, if the amount of SDH transmission equipment is reduced to the minimum network level, the equipment that is no longer required may have a network building cost to weighted equipment NRC ratio that is different to that of the equipment that forms part of the minimum network. If so, this will mean that there is an incorrect division of network building capital costs between the minimum network equipment and the rest. This in turn means that network building costs will be inappropriately allocated across non-length dependent transmission components. This is because the two sets of costs are allocated differently. The costs related to the equipment that does not form part of the minimum network are allocated directly to the appropriate non-length dependent transmission component. However the costs related to the minimum network are allocated pro rata across different non-length dependent transmission network components.
- The use of GRC rather than NRC would improve the situation as it means that older equipment, which has a low NRC, is not implicitly (and erroneously) assumed to require less space. However, given that eircom carries out a detailed survey of how network building space is used, it would be better to use this directly and for there to be separate building cost CVRs for different types of equipment based on survey data.

Exactly the same type of argument applies to maintenance costs and power costs, both of which have analogous CVRs based on weighted equipment NRC. In each case, surveys are carried out which directly identify the relevant costs with different activities and hence would allow a greater granularity of CVR relationships. For example, switch maintenance costs (pay and non-pay) are recorded by exchange area and type of switch and are then split between different categories of equipment on the basis of a survey of the time spent by technical staff. This would allow CVRs between switch maintenance costs and the volume of different types of equipment to be established directly and would avoid the problems discussed above. In case this sounds fanciful, it is worth pointing out that BT, for example, has a CVR that relates local exchange maintenance to the number of call minutes via an engineering model.

2.4.5.6 Cost Dependencies - Use of straight line relationships

There are many CVRs where a particular cost is driven by pay costs, sometimes weighted and sometimes not. In addition, a straight line relationship through the origin is arbitrarily assumed (and hence no fixed costs or economies of scale). Given the absence of survey data, this may be the best that can be done. However, in the case of both group finance and human resource costs, a regression analysis was carried out of the relationship between each of these costs and total payroll costs for the US LECs. This allowed the existence or otherwise of fixed costs and economies of scale to be identified.

This seems to us to be a reasonable approach and it is not clear why it wasn't extended to areas such as procurement, general management costs and IT capital costs.

The use of straight lines through the origin for CVRs extends to costs such as planning and development where assets are the cost driver.

2.4.5.7 Conclusions on CVRs

The methodologies used to derive CVRs for the capital costs of switches, transmission equipment, cable and duct appear appropriate and do not raise any significant issues. Where there are some potential problems is in the case of dependent costs. In particular, relatively crude and imprecise CVRs are used in the case of maintenance, network building and power costs, when survey data offers the potential to do something more sophisticated and accurate.

This is not just an academic point as there is the possibility, even with the use of weighted rather than unweighted NRCs, for dependent costs to be incorrectly allocated between minimum network costs (intra core common costs) and other costs. This in turn can lead to incorrect allocation of costs between network components because the two sets of costs are allocated differently. At the very least, GRC should be used in order to remove the distorting impact of NRC, which implicitly assumes that older assets which have been written down more fully require less space, less power etc, when in fact the opposite is likely to be true. Given the availability of survey data it should be possible to derive a more granular and accurate set of CVRs.

The other problem is the proliferation of CVRs that arbitrarily assume a straight line through the origin relationship between the cost category and its driver. eircom argue that materiality was the reason for not taking things further. However, given enough such relationships, their collective materiality may become significant. The use of regression analyses to derive CVRs from the US for finance and HR costs represents a sensible step and should be extended into other cost areas.

3 Proposals for modifications and changes to eircom's top down LRIC model not yet implemented.

3.1 Introduction

This section lists the possible changes and modifications to eircom's top down model as reported to us by our consultants as a result of the review of the model. (as detailed in Section 2).This section should be read in conjunction with the previous chapter. The ODTR will address these recommendations through further engagements with eircom

3.2 Overall comments

Given the scale and complexity of eircom's cost models and allocation methods these impressions regarding the cost allocation system are in the main high level ones. As part of our review costs were followed through from one end of the model to the other. However, this proved to be quite difficult for a variety of reasons:

- the model is very complex and relies on a variety of off line inputs (e.g. current cost asset valuation and depreciation);
- Not withstanding that eircom did make available a substantial amount of back up data a comprehensive structured documentation of the cost allocation processes in the model was not available. This made the task of understanding the structure of the model more difficult. Eircom have indicated that they intend to submit comprehensive documentation on the model to the ODTR by the 31st October 2002.
- In broad terms, however, the approach to cost allocation seems reasonable and eircom has clearly made a serious attempt to identify cost drivers and allocate costs appropriately. Much, however, depends on the quality of the information used to allocate costs. In this context we would note the extensive reliance on surveys and the importance, in particular, of physical records of transmission network assets.

3.3 Specific Proposals

The ODTR is undertaking a continuous programme of improvement to eircom's processes, through investigation, discussion and debate, culminating in a determination, or direction by the Director. In the short to medium term the following issues are to be addressed:

- Comprehensive documentation of the model and its allocation bases and eircom's planned data improvement programme
- adjusting MEA valuations to take account of the different functionality and operating costs of modern equipment
- valuing PDH equipment using MEA assumptions that would be apply in an efficient network (i.e. only where PDH is cost effective should it be treated as the MEA) Eircom has stated that this will be completed for the separated accounts for the year ended 31st March 2002.
- the use of the two different methods to calculate CCA depreciation and related items.
- Making the maximum use of the available physical and survey data when deriving CVRs. In particular, developing a more granular set of directly related CVRs based on such information for maintenance, power and building costs. As an interim step, weighted GRC should replace weighted NRC as the cost driver for space allocation
- Further work will be carried out in the case of the many cost categories where straight line through the origin CVRs have been assumed. Regression analysis of US data is one possible route and greater activity analysis (which would also lead to more accurate cost allocation) would be another.
- eircom should be obliged to justify in detail its approach to allocating exceptional costs and to implement any necessary changes and publish its policy with regard to exceptional cost. The resulting procedures should be followed in future years. eircom have stated that they have excluded virtually all exceptional costs attributable to the core network in compliance with existing decision notices.
- extending the time period over which activities are surveyed, in the case of maintenance costs.
- increasing the number network buildings in the floor space survey
- Providing information on the number of vacant duct bores and the amount of vacant office space in non-network accommodation. CCA asset values may then be modified accordingly
- Justifying the 3 year lead time that is used when estimating the amount of vacant exchange building space. If it cannot be justified a more appropriate lead time (e.g. 1 year or 18 months) when valuing exchange buildings may be used
- improving information on different types of duct
- Providing a breakdown of the number of fibre pairs on each transmission system.

Both eircom and the ODTR are working together to incorporate these proposals at the earliest possible time and in some case progress has already been made in the implementation of these proposals.

4 Comparison of the Top Down and Bottom Up Models and Recommended Amendments to Bottom Up Model.

4.1 Introduction

This section explains the differences between the two models as they applied to 1999/2000 data. This was done by progressively replacing input data and assumptions (based largely on IAG inputs and benchmark data) with eircom's input data and assumptions and analysing the impact of the changes. The process of comparing the outputs of the two models involved starting with the base run of the bottom up model as agreed by the IAG and progressively substituting in eircom inputs, where they differed from those used in the bottom up model. This allowed us to ascertain whether the two models produced similar results when the same inputs were used. It also allowed us to identify which were the most differences in the inputs used in the two models in terms of their impact on interconnection costs.

Finally, as a result of the comparison exercise, we identified changes in inputs into the bottom up model and produced revised cost estimates using these inputs.

4.2 Overall Conclusion

The conclusion from the model comparison is that it has been possible to explain most of the differences in the costs produced by the two models in terms of differences in input assumptions. This suggests that there are no substantial differences arising from fundamental differences in modelling approach or in the application of engineering rules.

In summary the main reasons why the bottom up and top down models produced different results during the comparison exercise were:

- eircom's asset lives were shorter which, other things being equal, raises the costs by around 5%, eircom have subsequently been directed to use longer lives;
- eircom's assumed asset price changes, other things being equal, lead to costs being around 5% higher than those in the bottom up model;
- eircom's operating costs were substantially lower than the benchmark figures based on average US LEC performance that are used in the NERA base case. If eircom's operating costs were substituted for the average benchmark figures, costs in the bottom model fall by around 10%, the bottom up model has since been adjusted to top 25% of US LEC's ranked by efficiency.

- the existence of written down asset values in the top down model (as opposed to brand new assets in the bottom up model), has the effect, other things being equal, of reducing costs by around 13% compared with the bottom model.

It is also not possible to replicate the top down model's treatment of transmission costs in the bottom up model. The top down model assumes that all 565 Mbit line systems and 60% of 140 Mbit line systems use SDH transmission equipment and the rest use PDH. In contrast, the bottom up model calculates where SDH is the lowest cost option. It is found that SDH is appropriate for all line systems between primary, secondary and tandem switches and on over half the routes between RSUs and primary/secondary switches. This is likely, other things being equal, to make the costs of the top down model higher than those of the bottom up model. However, the way that PDH equipment is valued in the top down model (1997 prices indexed by subsequent changes in SDH prices) helps to constrain this effect. Hence the impact of using the top down approach in the bottom up model, if it could be done, would be likely to be limited.

4.3 Detail of Comparison and explanation of the difference in output produced by the 2 models.

The process of comparing the outputs of the two models as applied to 1999/2000 data involved starting with the base run of the bottom up model. Section 4.4.1 details the changes incorporated in the bottom up base case model, which was then used for comparison with the top down model. The NERA bottom up model was then compared with the eircom model produced an overall difference of 17.68% (i.e. the bottom up costs are 17.68% higher than the top down model). By adjusting the inputs to the bottom up model in a sequential and cumulative manner as detailed in section 4.1 above, the following results were obtained.

4.3.1 eircom Duct Split

The first input change was to replace the split of duct between core network and shared with the figure used in eircom's top down model. The difference in the costs produced by the two models is reduced on average from 17.68% to 15.15%.

4.3.2 eircom Proportion of Traffic in the Busy Hour

The next change involved replacing the assumptions in the bottom up model relating to the proportion of traffic in the busy hour and the necessary uplift to allow for traffic in the busiest hour of the year with those used by eircom in the top down model. The costs produced by the bottom up model are reduced significantly. The gap between the costs produced by the two models is now down to 10%.

4.3.3 eircom Asset Lives

The asset lives in the bottom up model were an average of the figures put forward by IAG members. At the time of this study, this had the effect of increasing bottom up costs substantially and that the gap between the costs generated by the two models widens again to nearly 15%. This difference has now been eliminated as eircom are now using asset lives as determined by the ODTR. The bottom up model also used these asset lives.

4.3.4 eircom Asset Price Changes

At present, the asset price changes in the bottom up model are an average of the figures put forward by IAG members. Replacing these asset price changes by those used in the top down model has the effect of increasing bottom up costs substantially and that the gap between the costs generated by the two models widens further to 19.5%.

4.3.5 eircom Working Capital

The base case of the bottom up model assumed that working capital netted out to be zero. This reflected the views of IAG members. If creditors, provisions and notional debtors from the top down model are introduced into the bottom up model, costs increase by around 0.5% and the gap between the two models is now on average nearly 20%. eircom have subsequently been directed to use actual interconnect working capital and not notional debtors in working capital.

4.3.6 eircom Redundancy Costs

The bottom up model does not include redundancy costs. When redundancy costs from the top down model are introduced into the bottom up model, costs increase by nearly 2% and the gap between the two models now averages 21.5%. eircom were subsequently directed to exclude redundancy costs.

4.3.7 eircom Operating Costs

When operating costs from the top down model are introduced into the bottom model there is a reduction in costs of around 8% and the gap between the two models is reduced to 13%. Looking at sub-categories of operating costs, it is evident that a bit more than half the impact of using eircom's operating costs comes from lower indirect capital costs, with most of the rest resulting from lower direct operating costs for primary and tandem interconnection services (but not for double tandem). The bottom up model has been adjusted to top 25% of US LEC's ranked by efficiency and this difference no longer exists.

4.3.8 eircom Call Volumes and Routing Factors

The effect of substituting the call volumes and routing factors used in the top down model for those in the bottom up model is to reduce costs on average by around 3%. What is more noticeable, however, is that it has the effect of sharply increasing primary and tandem costs while sharply reducing double tandem costs. The NERA routing factors are not differentiated between short and long tandem whereas the eircom ones are.

4.3.9 Taking Written Down Assets into Account

In the bottom up model, which aims to replicate the costs of a new entrant supplying services at the same volume and coverage level as eircom, all the equipment is assumed to be new. The cost of capital is therefore applied to the investment cost (i.e. there is no difference between GRC and NRC). In the top down model, the cost of capital is applied to NRC, which is substantially lower than GRC, as the asset are not new. When the cost of capital in the bottom up model is reduced by the ratio of NRC to GRC, there is a decline in costs of nearly 13%. As a result costs produced by the top down model are now on average 3% higher than in the bottom up model.

4.3.10 eircom Equipment Prices

If equipment prices used in eircom's top down model are substituted for the IAG average figures in the bottom model, costs increase on average by about 1.5%. This has not been implemented in the bottom up model.

4.3.11 Introduction of Two Additional Tertiary Switches

In the top down model, there are four tertiary switches and two tertiary sites. This compares with the bottom assumptions of two tertiary switches and two tertiary sites. If two additional tertiary switches are introduced into the bottom up model, costs are increased on average by around 1% and the average cost difference between the two models is very close to zero (just 0.05%). There remain differences in the case of individual services, with shorter distance services tending to be more expensive in the bottom up model, but longer distance services being cheaper. This has not yet been implemented in the bottom up model.

4.4 Modification and Changes to the Bottom Up model

Having reviewed eircom's top down model and the bottom up model and explained why the costs produced by the two models differ, it is possible to produce consolidated results from the bottom up model.

4.4.1 Items that have already been reflected in the Bottom Up Model

The next step in the process of comparing the results of the two models was to review the bottom up model. This led to the following changes.

4.4.2 Switch Site Mark Up

Switch site costs are applied as a mark up on the costs of the equipment inside them. However, the situation is complicated by the fact that different types of switch often share switch sites. Thus, for example, primary switches are sometimes housed in sites on their own and sometimes share sites with secondary switches.

Switch sites have been defined as being tertiary, secondary, primary etc on the basis of the highest level switch inside them. In this context, tertiary is the highest level and primary the lowest. The tertiary site mark up is therefore calculated as the total capital and operating cost of tertiary sites divided by the total capital and operating cost of the equipment inside them. That equipment consists of both tertiary switches and secondary switches. In exactly the same way, the secondary switch mark up is calculated using equipment costs that include both secondary and primary switching equipment.

The tertiary site mark up is applied to the tertiary equipment inside. It should also be applied to that part of the secondary switch equipment located in tertiary switch sites and the secondary site mark up should be applied to the remainder of the secondary switch equipment, which is located in secondary switch sites. Similarly, the secondary site mark up should be applied to that part of the primary switch equipment located in secondary switch sites and the primary site mark up should be applied to that part of the primary switch equipment located in primary switch sites. That is what now happens. However, previously the secondary site mark up was applied to all secondary switch equipment costs and the primary site mark up to all primary switch costs, which is incorrect.

Further minor amendments were made to correct the calculation of savings from switch site sharing and the split of site costs between access and conveyance.

4.4.3 Allocation of Duct Costs between Different Transmission Network Components

When deriving the share of duct accounted for by different transmission components (Remote to Primary, Secondary to Secondary etc), the model was not converting logical route length into physical route length correctly. This error has been corrected.

4.4.4 Number of Secondary and Tertiary Switch Ports

The model was previously understating the number of secondary and tertiary ports, where they were acting as tandem switches. This problem has been corrected.

4.4.5 General and Administrative Costs

General and administrative costs are calculated as a mark up on other operating costs. This mark up was being applied to direct operating costs but not to the operating costs associated with non-network capital equipment (i.e. buildings, vehicles, computers etc). It should have been and this has now been corrected.

As a result of the comparison process, the following additional changes were incorporated into the bottom up model.

4.4.6 Duct Split

The bottom up model now makes use of eircom's duct split between core and shared duct.

4.4.7 Busy Hour Traffic Profile

Eircom's busy hour traffic profile and associated engineering rules have been input into the bottom up model.

4.4.8 Operating Costs

Revised benchmark operating costs (top 25% of LEC's ranked by efficiency) are now used by the bottom up model.

Following these changes the average difference of the conveyance charge costs as calculated by the 2 models is approximately 2% utilising 1999/2000 data.

Appendix I - Legislative Background

There is a range of relevant legislation in this area; the most relevant of which is summarised below:

Interconnection Legislation:

- *Council Directive 97/33/EC on interconnection in Telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP) and*

- *The European Communities (Interconnection in Telecommunication) Regulations, 1998, SI No. 15 of 1998, transposing the above directive.*

Accounting Separation

This legislation states that organisations providing public telecommunications networks and/or publicly available services and which have been designated by the Director as having SMP, and which offer interconnection services to other organisations are required to keep separate accounts for their activities relating to interconnection and 'other activities'. These accounts should identify all elements of cost and revenue, 'with the basis of their calculation and the detailed attribution methods used, related to their interconnection activity including an itemised breakdown of fixed asset and structural costs.'

NRA's "may publish such information as would contribute to an open and competitive market, while taking account of considerations of commercial confidentiality."

Interconnection (obligation on operators with SMP in the fixed market)

- interconnection charges should follow the principles of transparency, non-discrimination and cost-orientation;
- the Director may direct an organisation to justify its charges and to adjust these charges where they are not in compliance with these principles;
- the burden of proof lies on the organisation providing interconnection;
- a RIO shall be published and the Director may direct changes to this offer;
- Interconnection charges shall be sufficiently unbundled, so that applicants are not required to pay for anything not strictly related to the service requested.

Voice Telephony Legislation

- *Council Directive 98/10/EC on the application of open network provision (ONP) to voice telephony and on universal service for telecommunications in a competitive environment, and*

- *European Communities (Voice Telephony and Universal Service) Regulations, 1999, SI No. 71 of 1999, transposing the above directive and Directive No. 97/33/EC*

This legislation states that an organisation with SMP, which has an obligation for its tariffs to follow the principles of transparency and cost orientation in accordance with the legislation, shall operate and maintain a cost accounting system based on generally accepted accounting practices and which is suitable for compliance with the legislation's requirements.

Compliance by an organisation with the cost accounting system referred to in the above paragraph shall be verified by a person or body independent of the organisation and selected by the organisation with the prior approval of the Director.

The Director may issue directions establishing standards for cost accounting systems required pursuant to this legislation and an organisation subject to this legislation shall comply with any such directions.

Leased Lines

- *Council Directive 92/44/EC on the application of open network provision to leased lines as amended by 94/439/EC and Directive 97/51/EC*

- *European Communities (Leased Lines) Regulations, 1998, SI No. 109 of 1998, transposing the above directive*

This legislation states that, for SMP or notified operators; tariffs for leased lines must follow the basic principles of cost orientation and transparency, and are independent of the type of application, which the users of the leased lines implement. A notified[13] organisation shall operate and maintain a cost accounting system suitable for the implementation of these and other principles set out in the legislation.

Licence Condition

Pro Forma General Telecommunications Licence (ODTR Document No. 98/50R)

Condition 15 of the General Telecommunications Licence applies to organisations that have been designated as having SMP in the fixed telephone network and services market. The condition provides, inter alia, that the licensee shall maintain accounting records in a form which enables the activities of any business unit specified in any direction given by the Director to be separately identifiable, and which the Director considers to be sufficient to show and explain the transactions of each of those business units.

European Commission Recommendations

In addition, the Commission has published recommendations on the pricing of interconnection as well as on costing methods that could be used to calculate such prices. The relevant documents are:

Commission Recommendation of 8 January 1998 on interconnection in a liberalised telecommunications market (as amended) – Part 1 Interconnection Pricing (98/195/EC as amended by 98/511/EC)

This Recommendation states that interconnect 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.

[13] An organisation directed by the Director to provide at any point within a specific geographic area, a type of leased line that is specified in Annex II, as amended by Article 1 of Commission Decision 94/439, of Council Directive 92/44.

Commission Recommendation of 8 April 1998 on interconnection in a liberalised telecommunications market – Part 2 – Accounting separation and cost accounting (98/322/EC)

This Recommendation concerns the implementation of accounting separation and cost accounting systems by operators designated by their NRA as having significant market power in accordance with Article 8(2) of Directive 97/33/EC for implementation of interconnection obligations, with particular regard to the principles of transparency and cost orientation.

The Commission Recommendation (the “recommendation”) suggests that notified operators provide a disaggregation of their operating costs, capital expenditure and revenue into at least the following main business areas: -

-Core Network (Transmission and Switching)

-Local Access Network (Local Loop infrastructure)

-Retail

-Other Activities

The recommendation also states that disaggregated accounts within the above main business areas may be considered appropriate by NRAs, having regard to the transparency and competitive requirement of national and /or community law.