6 Costs of number portability

Contents

Introduction

6.1. The purpose of this chapter is to describe the background to the discussions between OFTEL and the telecommunication operators on the costs involved in the introduction of NP, principally those of BT as the largest operator. Reference to the work carried out by NERA for OFTEL in 1993 is included as it formed the basis of the subsequent debate, although the details are now somewhat out of date. The costs of portability for single exchange lines are considered first, but later the position on other forms of NP, such as the portability of non-geographic numbers and of number blocks, is also considered.

BT's costs

Background

6.2. From an early stage there has been widespread recognition of two major categories of cost involved in NP-set-up costs and additional conveyance costs. In a note, *Sharing the costs of number portability*, issued by OFTEL in August 1993 and based on the cost-benefit analysis required under the terms of BT's licence which was then being undertaken by NERA, OFTEL said:

> An efficient allocation of resources might be achieved by making each operator responsible for its software costs. It would be important to prevent any operator (especially BT) recovering its cost of installing NP by imposing a specific charge upon subscribers who choose to switch to another operator; this would clearly jeopardise the lower tariffs and efficiency savings potentially available from greater competition. Extra transmission costs could either be borne by the operator incurring them or be split on a market share basis …

Software costs are the main element in system set-up and transmission is generally referred to as conveyance. In a press release in January 1994, following completion of the work by NERA, the DGT concluded that it would be equitable for the costs of implementing portability to be shared roughly in proportion to benefits which accrue to all subscribers. He said it was important that costs were allocated in a transparent manner. In an accompanying background note OFTEL indicated that one means of achieving these objectives would be for each operator to pay the costs of introducing NP on its own system and for any joint costs to be allocated in proportion to relevant market shares.

6.3. Following the inability of BT and Videotron to agree terms for NP to be introduced in accordance with a direction from the DGT under Condition 34B.11 of BT's licence (paragraph 3.45), the DGT issued a draft modification to BT's licence for formal consultation on 22 February 1995. This draft recognized two further categories of cost: per line set-up costs, and administrative costs incurred as a result of a customer moving to another address at the same time as, or subsequent to, the porting of a number (we have followed OFTEL's practice in referring to this as `mobility'). The draft modification also provided for operators to bear their own system set-up costs and for additional conveyance costs to be shared between operators `as appropriate'. Per line set-up costs and the administrative costs involved in mobility were to be recoverable by BT from the operator to which portability was provided. The draft modification introduced a power for the DGT to determine both the charges and the costs on which they were based, on the request of either party concerned in the negotiation of arrangements for NP. As described in paragraph 3.49, BT's refusal to accept a subsequent version of the DGT's proposals led to the reference to us.

6.4. In the course of the negotiations on NP which preceded the reference both BT and Videotron made proposals for three of these cost categories: system set-up costs, per line set-up costs and additional conveyance costs; the positions of the various parties on these are considered in more detail below. The general nature of these three main items of cost under the tromboning, call drop-back and IN solutions respectively (paragraphs 5.17 to 5.31) are set out in Table 6.1. The negotiations also included the pre-interim solution of remote call forwarding, but it is not examined further as it has ceased to be a serious option.

TABLE 6.1 **Costs of implementing NP**

Type of cost	*Technology used*		
	Tromboning	*Drop-back*	*IN*
System set-up	Major one-off cost	Small additional one-off cost	Major investment involved
Per line set-up	< ----------	One-off administrative cost	---------- >
Additional conveyance	Possible per minute cost due to need for extra routeing	Cost per call, but lower than for tromboning	Outside timeframe of this inquiry (paragraph 5.34)

Source: MMC.

6.5. Neither BT nor the cable companies made specific representations on the remaining category of cost, that of providing mobility (paragraph 6.3). BT told us that the type of costs involved in providing mobility were similar to those of per line set-up and that it saw no reason for different arrangements. OFTEL commented that mobility which took place at the same time as the number was ported would probably be included in the normal procedure for handling the porting process. If mobility took place subsequently it would be a separate procedure probably involving no more than a call from the recipient operator to the donor operator to check that the address to which it was planned to move the ported number was within the donor operator's local exchange area (information on the boundaries of BT's local exchange areas was not within the public domain).

6.6. Throughout its submissions to us BT stressed that in its view the existing regime for interconnection between operators should apply fully to NP. Among the key features for interconnection under Condition 13 of BT's licence were:

(a) costing on a usage basis, calculated on the fully allocated costs of BT's network;

(b) costs determined by OFTEL under the relevant conditions of BT's licence; and

(c) charges provisionally set on the basis of estimated costs and then adjusted retrospectively when actual costs for a year were available.

System set-up costs

6.7. System set-up costs are the costs that an operator incurs in establishing the capacity to provide portability on its network and in its associated administrative systems. BT's current estimate of its set-up costs for the introduction of tromboning is £35 million, a relatively firm figure from BT's point of view as much of the expenditure has by now been incurred. This compares with an initial estimate by NERA in its January 1994 report of £20 million (itself derived from information provided by BT) and a first estimate from BT to OFTEL in February 1995 of £30 million.

6.8. The initial estimate by NERA of £20 million included £5 million for work done by switch manufacturers on software changes to their equipment, nearly £10 million for development of BT's management information systems and £5 million to create a national number and information database to provide information to the emergency services and for use in inter-network administration. The breakdown of BT's current estimate of £35 million is shown in Table 6.2.

TABLE 6.2 **BT: system set-up costs for tromboning**

	£m
NP systems development	13
Network management/line testing	5
Operator services	5
Billing information	2
Integration and other	3
AXE10 exchanges overlay	3
Design and management	2
Maintenance and support	2
Total	35
Comprising:	
Capital (bought-in hardware)	9
Manpower	24
Other	2
Total-as above	35

Source: BT.

The largest item in the expenditure is upgrades to the customer service information systems where BT carries out the work internally. For the switch adaptation costs we sought information from the two largest switch manufacturers involved-GPT Limited and Ericsson Limited-which broadly endorsed the level of the estimates made by BT.

Per line set-up costs

6.9. As noted (paragraph 6.3), per line set-up costs were first formally introduced into the debate when the proposed licence amendment was published for consultation in February 1995. BT's estimate of its per line set-up costs given to us in September 1995 was an average figure of £18, though with scope for reduction in the future as experience was gained and BT's remaining analogue (TXE4) exchanges, where porting requires additional manual work, were phased out. However, this position represented the outcome of substantial variations in estimates by BT over a relatively short period of time.

6.10. The first estimate given by BT to OFTEL in February 1995 was for an incremental per line set-up cost of £3, assuming that another required transaction, removal of the customer from BT's billing records,

took place at the same time. Later a per line set-up cost of £36.61 was indicated to the cable companies, but this was reduced by BT to £24.60 in its main submission to the MMC. We sought an explanation of such substantial movements between the estimates. BT told us that the initial £3 was a very early estimate which reflected the long-term future position with all systems developments in place and the phasing out of older exchanges completed; it also excluded overheads and a profit mark-up. The £36.61 (notified to the cable companies on 9 May 1995) was an estimate of BT's direct pay costs for the various set-up tasks together with an allowance for overheads and return on capital consistent with BT's submitted rates for data amendments, a service to other operators where the ground rules were already in place.

6.11. BT went on to state that the subsequent shift to the lower figure of £24.60 (introduced on 22 June 1995) reflected the application of reduced overhead rates and a lower profit mark-up following a recent determination by OFTEL of other comparable charges from BT to OLOs. The detailed make-up of the £24.60 is shown in Table 6.3.

TABLE 6.3 **BT: estimated per line set-up cost, June 1995**

	£
Direct pay	14.74
Overheads @ 55.6%	8.20
	22.94
Profit mark-up @ 7.24%	1.66
Total	24.60

Source: BT.

The £14.74 direct pay, an average over different types of exchange and of different categories of staff, represented one hour's labour for the technical officer grade at BT's current rates and was the estimated time taken for the various administrative tasks for line set-up using BT's existing systems and procedures.

6.12. We obtained from BT details of the assumptions underlying the calculation of the direct pay rate used which included allowances for overtime, national insurance, pension, training and holidays. The actual time spent will be sensitive to three considerations. First, there is a degree of trade-off between what BT spends on developing its customer service systems and the per occasion cost of changing data within those systems; the greater the spend on system set-up, the lower the cost of per line set-up. Secondly, the labour estimate is a weighted average and takes account of the fact that some customers to be ported will be from TXE4 exchanges where additional work at the exchange is required. Thirdly, the arrangements in place within the systems of the operator to which the number is to be ported will also affect BT's costs. Some operators will have well-developed technology and automated systems, but others could have less sophisticated arrangements including continued use of manual procedures. BT told us that it planned to use additional dedicated staff in a facility in Edinburgh, a normal practice within BT which, it told us, minimized training costs and would offer a high-quality service to other operators. By contrast some OLOs expect to use their existing staff already working primarily on other matters.

6.13. In the course of a hearing on 19 July 1995 BT stated that it expected its costs to fall fairly quickly, as a result of experience and the phasing out of TXE4 exchanges, to perhaps £15 and thereafter to go on declining. However, there was as yet no field experience on which to base cost estimates and procedures had not yet been agreed with OLOs, though proving trials with four cable companies were currently taking place. Accordingly the starting point of the cost estimate of one hour's labour at £14.74 could not be regarded as a firm or a permanent figure for use in considering the charging of costs between operators.

6.14. Subsequently BT told us on 15 August 1995 that it had revised its labour estimate downwards to 45 minutes to give an average cost of £18 (paragraph 6.9) and that there was scope for a further reduction to 30 minutes per occasion and an average cost of £12 when an automatic link between the customer service system and the operational management centre was in place. When de-averaged between digital and TXE4 exchanges (where an extra one hour of labour was required on each occasion), the per line estimate of £12 broke down into costs of £8 and £32 for the respective types of exchange. BT later offered a firm commitment to April 1996 for introduction of the reduced average rate of £12, together with differential charges according to type of exchange (subject to the consent of the DGT). On this basis most per line set-up charges after April 1996 would be at the £8 rate. BT added that its existing programme for the phasing out

of TXE4 exchanges was due for completion by September 1997, but this was subject to review and the availability of capital for the necessary investment.

6.15. BT provided a range of forecasts of NP take-up according to different pricing and market scenarios. If 3 million customers were to port their numbers over the next five years the consequent per line set-up costs would total £74 million on the basis of a per line set-up cost of £24.60. However, the total cost would fall to £24 million if the per line set-up cost was reduced to £8, as described in the preceding paragraph.

Additional conveyance costs

6.16. As with per line set-up costs, BT's estimates of its costs of additional conveyance under NP have declined as further analysis has been carried out. The estimates which BT gave us in September 1995 were for an average cost in 1995/96 of 0.54p a minute under tromboning and 0.2p a minute for call drop-back (this was expected to have fallen to 0.18p a minute by 1997/98 when call drop-back is introduced-paragraph 6.30).

6.17. In its cost-benefit analysis for OFTEL (paragraph 6.2) which was completed in January 1994, NERA made estimates of the additional conveyance costs incurred as a result of the introduction of NP. The extent of additional conveyance depends both on the type of call involved and on the basis of the comparison made.

6.18. For its estimates NERA divided calls terminating on local exchanges into five categories depending on the routeing involved, but in the calculation of additional conveyance costs for its submissions to us BT used a structure involving three types of call, one of which covered three of the call categories used by NERA. The three call types used by BT are:

Trunk delivered:	Long-distance and international calls delivered via at least one trunk exchange
Adjacent local exchange:	Local calls between local exchanges
Own exchange:	Calls solely within one local exchange area

BT's September 1995 assessment of the relative significance of the types of call, based on 1992/93 data, is shown in Table 6.4.

TABLE 6.4 **BT: breakdown of calls to local exchanges**

Call type	*%*
Trunk delivered	48
Adjacent local exchange	26
Own exchange	26
Total	100

Source: BT, based on 1992/93 data.

6.19. The calculation of the cost of additional conveyance on the BT network for delivery of a call resulting from the introduction of portability by the tromboning method (see paragraph 5.18) also depends on the assumption made as to what would have happened in the absence of portability. In order to explore this it is necessary to consider three possible customer relationships: the initial position while the customer is still on the BT network; the position where the customer has switched from BT with a new number being allocated by the new operator; and the position where there has been a change of operator accompanied by the porting of the original number from the BT network. The resulting call routeings involved for each of the call types are shown in Figure 5.4.

6.20. NERA recognized two main possibilities for making comparisons between call routeings to establish the extent of the additional conveyance involved: first, a comparison of the routeing of a call after a

number had been ported with the position while the called person was a customer on the BT network, and secondly, a comparison of the routeing of the call to a ported number with the position where there had been a change of operator but accompanied by a change of number. The number of additional uses of elements of BT's network in the two cases for each of the three types of call is shown in Table 6.5.

TABLE 6.5 **BT: additional routeing of calls to ported numbers**

	Type of call		
Network element	*Trunk delivered*	*Adjacent local exchange*	*Own exchange*
Comparison with routeing while called customer was on the BT network*			
Switching at exchanges†			
Trunk switch	1	1	1
Local switch	-	-	-
Transmission links between exchanges			
Local to trunk	1	1	1
Comparison with routeing to a new number on an OLO network			
Switching at exchanges†			
Trunk switch	1	-	-
Local switch	1	1	-
Transmission links between exchanges			
Local to trunk	2	-	-
Local to local	-	1	-

Source: MMC, based on information supplied by BT and NERA.

*Interconnection with the OLO and delivery of the call on the OLO network are additional factors in this case.

†The table shows the number of additional switches over which the ported call is carried. In addition ported calls make differential use of the switch functions (Appendix 6.1, paragraph 6).

6.21. In the first case, prior to porting, calls would have been routed direct to the BT local exchange to which the customer was connected so the additional conveyance, after the number has been ported, is the redirection from that BT local exchange to the BT trunk exchange and onward interconnection to the new operator. This additional routeing does not vary according to the type of call as the starting point of the conveyance for all three types of call is the BT local exchange to which the customer was connected before the change of operator took place. However, as a change of operator has occurred, there will now be interconnection with the other operator and delivery to the ported number on the other operator's network.

6.22. In the second case there is a comparison of the position after the number has been ported with the position that would have arisen in the case of calls to a customer of an OLO, but with a new number allocated by that OLO. If the number had been changed to one newly allocated by the OLO the call would have been routed directly to the appropriate BT trunk exchange for interconnection and transfer to the other operator's network. When instead the number is ported the call travels in the normal way on the BT network (as if it were still a BT number) to the destination local exchange, but as the number has now been ported it is then redirected to the appropriate BT trunk exchange for interconnection and onward transfer to the other operator's network. In this case the additional use of network elements does vary as between types of call as there are different routes to the BT local exchange and some offsetting savings in network use. In both relationships the called customer is on an OLO network, so interconnection and onward delivery is not an additional factor arising from the porting of the number.

6.23. In their submissions to us BT and OFTEL differed in their approach to establishing the extent of additional conveyance. OFTEL (paragraph 8.36) compared routeing of calls to the ported number with the routeing before porting and before the customer had moved to an OLO (a situation similar to the first case above). It considered the additional cost to be minimal in view of offsetting savings in use of the network for outgoing calls as a result of the customer moving to another operator. BT compared the routeing of calls to the ported number with the routeing to a new number on another operator's network (similar to the second case above). BT told us that it considered this a more appropriate comparison as *(a)* it avoided the need to

introduce the potentially confusing addition of the payment to the other operator for delivery of the call (paragraph 6.21) and *(b)* it was applicable to all call types; comparison of a call to a ported number with a call within the BT network prior to porting taking place would give a misleading result for own exchange calls.

6.24. The exact details of additional routeing on BT's network for the realization of the tromboning proposals are determined by the architecture of BT's network. The hierarchical structure of the network and the choice of trunk exchange level for outgoing interconnection with the networks of other operators reflect decisions taken by BT in the interests of the efficient delivery of service over its network as a whole, but they also affect the extent of the additional routeing required for implementing NP under the tromboning solution. For instance, if there were interconnection facilities between operators at local exchange level it would not be necessary after the call redirection at the local exchange is introduced to route a call to the trunk exchange for the interconnection to take place. However, interconnection at local exchange level would normally involve an OLO in setting up additional points of interconnection with BT and this would itself entail extra costs. BT also took account of differential exchange usage (breaking down into three parts the functions performed by an exchange-Appendix 6.1, paragraph 6) when quantifying extra conveyance, in addition to differentiation of call types and route factors.

6.25. Where there is a need for joint working between operators for the delivery of a call the general convention is that the originating operator (ie the operator serving the customer making the call) carries the call on its network as far as it chooses and then hands the call over to the other operator for onward conveyance and/or delivery. The price for the call is collected from the caller by the originating operator, which reimburses the other operator for the use of those elements of its system needed to complete the call. The net income from the call for the originating operator is the price of the call collected from the customer, less the sum paid to the other operator, and will vary according to the point of interconnection and the extent of the use made of the other operator's network. Interconnection charges are normally based on notional use of an efficient route rather than the route actually taken, which is determined in part by the architecture of the network carrying the call.

6.26. BT represented to us that it expected to recover from the OLO to which the number was ported the whole of the cost of the additional conveyance on its network. Early discussion between BT and Videotron in 1994 on the provision of NP took place on the basis of remote call forwarding (para-graph 5.16) as this was the only feasible basis if NP was to be introduced by 7 October 1994, the date specified in the 22 August 1994 direction from the DGT. Initially BT offered the remote call forwarding service to Videotron at the standard retail rates, but on 20 September 1994 it put forward an alternative proposal for the additional conveyance element involving a payment of 1.23p a minute. BT described the charge as being based on the ready reckoner rate, for use under interconnection arrangements, of a single tandem segment (a standard combination of network components including a local switch, a trunk switch and the transmission links between them). This conveyance rate of 1.23p a minute was used in the trials conducted by BT and four cable companies during our inquiry and was incorporated in BT's trial contract for the subsequent offer to introduce NP on a fully commercial basis, with the proviso that the rate would be adjusted retrospectively (with interest) when final arrangements had been resolved with OFTEL.

6.27. In its main submission to us in June 1995, BT told us that the average cost of additional conveyance in 1995/96 was 0.7p a minute (rounded to one place of decimals) and that this was falling by 10 per cent a year, though the cost was sensitive to what assumptions were made about numbers of lines ported, the pattern of calls and the time of day at which they were made. BT again based its cost estimates on a December 1993 determination made by the DGT of charges for the use of a local tandem segment, but this time it made an adjustment to remove the concentrator element of the use of a local switch. This adjustment, together with an allowance for falling costs since 1991/92 (the base year for the determination), had the effect of reducing the original 1.23p a minute, which had been offered to Videotron, to 0.67p a minute and this was rounded by BT to 0.7p a minute. BT told us that it felt a local tandem segment equated most closely to the use of the network made by tromboning and hence was considered a reasonable initial proxy for costing and charging purposes. BT also told us that in making its calculations it had made no allowance for the possibility that the extra demand for the use of its network due to NP was concentrated in particular localities or by time of day; this could mean additional costs if quality were not to be impaired.

6.28. When BT looked in more detail at the position and refined its estimate of additional conveyance from 0.7p a minute to 0.54p a minute (paragraph 6.16) it took account of the split between call types

(paragraph 6.18), the individual routeing of call types and the differential use of network elements by various types of ported call. More recent interconnection information than that of 1991/92 was also by then available and the rate of reduction in cost was revised to 7 per cent a year. On the use of network elements in tromboning of a trunk-delivered call, for instance, a local exchange was assessed as performing 60 per cent of the processing required for an average call and no concentration, while a trunk exchange was assessed as using 93 per cent of its average processing effort.

6.29. Details of the calculation of the conveyance rate of 0.54p a minute are given in Appendix 6.1, Table 1. When multiplied by BT's 1993/94 time of day gradient (both wholesale and retail rates for the use of the network vary according to the time of day) the rate of 0.54p a minute can be split down to prices of:

Day	0.69p a minute
Evening	0.41p a minute
Weekend	0.30p a minute

BT told us that the sort of customer likely to move to the cable networks tended to make relatively more off-peak calls than the average and provided estimates. If these estimates are correct the average additional conveyance for such customers would in practice be 0.48p a minute. As noted above (paragraph 6.6), BT would expect its charges for NP conveyance to be based on actual interconnection costs, as determined by OFTEL, and they would also reflect actual traffic and time of day profiles.

Transition to call drop-back

6.30. BT told us that the system set-up costs of a move to call drop-back should only be of the order of £2 million (in addition to the £35 million for tromboning-paragraph 6.7), of which £1 million was for supplier modification and £1 million for in-house testing. BT originally estimated in its June 1995 submission that the additional conveyance charge, once call drop-back had been introduced, would be in the range 0.15p a minute to 0.25p a minute. Subsequently BT was able to refine the average cost of additional conveyance under call drop-back to 0.2p a minute for 1995/96, falling at 7 per cent a year (it is thus expected to have fallen to 0.18p a minute by 1997/98 when call drop-back is introduced).

6.31. The principal difference between the trombone and call drop-back technologies is that under call drop-back the link between the final local exchange and the trunk exchange is released before the call set-up is complete. BT assumed in calculating the additional cost of conveyance under the call drop-back solution that only a signalling path would pass between the trunk exchange and the local exchange: the voice path between the two exchanges, which under tromboning is needed for the duration of the call, would no longer be required. Details of the BT calculation of the conveyance cost under call drop-back of 0.2p a minute, using similar assumptions on routeing factors to those above (paragraph 6.28), are shown in Appendix 6.1, Table 2. The resulting 0.2p a minute for 1995/96 splits between time of day categories as follows:

Day	0.26p a minute
Evening	0.15p a minute
Weekend	0.11p a minute

6.32. The conveyance cost of 0.18p a minute, expected to apply when call drop-back is introduced in 1997/98, is less than 40 per cent of the equivalent charge of 0.46p a minute for the same year under the tromboning solution (0.54p a minute rolled forward for a further two years of cost reduction at 7 per cent a year). BT's revised estimate of additional conveyance, incorporating both the refinement of the trombone cost to 0.54p a minute and the effect of the introduction of call drop-back from the beginning of November 1997, is shown in Table 6.6.

TABLE 6.6 **BT estimate of additional conveyance minutes and costs for NP**

	1995/96	*1996/97*	*1997/98*	*1998/99*	*1999/2000*
Lines ported ('000) (cumulative)	[				
Call minutes (m)			*Figures omitted. See note on page iv.*		
Total cost (£m)					]
Average cost per minute (p)	0.54	0.50	0.34	0.16	0.15

Source: BT.

Application of the predicted higher use of off-peak calls by customers likely to move to the cable companies (paragraph 6.29) reduces the costs shown in the table by around 11 per cent.

6.33. BT's estimates of additional conveyance costs (paragraphs 6.16 to 6.32) approached the matter essentially as an extension of the existing regime for interconnection between operators, with any additional conveyance brought about by the introduction of NP being treated as a further wholesale conveyance service. Initially the introduction of NP is likely to affect only a limited part of BT's network. The impact in any particular area will depend on the structure of BT's network and the rate at which the OLO concerned wins new customers. In some areas BT might have unused capacity in the network which for a time at least could be used to support NP without the need for any additional investment on the part of BT. In other areas there could be congestion with a requirement for further network investment.

6.34. An alternative way of assessing the cost of additional conveyance for portability would be to consider the impact on network capacity and the extent of additional investment actually required. BT provided us with information along these lines based on an analysis of theoretical traffic flows, supplemented by consideration of the position of four locations in the UK. BT concluded from its theoretical model that if 10 per cent of customers ported their numbers, increases in transmission capacity and processor capacity would be required under the tromboning solution for some types of call. Other types of call would give rise to reductions, though the resulting released capacity would not necessarily be capable of being reused immediately. The case studies in the four locations confirmed that the situation is complex and will differ from area to area according to the network structure, the particular demands of OLO traffic and the expected demand compared with BT's existing network investment plans. BT also emphasized the difficulty of isolating the investment requirements of NP from those of its other services and said that there was no direct match between the network investment carried out at any point in time and the demands of any particular service or customer. It had concluded that the most appropriate method for identifying additional cost was through the mechanism already existing under Condition 13 of its licence dealing with interconnection, which used average pricing against the assumption of a fully loaded network.

Alternative views of costs

6.35. In the course of the inquiry we received alternative views of the levels of costs involved in NP, particularly from OFTEL and a group of cable companies including Videotron.

OFTEL

6.36. OFTEL did not comment on the level of BT's system set-up costs (reported by OFTEL as being £30 million) as OFTEL had not sought to verify BT's cost estimates and the proposed licence amendment provided for each operator to bear its own system set-up costs. On the per line set-up costs, OFTEL asked BT to explain the increase in the estimate from the original £3 to £36 (paragraph 6.10) and was aware of the reduction of the estimate to £24.60, but had not sought to reach a conclusion on the matter in view of the reference to the MMC.

6.37. Commenting on the additional conveyance costs resulting from the use of tromboning, OFTEL emphasized the essentially short-run nature of this approach, with the prospective transition first to call drop-back and later to an IN solution, and pointed to the contrast with interconnection which involved long-run relationships between operators and ongoing investment. OFTEL said that it regarded the provision of capacity as the main influence on the cost of both switching and transmission in a network. The capacity requirement was determined by the time at which the level of demand was greatest (the `busy hour'). However, the busy hour could be assessed at any point in the network or for the network as a whole; different network components might have different busy hours; and the demand on the network included unsuccessful call attempts as well as completed calls. OFTEL considered that unless additional capacity in

the BT network was required to support NP, the cost to BT in the short term would be very small-the cost of electricity to send the message and possibly some additional maintenance.

6.38. OFTEL recognized that compared with a call to a competitor's customer who had not ported his/her number there was additional use of BT's network components. However, OFTEL concluded that when measured against the use of BT's network (for both incoming and outgoing calls) before the loss of the porting customer, it was unlikely that BT would be required to install significant extra capacity in the short term. The basis for this conclusion was that the increased network usage on incoming calls was compensated for by the reduced usage of the network for outgoing calls. OFTEL noted the arguments put by BT that additional switch and transmission capacity would be necessary in the short run. OFTEL agreed that BT had established that an increase in traffic was theoretically possible, but said that BT had also shown that theory and practice were not necessarily the same. In any event, OFTEL said that this did not prove that substantial actual costs would be incurred in the short run. The amount would depend on whether the increase in traffic necessitated an upgrade to BT's actual capacity; OFTEL doubted whether this would in the event be required on more than a handful of routes. The fact that the position could not be determined until NP was in operation constituted, OFTEL considered, a further reason for the DGT to be given discretion in relation to cost allocation.

Cable companies

6.39. Four cable companies (Bell Cablemedia, NYNEX, TeleWest and Videotron) made estimates of their incremental system set-up costs for NP which they put at between £1 million and £2 million for each major multi-system operator (a company providing both telecommunication and TV services). The breakdown of these set-up costs into switch-related costs and management information systems varied due to the use of different switch types and the varying levels of management systems development required.

6.40. For per line set-up costs the cable companies identified their costs both for porting numbers to BT (export) and for accepting ported numbers from BT (import). In both cases, the magnitude of the costs was dependent on the processes that were installed by the operators, which in turn were affected by the level of investment in system set-up costs (paragraph 6.12). In particular the cable companies considered that the existence of a real-time routeing device, which enabled the recipient installer remotely to activate the porting operation on the donor operator's switch, was a key factor in reducing per line set-up costs.

6.41. Table 6.7 shows the range of the estimated per line set-up costs incurred for both import and export of numbers, depending on whether a real-time router is available.

TABLE 6.7 **Cable companies: estimated per line set-up costs**

	per number charge, £	
Service	*With real-time router*	*Without real-time router*
Export number to BT	£0.37-£1.24	£1.00-£2.50
Import number from BT	£0.50	£4.29-£31.67

Source: The four cable companies.

The significantly higher costs for importing a number from BT in the absence of the use of a real-time routeing device on the part of BT was said by the cable companies to be due to the potential necessity for a second visit to the customer premises by the cable company staff. The cable companies told us that they were committed to installing real-time routeing devices to reduce the costs of importing numbers, but they were not aware of BT yet having made a similar decision.

6.42. The cable companies also provided estimates of the long-run incremental costs they expected to incur as a result of tromboning calls across their switches when called customers had ported their numbers to BT. These costs were assumed to be in the range of 0.08p a minute to 0.15p a minute, and contrasted with the estimates of BT (paragraph 6.29) which had been calculated on a fully allocated cost basis.

6.43. However, the cable companies told us that they did not consider long-run incremental costs to be the appropriate basis for the measurement of the costs of the use of the tromboning solution, which would be applied only until call drop-back was introduced. More appropriate, they said, would be short-run incremental or marginal costs, which they believed to be zero or very small taken overall. Indeed, the cable companies thought network usage could actually be reduced by the introduction of NP because the migration of customers to the networks of other operators would free capacity. The views of the cable companies are set out in more detail in Appendix 6.2.

Other operators

6.44. The other operators which provided evidence to us broadly supported the position taken by the cable companies. One long-distance network operator estimated the BT per line set-up costs at £5.17 and while it recognized that the data decode solution initially involved additional physical conveyance it regarded this as arising from inefficiencies in the BT network arrangements. These costs should not, therefore, be recoverable from other operators to which numbers had been ported.

Allocation of costs

6.45. Condition 34B.15 of the BT licence provides that nothing in the condition is to prevent BT from recovering from other operators the reasonable costs associated with allocating numbers to and routeing calls to other telecommunication systems, with the DGT having a power to determine the level of costs in the event of any dispute. However, the DGT told us that he had no power to resolve a dispute over who should bear the costs of establishing and maintaining the NP facility and had not sought to make a determination under Condition 34B.15 on the level of the costs involved.

6.46. In the amendment to the BT licence proposed by OFTEL (paragraph 6.3) there was provision for the DGT to determine the terms and conditions of an agreement for NP, including the reasonable charges payable by other operators to BT. These reasonable charges were to be calculated on the basis of fully allocated costs and a return on investment and determined as follows:

- *System set-up costs:* no charge to be based on or to incorporate system set-up costs.

- *Per line set-up costs:* BT's per line set-up costs to be recoverable.

- *Additional conveyance costs:* to be shared between BT and all operators as appropriate (see paragraph 8.38 for OFTEL's views on this matter).

The DGT's proposal for additional conveyance cost, though this would not be incorporated in the licence condition itself, was that there should not be any specific charges between BT and other operators for calls to ported numbers; rather, any additional outlays actually incurred by BT would be included in the overall cost of the operation of the network and recovered by interconnection charges from BT in the normal way. These standard interconnection charges would be slightly higher than they would be in the absence of NP. OFTEL told us that the effect of its proposals on additional conveyance would be to spread any additional cost over all OLOs approximately in proportion to their market share.

6.47. In reaching his proposed basis of allocation the DGT told us that he had had regard to the six principles set out in paragraph 8.41.

Regulatory accounting arrangements

6.48. Details of the accounting requirements for regulatory purposes currently affecting BT are given in Appendix 6.3.

Transition to IN

6.49. The technical aspects of the transition to an IN environment are discussed in paragraphs 5.25 to 5.31. At this stage the identification of the services that would be supported on an IN is uncertain and it follows that the costs attributable to a particular application, such as NP, are also unclear. BT indicated a range of set-up costs for introducing IN lying between £500 million and £1 billion, though much of this was general network investment which could also be used to provide other advanced services. In BT's submission per line set-up costs remained at £24.60 per occasion, though, as discussed above (paragraph 6.14), this figure should have fallen considerably before an IN solution is likely to be introduced. BT has made no forecast of additional conveyance costs for NP supported by an IN.

6.50. By way of illustration BT provided an estimate of the costs involved in installing a co-located database at each originating local exchange. Table 6.8 shows that the estimated total is £74.5 million, but this sum is likely to be dwarfed by the associated general network investment for which BT gave a range of £200 million to £800 million.

TABLE 6.8 **BT: outline cost of co-located database**

	£m
Interface to co-located database	1.5
Exchange software development	2.0
Call control software	10.0
Relational database*	61.0
Total	74.5

Source: BT.

*Alternative database facilities such as a flat memory database and a fault tolerant relational database would be available, at alternative levels of cost.

Other forms of NP

6.51. So far cost details in this chapter have been discussed with reference to the portability of single domestic exchange lines (or of a few lines for a small business), the kind of customer at whom the marketing activities of the cable companies have mainly been directed. Other forms of NP covered by the reference include those for number blocks and for non-geographic numbers, where different cost considerations apply.

Portability of number blocks

6.52. BT told us that it was continuing to study the implications of number block portability. The initial results indicated that for large blocks, 10,000 numbers, the porting of a block had to be regarded as a separate project with its own feasibility study and implementation plan. BT was not able to supply any estimate of the scale of the per project costs involved, but since control of such blocks passed to another operator on porting no additional conveyance costs would arise. For medium-sized blocks between tens and thousands of numbers, BT said that costs would also need to be considered on a per project basis, though the non-standard work required was likely to be less. BT envisaged that for small blocks per line porting costs would be on the same basis as for single lines, though possibly with some reduction as a result of economies of scale. For both small and medium-sized number blocks there would be additional conveyance costs and BT indicated to us that it would expect to recover those costs on a basis consistent with the interconnection pricing regime in the same way as for single ported lines.

Portability of non-geographic numbers

6.53. Non-geographic NP is currently being studied in the UK telecommunication industry against a background which includes experience in the USA, where IN features include an independently-operated central database for non-geographic numbers. We received no indication from either BT or other parties of what the cost of introducing non-geographic NP was likely to be. BT currently provides its 0800 services as part of an early type of IN introduced in 1990 as a stand-alone system. BT said that the system was likely to reach its capacity limits by 1998/99.