

# Interconnection Pricing Methodology

Prepared for the  
*Commerce Commission (New Zealand)*

By  
***frontier Economics***

5 April 2002

## *Table of Contents*

---

<i>Section</i>	<i>Page</i>
<b>Executive Summary .....</b>	<b>i</b>
<b>1. Introduction .....</b>	<b>1</b>
<b>2. Regulatory regime.....</b>	<b>4</b>
2.1. Legislative requirements.....	4
2.1.1. Applicable pricing principles.....	4
2.1.2. Purpose of the Act.....	7
2.2. Relevant features of the regulatory regime.....	9
<b>3. Interconnection services .....</b>	<b>11</b>
3.1. Local interconnection .....	11
3.1.1. Local voice calls.....	11
3.1.2. Local data calls .....	13
3.1.3. Agreements for local interconnection.....	14
3.2. Toll interconnection.....	14
3.3. Mobile-to-fixed interconnection .....	16
<b>4. Reasons why interconnection prices based on forward-looking costs may not give best effect to the purpose of the Act .....</b>	<b>18</b>
4.1. Practical difficulties in setting prices to reflect forward-looking costs 19	
<b>5. Local interconnection .....</b>	<b>21</b>

## *Table of Contents*

---

<i>Section</i>	<i>Page</i>
5.1. Interconnection for local data calls.....	21
5.1.1. Consequences of setting interconnection charges for local data calls above costs .....	22
5.1.2. Consequences of setting interconnection charges for local data calls below costs .....	27
5.1.3. Preliminary view .....	29
5.2. Interconnection for local voice calls .....	30
5.2.1. Consequences of setting interconnection charges for local voice calls above cost .....	30
5.2.2. Consequences of setting interconnection charges for local voice calls below cost .....	36
5.2.3. Implications for setting interconnection charges for local voice calls on the basis of TSLRIC and bill-and-keep .....	38
5.3. Using bill-and-keep for in-balance traffic, or up to a pre-specified limit of out-of-balance traffic.....	39
<b>6. Interconnection for toll calls.....</b>	<b>43</b>
6.1. Interconnection for toll-bypass calls .....	43
6.1.1. Setting interconnection charges for toll-bypass calls on the basis of bill-and-keep .....	43
6.2. Interconnection for the provision of toll-free calls.....	46
6.2.1. Setting interconnection charges for toll-free calls .....	46

*Table of Contents*

---

<i>Section</i>	<i>Page</i>
7. Mobile-to-fixed interconnection.....	48
Appendix 1: FCC Working Paper proposals.....	49

## **Executive Summary**

1. The Telecommunications Act 2001 (the Act) requires the Commerce Commission ('the Commission' or 'we') to consider whether a forward-looking cost-based approach to setting interconnection charges gives best effect to the purpose of the Act. If the Commission considers that there are circumstances where it does not, then it is provided the option of setting the charges on the basis of either:

- a pure bill-and-keep approach; or
- a hybrid bill-and-keep approach.

2. Under a pure bill-and-keep approach, call traffic between networks is exchanged without charge. Under a hybrid approach call traffic between networks that is in balance (or is out-of-balance up to a pre-specified limit) is exchanged without charge. The remainder of the call traffic is charged on the basis of forward-looking costs.

3. Under the Act, the Commission may be required to consider the merits of the forward-looking cost-based approach and bill-and-keep in setting prices for:

- interconnection for local calls (data and voice);
- interconnection for toll calls; and
- interconnection for mobile-to-fixed calls.

4. The choice between adopting a forward-looking cost-based approach and bill-and-keep depends primarily on three issues:

- consequences of setting interconnection prices that differ from forward-looking costs;
- consequences for the use of telecommunications services; and
- costs and uncertainty in implementation.

These will differ on a case-by-case basis.

**Consequences of setting interconnection prices that differ from forward-looking costs**

5. In theory, setting interconnection prices on the basis of forward-looking costs will, in most cases, generate outcomes that best promote the long-term interests of end-users. A key principle underlying the economics of public policy is that parties will make socially welfare-enhancing decisions if they are faced with the full costs and benefits of those decisions. In most cases, this will occur if the costs of providing interconnection services are signalled through the price.

6. In a determination, the Commission is required to estimate forward-looking costs on the basis of benchmarking against interconnection prices in comparable countries. In a review of a determination, we are required to estimate forward-looking costs on the basis of the total service long-run incremental cost (TSLRIC) of providing the services in New Zealand.

7. Under pure bill-and-keep, interconnection prices are set at zero. To varying degrees, prices based on bill-and-keep will always be set *below* the costs of providing interconnection services.

8. Setting interconnection prices that differ from costs can potentially have adverse consequences for competition and investment in the telecommunications industry. For instance, setting interconnection charges for dial-up calls to internet services providers (ISPs) above cost may inhibit the development of local network competition for residential users who make a large number of these calls. In some circumstances, the consequences for competition and investment of setting interconnection charges above or below cost may be asymmetric.

**Consequences for the use of telecommunications services**

9. The choice between forward-looking costs and bill-and-keep will also have implications for the retail prices of telecommunications services. In turn, this will have implications for whether or not consumers use telecommunications services efficiently. In an economic sense, it is efficient for a telephone call to be made if the benefits to the parties of the call outweigh the costs of the call.

10. For instance, it is possible that setting interconnection prices for dial-up calls to ISPs on the basis of forward-looking costs may ultimately encourage the inefficient over-use of the internet. It has been argued that recently in New

Zealand interconnection charges played a role in encouraging some ISPs to offer free internet services to end-users. These interconnection arrangements have since been replaced.

11. The relationships between interconnection prices, retail prices and the use of telecommunications services by end-users is not straightforward. It is complicated by the telecommunications service obligation (TSO) regime, which, among other things, imposes restrictions on the line rental and local call prices Telecom can offer residential users. The effects of setting interconnection prices on the basis of forward-looking costs or bill-and-keep must be examined on case-by-case basis.

### **Costs in implementation**

12. Estimating forward-looking costs typically involves the development and on-going refinement of bottom-up engineering-based models of the costs of telecommunications networks. This will require both the Commission and interested parties to make a significant investment of resources.

### **Interconnection for local data calls**

13. The adverse consequences of setting interconnection charges for local data calls above cost are likely to be more severe than setting them below cost. This gives bill-and-keep an advantage over a forward-looking cost-based approach.

14. If interconnection charges for local data calls are set above cost, terminating calls to ISPs that originate from users connected to other local networks can become very profitable. This profit opportunity will push down the connection and other fees local networks charge ISPs. In turn, this will enable ISPs to offer lower retail prices to users of the internet. In the extreme, if the interconnection charge is set sufficiently above cost, ISPs may offer end-users free internet access.

15. The consequences of this are three-fold. First, it will encourage the over-use of the internet. For example, if retail prices are low enough, end-users may be encouraged to stay connected to the internet permanently. Such behaviour can result in unnecessary and costly investment in network capacity.

16. Second, it may impede the development of local network competition for residential users. The higher the interconnection charge for local data calls,

the less profitable it will be for local network providers to offer local services to residential users. In some cases, it may make these users unprofitable. These users will become less attractive for competing local network providers.

17. Third, it will probably increase the size, and hence the efficiency cost, of funding Telecom New Zealand Limited's (Telecom's) net loss, if any, under the TSO.

18. Setting interconnection charges for local data calls below cost (as will occur under bill-and-keep) will not result in these adverse consequences.

19. Compared to using a forward-looking cost-based approach, setting interconnection charges for local data calls on the basis of bill-and-keep is likely to:

- result in more efficient use of the internet (including reducing the risk that users will remain connected to the internet even if they are not using it);
- result in more efficient investment in network capacity to service internet traffic;
- promote competition among local network providers in residential areas; and
- result in a lower efficiency cost in meeting the TSO.

These outcomes make bill-and-keep an attractive option for local data calls.

20. It is our preliminary view that setting interconnection charges for local data calls on the basis of bill-and-keep will be most likely to give best effect to the purpose of the Act.

### **Interconnection for local voice calls**

21. In relation to local voice calls, the choice between employing a forward-looking cost-based approach or bill-and-keep is less clear. However, there are merits in using a consistent approach to setting interconnection charges for local voice calls and local data calls. As a result, it is our preliminary view that interconnection charges for all local calls should be set

on the basis of pure bill-and-keep or some hybrid of bill-and-keep and forward-looking costs.

### **Toll call interconnection**

22. Using bill-and-keep to set interconnection charges for toll-bypass and toll-free calls can potentially undermine the ability of local network providers (including Telecom) to recover efficiently incurred costs in providing originating and terminating services. If, for example, toll-bypass operators do not pay local networks for originating and terminating toll calls, local network providers must seek recovery from other sources. However, the scope for them to do so is highly limited. As a result, bill-and-keep applied to toll-bypass interconnection will be likely to:

- inefficiently discourage local network providers from investing in the fixed public switched telephone network (PSTN);
- impede the development of local network competition; and
- distort competition in the provision of toll calls.

23. In our view, basing interconnection for toll-bypass and toll-free calls on the basis of forward-looking costs will give best effect to the purpose of the Act.

### **Mobile-to-fixed call interconnection**

24. Since terminating fixed-to-mobile calls is not a designated service, we have no powers to set zero charges. In our view, therefore, charges for mobile-to-fixed calls should be set on the basis of forward-looking costs.

## **1. Introduction**

25. The purpose of this paper is to examine the relative merits of determining prices for interconnection services on the basis of a forward-looking cost-based approach or a bill-and-keep approach.

26. Interconnection between telecommunications networks is necessary in order for end-users connected to one network to communicate with end-users connected to another network. For example, if a Telecom customer makes a local call to a Telstra-Clear customer, the call originates on Telecom's network and is terminated on TelstraClear's network. TelstraClear provides Telecom with an interconnection (or terminating) service in order for Telecom to provide the local call to its customer.

27. In this example, if the prices of interconnection services are set on the basis of forward-looking costs, Telecom would pay TelstraClear an interconnection fee based on the costs of terminating the local call. If the prices of interconnection services are determined using a pure bill-and-keep approach no payment would be made. That is, the price of interconnection services is set at zero.

28. Under the Act, the Commission is required to consider employing a forward-looking cost-based approach, a pure bill-and-keep approach or a hybrid of bill-and-keep and forward-looking costs (hybrid approach) to set interconnection charges. The Act requires us to make such a choice in the event of arbitrating a dispute concerning the price of:

- interconnection with Telecom's fixed Public Switched Telephone Network (PSTN); or
- interconnection with fixed PSTNs other than Telecom's.

29. In making a determination in relation to such a dispute, we are required to employ a bill-and-keep approach or a hybrid approach if we consider that a forward-looking cost-based approach does not give best effect to the purpose of the Act.

30. If we are required to estimate the forward-looking costs, the Act requires that the estimate for the final pricing principle is based on the total service long-run incremental cost (TSLRIC) of providing the services. As a

result, the terms 'forward-looking costs' and 'TSLRIC', when used in this paper, refer to the same approach.

31. In our view, the decision of whether to employ a forward-looking cost-based approach or a bill-and-keep approach involves an exercise of comparison. It is necessary to predict the likely outcomes under a forward-looking cost-based approach **and** under a bill-and-keep approach, and determine which outcome gives best effect to the purpose of the Act.

32. Forward-looking cost-based and bill-and-keep approaches both have their advantages and disadvantages. Although setting prices for interconnection services on the basis of forward-looking costs is, from most perspectives, ideal, estimating such costs is difficult in practice. It is possible that the estimate will be above or below the cost of providing the service. Under bill-and-keep, the price of interconnection services is set at zero. The price will always be below the cost of providing the service.

33. A major issue in deciding whether to set interconnection prices on the basis of forward-looking costs or bill-and-keep is whether the adverse consequences of setting the price too high (which is possible under a forward-looking cost-based approach but not bill-and-keep) are more severe than the consequences of setting the price too low (which can occur under a forward-looking cost-based and will occur under bill-and-keep). This will differ on a case-by-case basis.

34. It is our preliminary view that setting interconnection charges for local calls on the basis of bill-and-keep (or a hybrid approach) is likely to give better effect to the purpose of the Act than setting these charges on the basis of forward-looking costs. It is also our preliminary view that interconnection charges for toll-bypass and toll-free calls should be based on forward-looking costs.

35. These views are based on our current understanding of the telecommunications industry in New Zealand. To the extent this understanding or circumstances change, the views are subject to change. For instance, there may be circumstances under which the preferred pricing approach may have unintended consequences. As a result, it may be necessary to examine the relative merits of the different pricing approaches on a case-by-case basis.

36. The paper is divided into a number of sections. In the next section, the relevant aspects of the regulatory regime are outlined. Section 3 describes the

major interconnection services captured by the Act. Section 4 details the reasons and circumstances under which a forward-looking cost-based approach may not give best effect to the purpose of the Act. Section 5 examines the relative merits of setting interconnection charges for local voice and local data calls on the basis of forward-looking costs and bill-and-keep. Sections 6 and 7 do the same for interconnection services for toll calls and mobile-to-fixed calls respectively.

## **2. Regulatory regime**

### **2.1. Legislative requirements**

37. In making a determination of the price of interconnection services, the Commission must:

- make the determination in accordance with any applicable pricing principles; and
- consider other matters as specified in the Act.

#### **2.1.1. Applicable pricing principles**

38. If we are required to determine prices for designated services, the Act specifies that the determination must be made in accordance with any applicable access pricing principles. The pricing principles (set out below) detail our obligations in considering the choice between forward-looking costs and bill-and-keep. The initial pricing principles apply to our determination. The final pricing principles apply if we are required to review that determination.

#### **Interconnection with Telecom's fixed PSTN**

39. The initial pricing principle requires us to determine a price for interconnection with Telecom's fixed PSTN in accordance with:

Benchmarking against interconnection prices in comparable countries that result from the application to networks that are similar to the access provider's fixed PSTN of -

- (a) a forward-looking cost-based pricing method; or
- (b) if the Commission considers that a forward-looking cost-based pricing method does not best give effect to the purpose set out in section 18, whichever of the following methods that the Commission considers best gives effect to that purpose:
  - (i) a pure bill-and-keep method; or

- (ii) a pure bill-and-keep method applied to two-way traffic in balance (or to a specified margin of out-of-balance traffic) and a forward-looking cost-based pricing method applied to out-of-balance traffic (or traffic beyond a specified out-of-balance margin).

40. The final pricing principle requires us to determine a price for interconnection with Telecom's fixed PSTN, in accordance with:

- (a) TSLRIC; or
- (b) if the Commission considers that TSLRIC does not best give effect to the purpose set out in section 18, whichever of the following methods that the Commission considers best gives effect to that purpose:
  - (i) a pure bill-and-keep method; or
  - (ii) a pure bill-and-keep method applied to two-way traffic in balance (or to a specified margin of out-of-balance traffic) and TSLRIC applied to out-of-balance traffic (or traffic beyond a specified out-of-balance margin).

#### **Interconnection with fixed PSTNs other than Telecom's**

41. The initial pricing principle requires us to determine a price for interconnection with fixed PSTNs other than Telecom's in accordance with:

- (a) the price determined by the Commission (if any) for interconnection with a network of Telecom's that corresponds most closely in nature to the access provider's network; or
- (b) benchmarking against interconnection prices in comparable countries that result from the application to networks that are similar to the access provider's fixed PSTN of -
  - (i) a forward-looking cost-based pricing method; or
  - (ii) if the Commission considers that a forward-looking cost-based pricing method does not best give effect to the purpose set out in section 18, whichever of the following methods that the Commission considers best gives effect to that purpose:
    - (A) a pure bill-and-keep method; or
    - (B) a pure bill-and-keep method applied to two-way traffic in balance (or to a specified margin of out-of-balance traffic) and a forward-looking cost-based pricing method applied to

## *Interconnection Pricing Methodology*

---

out-of-balance traffic (or traffic beyond a specified out-of-balance margin).

42. The final pricing principle requires us to determine a price for interconnection with fixed PSTNs other than Telecom's, in accordance with:

- (a) the price determined by the Commission (if any) for interconnection with a network of Telecom's that corresponds most closely in nature to the access provider's network; or
- (b) TSLRIC; or
- (c) if the Commission considers that TSLRIC does not best give effect to the purpose set out in section 18, whichever of the following methods that the Commission considers best gives effect to that purpose:
  - (i) a pure bill-and-keep method; or
  - (ii) a pure bill-and-keep method applied to two-way traffic in balance (or to a specified margin of out-of-balance traffic) and a TSLRIC method applied to out-of-balance traffic (or traffic beyond a specified out-of-balance margin).

43. Furthermore, in applying the pricing principles, we must consider a number of other matters. Specifically:

In applying the initial pricing principle and the final pricing principle, the Commission must consider –

- (a) incentives to terminate dial-up internet traffic and other similar one-way traffic streams must be efficient; and
- (b) the effect of any obligation under the TSO instrument to provide price-capped unlimited calls.

If we are required to determine charges for interconnection with either:

- Telecom's fixed PSTN; or
- any other fixed PSTN

the determinations must be made in accordance with any applicable pricing principles. Under these pricing principles we are required to set the price on

the basis of forward-looking costs, or, if we consider that forward-looking cost-based pricing will not give best effect to the purpose of the Act, either:

- a pure bill-and-keep approach; or
- a hybrid approach where bill-and-keep is used for traffic that is in balance (or out-of-balance up to a pre-specified limit) and charges for out-of-balance traffic (or out-of-balance traffic outside the pre-specified limit) are set on the basis of forward-looking costs.

### **2.1.2. Purpose of the Act**

44. In determining the prices of these interconnection services, we must make a determination that we consider best gives, or is likely to best give, effect to the purpose set out in Section 18 of the Act.

45. Section 18 of the Act states:

(1) The purpose of this Part and Schedules 1 to 3 is to promote competition in telecommunications markets for the long-term benefit of end-users of telecommunications services within New Zealand by regulating, and providing for the regulation of, the supply of certain telecommunications services between service providers.

(2) In determining whether or not, or the extent to which, any act or omission will result, or will be likely to result, in competition in telecommunications markets for the long-term benefit of end-users of telecommunications services within New Zealand, the efficiencies that will result, or will be likely to result, from that act or omission must be considered.

46. We have provided a draft interpretation of the purpose of the Act (see Commerce Commission, *A Guide to the role of the Commerce Commission in making Access Determinations under the Telecommunications Act 2001, a discussion document, December 2001* ('the discussion document')).

47. In relation to promoting competition we note in the discussion document:

Competition will be promoted where efficient access prices provide the potential entrant with incentives for entry which neither encourage inefficient entry nor deter efficient entry. (paragraph 61)

48. In assessing the effects of our determinations, we note in paragraph 66 of the discussion document that we will consider three types of economic efficiency:

- *allocative efficiency* – where service providers use their resources to produce the telecommunications goods and services most valued by end-users;
- *productive efficiency* – where service providers produce telecommunications goods and services at least cost (and to minimise industry wide costs); and
- *dynamic efficiency* where service providers invest, innovate and improve telecommunications services, increase productivity and lower costs through time.

49. As we noted in the discussion document, there are trade-offs between these objectives.

Where there are tensions between short-term allocative efficiency and long-term dynamic efficiency, the Commission takes the preliminary view that the latter will generally better promote competition for the long-term benefits of end users. (paragraph 70)

50. Consistent with the interpretation stated in the discussion document, we will, if required, aim to determine access prices for interconnection services that:

- promote efficient entry and competition in the provision of telecommunications services (such as toll calls) by allowing more efficient providers to displace less efficient providers;
- encourage efficient investment in infrastructure over the medium to long term by allowing a reasonable return on capital invested in networks and for the production of services;
- encourage the entry of more efficient networks (efficient build-buy decisions);
- encourage access providers to provide the services efficiently;
- encourage the efficient use of telecommunications services; and

- minimise the risks associated with regulatory intervention, through adopting open, transparent and accountable decision-making processes.

## **2.2. Relevant features of the regulatory regime**

51. Three important considerations in assessing the pricing approaches are the likely effects (i) on the development of competition among telecommunications networks, (ii) on the incentives to invest in network infrastructure and (iii) on retail prices for telecommunications services.

52. The likely effects of the pricing approaches on these outcomes will in turn depend on the operation of the Telecommunications Service Obligation (TSO) regime. Two parts of the TSO regime are relevant:

- the pricing constraints imposed on Telecom's local residential telephone service; and
- the scope for Telecom to recover losses incurred in meeting its obligations under the TSO.

53. The TSO instrument imposes the following constraints on Telecom's retail pricing:

*Principle 1* – A local free-calling option for local residential telephone service will be maintained for all Telecom residential customers. Telecom may, however, offer other optional packages (including on a geographical or customer segment basis and which include call and other charges) to those who wish to take them as an alternative.

*Principle 2* – Telecom will charge no more than the standard residential rental for local residential telephone services. The pre-GST standard residential rental (as it was at 1 November 1989) will not be increased in real terms provided that the overall profitability of Telecom's fixed business, as evidenced by audited accounts prepared for that business, is not or will not be unreasonably impaired. Telecom may selectively offer lower prices (including on a geographical or customer segment basis) if it wishes.

*Principle 3* – The line rental for local residential telephone service for Telecom residential customers in rural areas will be no higher than the standard residential rental and Telecom will continue to make local residential telephone service as widely available as it is at the commencement date.

*Principle 4* – Directory assistance is to be continued on the basis set out in the exchange of letters between the Crown and Telecom in 1997.

54. Of particular importance are the obligations on Telecom to offer residential users the option of free local calls and the price cap on the line rental. These obligations limit the scope for retail prices to adjust in response to the prices of interconnection services set by the Commission.

55. Telecom is able to recover a portion of any net cost it incurs in meeting its obligations under the TSO from other providers. How much Telecom recovers from other providers will depend in part on their revenues from telecommunications services relative to Telecom's.

### **3. Interconnection services**

56. Under the Act, the Commission may be called upon to determine charges for three types of interconnection services:

- interconnection between local networks (local interconnection);
- interconnection between fixed networks for the provision of toll calls; and
- interconnection for calls from mobile phone users to fixed phone users (mobile-to-fixed interconnection).

The relative merits of setting charges on the basis of forward-looking costs or bill-and-keep differ across the types of interconnection services.

#### **3.1. Local interconnection**

57. Local calls are calls within the same local calling area. Local interconnection is the interconnection between two fixed local networks. In New Zealand, there are two major local networks. Telecom's local network passes most homes and businesses. TelstraClear's local network passes homes and businesses in Wellington and Christchurch, as well as businesses in Auckland.

58. For the purposes of considering the relative merits of setting interconnection charges on the basis of forward-looking costs or bill-and-keep, it is helpful to distinguish between local voice calls and local data calls.

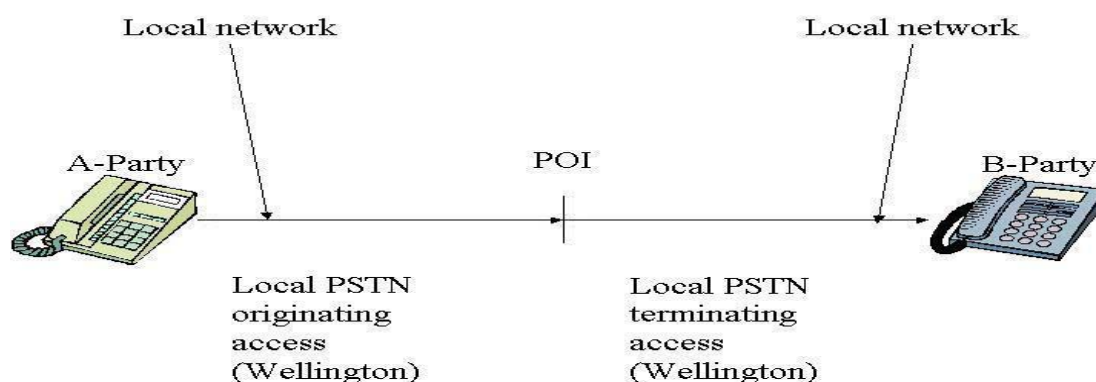
##### **3.1.1. Local voice calls**

59. Under the TSO, Telecom is required to offer residential users with the option of free local voice calls. There is no such requirement for business users.

60. Where an end-user makes a local voice call to an end-user on another local network, both networks play a role in completing the call. This is shown in Figure 1. Say a customer connected to Telecom's fixed PSTN (the A-party) makes a local voice call to a customer connected to TelstraClear's fixed PSTN. Telecom will convey the call to a point of handover or point of

interconnection (POI) with TelstraClear, who will then convey the call to the B-party.

**Figure 1: Local voice interconnection**



61. There are two parts to a charging regime for interconnection between local networks. One is the payments between local networks to terminate each others' local calls from the POIs. The other is the arrangements concerning the physical costs of interconnection between networks. The focus of this paper is on the former. Alternative models have recently been discussed in the United States (see Appendix 1) .

### **3.1.2. Local data calls**

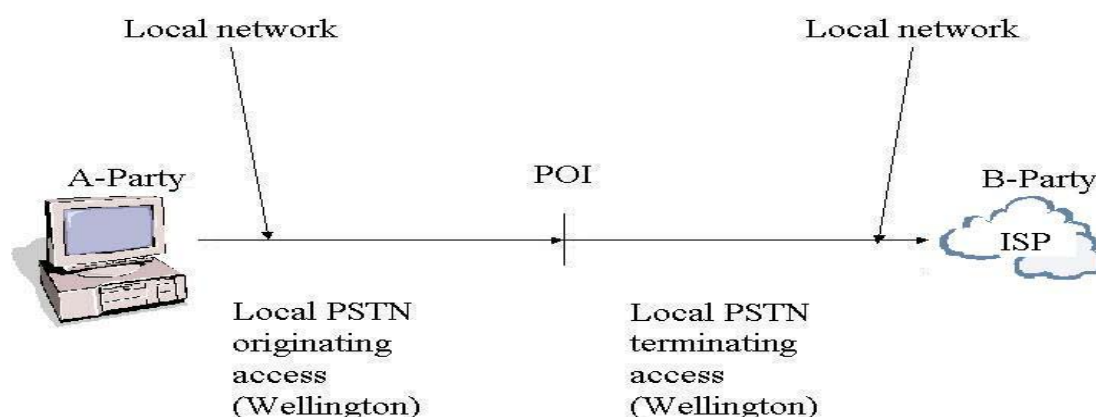
62. Currently, local data calls are primarily dial-up calls to internet service providers (ISPs).<sup>1</sup> Under the TSO, Telecom is required to offer residential users the option of free dial-up calls to ISPs. There is no such requirement for business users.

63. Where an end-user makes a dial-up call to an ISP connected to another local network, both local networks play a role in completing the call. This is shown in Figure 2. Say a customer connected to Telecom's fixed PSTN (the A-party) makes a local dial-up call to an ISP connected to TelstraClear's fixed PSTN. Telecom will convey the call to a point of handover or POI with TelstraClear, who will convey the call to the ISP.

---

<sup>1</sup> They also include other local calls data calls, such as calls to applications service providers.

Figure 2: Local data interconnection



### 3.1.3. Agreements for local interconnection

64. Under the recent Telecom-TelstraSaturn and Telecom-Clear interconnection agreements, charges for local call interconnection differ depending on the type of local call.

65. Certain types of local calls are categorised as callsinks. Callsinks are basically local telephone numbers that receive many more local call minutes (more than 10 times more) than they originate. Call sinks primarily capture local data calls. No interconnection charges are levied for terminating local calls to callsinks. In other words, local interconnection services for calls to callsinks are provided on a pure bill-and-keep basis.

66. Interconnection charges for **other** local calls are based on a hybrid approach.

## 3.2. Toll interconnection

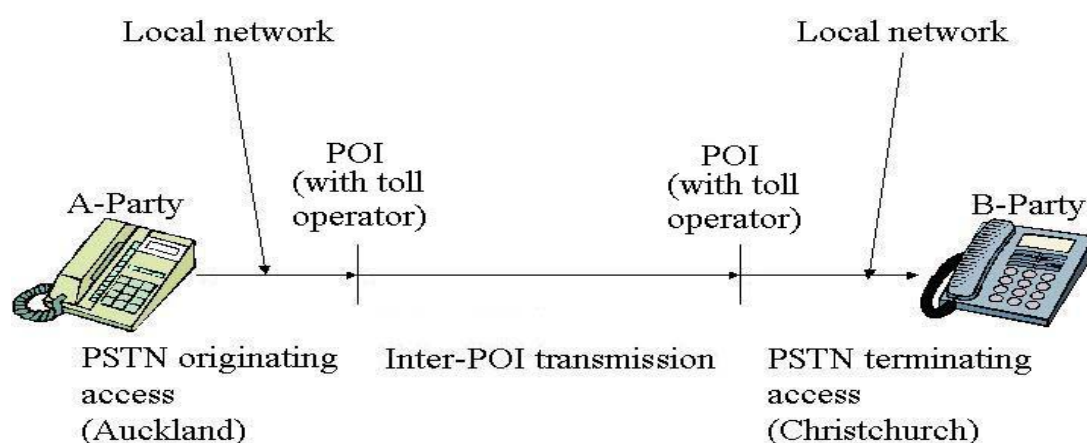
67. There are basically two types of toll interconnection:

- interconnection for toll-bypass calls; and
- interconnection for toll-free calls.

### **Interconnection for toll-bypass calls**

68. Consider a national toll call ,say, between an end-user in Auckland and an end-user in Christchurch. Assume that both end-users are connected to Telecom’s fixed PSTN. A toll-bypass operator requires Telecom to convey the call from the A-party to a point of handover (usually located in the same area). The toll-bypass operator then conveys the call between Auckland and Christchurch and hands the call back to Telecom at a point of handover in the same area as the B-party. Telecom then conveys the call the remainder of the distance to the B-party. This is shown in Figure 3. Toll bypass in New Zealand is facilitated by non-code access. Non-code access enables an end-user connected to Telecom’s fixed PSTN, for instance, to pre-select a toll-bypass operator to be their default provider of toll calls.

**Figure 3: Toll-bypass interconnection**



69. Under the Telecom-TelstraSaturn and Telecom-Clear interconnection agreements, charges are levied for interconnection services for toll-bypass calls.

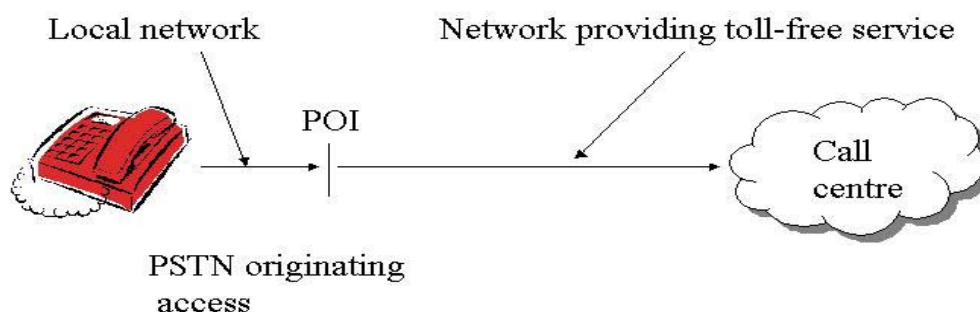
### **Interconnection for toll-free calls**

70. Toll-free calls are calls made from a mobile or fixed line phone to a toll-free number. Calls to toll-free numbers are provided without charge to the calling party. Generally, toll-free services are purchased by businesses (such

as an airline) that place a high value on receiving calls. In many cases, calls to toll-free numbers are directed to call centres, which may or may not be located in the same local calling area as the party making the call. Interconnection between fixed PSTNs in order to provide toll-free calls is displayed in Figure 4 below.

71. Under the Telecom-TelstraSaturn and Telecom-Clear interconnection agreements, charges are levied for interconnection services for toll-free calls.

**Figure 4: Interconnection for toll-free calls**



### **3.3. Mobile-to-fixed interconnection**

72. Mobile-to-fixed interconnection services are interconnection services between mobile network providers and fixed network providers. Say a Vodafone New Zealand Limited ('Vodafone') mobile customer makes a call to an end-user connected to Telecom's fixed PSTN (a mobile-to-fixed call). As shown in Figure 5 below, Vodafone will convey the call to a point of handover with Telecom in the same area as the B-party. Telecom will then convey the call the remainder of the distance.

73. Under the current Telecom-Vodafone interconnection agreement, Telecom charges Vodafone for terminating mobile-to-fixed calls.

**Figure 5: Mobile-to-fixed interconnection**



74. It is important to note that, although the Commission may be called upon to determine the interconnection charge paid by Vodafone to Telecom to terminate such a call, currently we cannot be called upon to determine the interconnection charge Telecom pays Vodafone for a call in the other direction (a fixed-to-mobile call). Interconnection services provided by mobile network providers are not designated services under the Act.

## **4. Reasons why interconnection prices based on forward-looking costs may not give best effect to the purpose of the Act**

75. The remainder of the paper is divided into two broad parts. This section discusses the reasons and circumstances under which setting interconnection charges on the basis of forward-looking costs may not give best effect to the purpose of the Act. This is relevant, as the Act requires the Commission to consider using a bill-and-keep approach if we consider that setting charges on the basis of forward-looking costs will not give best effect to the purpose of the Act. This is followed by an examination of the relative merits of a forward-looking cost-based approach and bill-and-keep for:

- interconnection for local calls (data and voice);
- interconnection for toll calls; and
- interconnection for mobile-to-fixed calls.

76. Prices of interconnection services affect a range of economic decisions. The price received by the provider of the interconnection service (the access provider) will affect its incentives to invest in network infrastructure. The price paid by the access seeker will affect its incentives to enter and compete in telecommunications markets. Retail prices paid by end-users (which ultimately depend in part on the price of interconnection services) will affect the use of telecommunications services.

77. In order for these economic decisions to be efficient, parties must weigh up the full costs and benefits of those decisions. In most circumstances, in order for this to occur, the full forward-looking cost of the interconnection service must be signalled through the price.

78. As noted by Professors Janusz Ordover and Robert Willig:

Economic cost-based charges best serve the public interest by promoting the twin goals of efficiency (in investment and use) and competitive neutrality. This is true regardless of the jurisdictional or regulatory classifications of the traffic, carriers, or

customers involved and regardless of the networks or technologies used to provide the services.<sup>2</sup>

79. Although, in theory, setting interconnection charges on the basis of forward-looking costs may be preferable, in practice there may be circumstances where such an approach may not give best effect to the purpose of the Act.

#### **4.1. Practical difficulties in setting prices to reflect forward-looking costs**

##### **Estimating the level of forward-looking costs**

80. To set interconnection prices on the basis of forward-looking costs requires knowledge of those costs. However, the Commission's (and even the access provider's) knowledge of these costs is likely to be imperfect. As a result, forward-looking costs must be estimated. Estimating the forward-looking costs of providing interconnection services requires us to make a number of decisions, including the efficient forward-looking network technology, the efficient forward-looking network design, efficient operating costs consistent with that technology and design, and the cost of capital facing the access provider. Each of these decisions requires judgement.

##### **Setting prices to reflect the structure of costs**

81. To the extent possible, interconnection charges should mirror the manner in which the costs of providing the service are generated. For example, the costs of providing interconnection services are likely to differ according to the time of the day and the day of the week. At some times of the day (such as late at night), the traffic using telecommunications networks is low. Given there is idle network capacity during those times, the cost of additional calls can be negligible. During the peak times of the day, networks can be at, or close to, capacity. Calls during those times are more costly.<sup>3</sup>

---

<sup>2</sup> Declaration of Janusz A. Ordovery and Robert D. Willig on behalf of AT&T Corp. before the Federal Communications Commission, CC Docket No. 01-92 *In the Matter of Developing a Unified Intercarrier Compensation Regime*, p. 5.

<sup>3</sup> As call traffic during the busy hour determines the capacity of the network, from an economic viewpoint, that traffic causes the costs of the capacity. Call traffic during off-peak times only causes the additional cost of conveying the traffic, given the network has been built to meet peak demand.

However, structuring interconnection prices to reflect the differences in costs over the time of day requires detailed knowledge of the busy hours and the sizes of the costs in the busy and non-busy hours. The interconnection agreements between Telecom-TelstraSaturn and Telecom-Clear do not set interconnection charges that differ by the time of day.

In theory, setting interconnection charges to reflect forward-looking costs is likely to be the best approach. In practice, however, estimating the level and structure of forward-looking costs is difficult. Compromises are inevitable. In some circumstances, these compromises will be of little consequence. In other circumstances, they may be to the long-term detriment to end-users. The likely consequences must be assessed on a case-by-case basis.

## 5. Local interconnection

82. Some local calls involve interconnection between two networks. This section considers whether the Commission should determine local interconnection charges on the basis of forward-looking costs or bill-and-keep. Although many of the issues are similar, it is useful to separate the discussion into interconnection for local data calls and local voice calls.

### 5.1. Interconnection for local data calls

83. Local data calls have a number of characteristics that differentiate them from typical local voice calls. First, local data calls are typically made in one direction. ISPs receive a large number of local calls, but make few (if any). That is, they are *net receivers* of local calls. Second, local data calls are typically of longer duration than local voice calls.

84. In a determination, the Commission is required to estimate forward-looking costs on the basis of benchmarking against interconnection prices in comparable countries. In a review of a determination, we are required to estimate forward-looking costs on the basis of the TSLRIC of providing the services. It is possible that the actual price we set will be *above or below* the forward-looking costs of the interconnection service.

85. Under a pure bill-and-keep approach, the price of the interconnection service is set at zero. As terminating local data calls will necessarily involve some costs, a price set on the basis of bill-and-keep will necessarily be *below* the forward-looking cost of providing the interconnection service.

There is a clear asymmetry between the forward-looking cost-based approach and the bill-and-keep approach. Under a forward-looking cost-based approach, there is a risk that the Commission will set interconnection charges that are above or below forward-looking costs. Under a bill-and-keep approach, we will necessarily set the price below forward-looking costs. A key issue in assessing the relative merits of the two approaches is the likely consequences of setting prices above or below cost.

### **5.1.1. Consequences of setting interconnection charges for local data calls above costs**

#### **Incentives to attract ISPs**

86. If the interconnection price is set above the forward-looking cost of terminating local data calls, the immediate effect will be to enhance the incentives for local network providers (such as Telecom or TelstraClear) to attract ISPs to connect to their local network.<sup>4</sup> There are two reasons for this.

87. First, the local network provider that attracts the ISP will achieve a profit on calls made by users on other local networks. Say there are two local network providers (Network A and Network B), each with 10 residential customers. Assume that the cost of originating local data calls is 1 cent per minute and the cost of terminating local data calls is 1 cent per minute. Assume this is the same for both networks. Say that the Commission sets a terminating access charge of 2 cents per minute. Say the ISP connects to Network A. For each call made to the ISP by customers on Network B, Network A will make a profit of 1 cent for each minute the call lasts (revenue of 2 cents per minute *less* costs of 1 cent per minute). Given that dial-up calls to ISPs tend to be of long duration, this profit can be quite large.

88. Second, the local network provider that attracts the ISP will improve its competitive position relative to the other local network. Say that, in the example above, each residential customer connected to Networks A and B makes one 10 minute call to the ISP. If the ISP connects to Network A, then the increase in costs Network A will incur in serving each of its residential customers will be 20 cents (one call of 10 minutes *multiplied by* (1 cent per minute for origination *plus* 1 cent per minute for termination)). The increase in costs Network B will incur in serving each of its residential customers will be 30 cents (one call of 10 minutes *multiplied by* (1 cent per minute for origination *plus* 2 cents per minute in termination charges)). As a result, Network A will be able to either offer lower charges for local services to its customers (specifically lower line rental charges) or achieve higher profits. Gaining the ISP improves Networks A's competitive position relative to Network B.

---

<sup>4</sup> As this incentive is created by the regulatory regime rather than differences in the relative costs of the networks or the relative quality of the service offered, it is arbitrary. A number of commentators refer to artificial incentives created by regulation as regulatory arbitrage.

89. Competition among local network providers for ISPs will be likely to result in lower connection and other charges to ISPs. If the profits from connecting ISPs are sufficiently large, local network providers may even pay ISPs to connect to their networks. The greater the difference between the interconnection charge and the cost of providing the termination service, the greater the discounts that networks will offer to ISPs.

90. In turn, lower connection and other charges to ISPs will be likely to result in ISPs offering lower retail prices to consumers. If the discounts to the ISPs are sufficiently large, some ISPs may even offer free internet services to consumers.

Setting interconnection charges for local data calls *above* the cost of providing the service will *initially* enhance the incentives of local network providers to attract ISPs to connect to their network. In turn this will be likely to result in:

- lower charges for ISPs; and
- lower retail prices for ISP services.

### **Implications for the number and duration of local calls to ISPs**

91. As noted above, setting interconnection charges for local data calls above cost will flow through to lower retail prices for internet services to end-users. It is our understanding that in New Zealand, at least until recently, some ISPs offered free internet services. Lower ISP retail charges will lead to increased use of the internet, in terms of both the number and duration of calls to ISPs. One key issue is whether the increase in internet usage is efficient.

92. A user will make efficient decisions concerning the use of the internet if he/she faces the full economic cost of that use. When a customer dials up an ISP, it would be efficient for that customer to face the combined cost of:

- originating the local call;
- terminating the local call; and
- providing the ISP service (including the cost of gaining access to the internet, customer service, etc.).

93. It is important to recognise two issues. First, as Telecom is required to provide residential users with free dial-up internet calls under the TSO, these users do not face the cost of (originating and terminating) local data calls. Any resulting over-use of the internet resulting from free dial-up internet calls is a consequence of the TSO.

94. Second, setting interconnection charges for local data calls above cost may result in an **additional** inefficiency. If local networks provide connection and other services to ISPs below cost (as a result of the interconnection profit the local network earns from terminating traffic to the ISP), then it is possible that, in turn, the ISP will offer internet services to end-users below cost. That is, end-users will not face the full cost of the ISP service. In fact, residential consumers that signed onto free internet services in New Zealand in recent times were signalled few if any of the costs of their internet usage.<sup>5</sup>

95. Since consumers are not bearing the full cost of their decisions to use the internet, the network will bear heavier traffic than would be the case if consumers were bearing the full cost of usage. In the extreme, ISPs (or an ISP's local network provider) could encourage consumers to stay connected to the internet permanently even when they are not using it. The end result could be significant over-investment in ISP services and telecommunications network capacity needed to provide them.

Setting interconnection charges for local data calls above cost will be likely to result in lower retail ISP prices, encouraging greater use of the internet. There is a risk that this will encourage over-investment in telecommunications network capacity.

### **Effects on investment and competition among local network providers**

96. Investment in local networks tends to be targeted toward certain areas and classes of customers. For instance, initially Clear's local network roll-outs focused on business districts with the aim of primarily attracting business users. On the other hand, TelstraSaturn packaged its investment in local networks with Pay-TV and primarily targeted residential users. The

---

<sup>5</sup> It is possible that discounted internet access is provided in exchange for 'putting up with' advertising throughout the internet session. In such a case, the end-user incurs some of the costs of access to the internet.

implications of setting interconnection charges for local data services above cost will differ across the business and residential segments of the market.

*Competition for ISPs*

97. Setting interconnection charges for local data calls above cost will not artificially advantage or disadvantage local network providers (including Telecom) when competing for ISPs. Although setting interconnection charges above cost will be likely to increase the number of ISPs (to service the resulting increase in demand for internet usage), and increase the incentives for local network providers to connect ISPs to their network, it will not impede particular network providers in competing for ISPs. As local network providers will be able to compete based on their relative merits, setting interconnection charges above cost is competitively neutral.

*Competition for residential users*

98. Setting interconnection charges above cost could adversely affect competition among local network providers for residential users. Under the TSO, Telecom must offer residential users free local data calls. To compete, other networks must offer comparable deals. The higher the interconnection charges that networks must pay (for calls to ISPs on other local networks), the less likely it is that residential customers who are heavy users of the internet will be profitable. This might deter local network providers from entering and competing for residential customers.

99. An example may assist. Say within a particular area an average residential user makes 800 minutes of calls to ISPs a month. Assume that the calls are to ISPs on another local network. Say the price cap for line rental is \$40 per month and that the cost to the network provider of connecting the customer to its network is \$20 per month.

100. Initially assume that the cost of originating local data calls is 1 cent per minute and that the terminating access charge is set at 1 cent per minute, which equals cost. Ignore any other telecommunications services and revenues (including local voice calls) for the purposes of demonstration. The local network provider will make a **profit** of \$4 (\$40 less \$20 less  $800 \times (2 \text{ cents})$ ) per month from this customer.

101. Now, assume that the terminating access charge is set above cost at 2 cents per minute. Again ignoring any other telecommunications services and

revenues, the local network provider will make a **loss** of \$4 (\$40 less \$20 less  $800 \times (3 \text{ cents})$ ) per month.

102. Assuming that this local network provider is equally as efficient as Telecom in providing local services to this customer (i.e. the cost incurred by Telecom in connecting this customer and originating local data calls is also \$20 and 1 cent per minute respectively), entry may be efficient (or at least marginal).

103. If line rental charges and local call prices were free to move, one or both would increase until, at least on average, residential users become profitable. However, these prices are constrained by the TSO. Although entry of the competing local network provider may be efficient, setting the interconnection charge above cost **combined** with the operation of the TSO may discourage that entry.

104. It should be recognised that efficient entry of competing local network providers in residential areas may be discouraged even if terminating access charges are set equal to or even below cost. The source of the distortion is the constraint on residential line rental and local call charges imposed by the TSO. Setting terminating access charges above cost exacerbates the distortion.

105. Although setting interconnection charges for local data calls above cost may discourage entry, it should not undermine the services provided to residential users. As noted previously, Telecom is obligated to provide local data services to residential users. The higher the interconnection charges paid by Telecom for local data calls, the larger will be its net cost from serving commercially non-viable residential customers. The higher net cost is then recovered from telecommunications providers (including Telecom).

106. It should be recognised, however, that funding the TSO is not costless. The TSO is ultimately funded through 'taxes' on other telecommunications services. This is likely to result in the inefficient under-use of these services. By unnecessarily increasing the size of the net loss under the TSO, setting interconnection charges for local data calls above cost will unnecessarily increase this efficiency loss.

*Competition for business users*

107. The key difference between business users and residential users is that the line rental and local call charges for the former are unconstrained. As a result, if initially setting interconnection charges for local data calls above cost

makes some business users unprofitable, retail prices will increase. Therefore, the incentives to enter and compete for business users will be largely unaffected by setting interconnection charges above cost.

It is unlikely that setting interconnection charges for local data calls *above* the cost of providing the service will distort the development of local network competition for ISPs or business users. However, it is likely to exacerbate the effects of the existing impediment to local network competition created by the price constraints under the TSO.

Setting interconnection charges for local data calls above cost could also unnecessarily increase the size of the TSO, and hence the efficiency losses associated with funding the TSO.

### **5.1.2. Consequences of setting interconnection charges for local data calls below costs**

108. Under the bill-and-keep approach interconnection charges are set below cost, even though each operator incurs indirect costs through the reciprocal obligation to terminate without compensation calls originating in the other network.

109. Setting interconnection charges for local data calls below cost will initially reduce the incentives for local network providers to attract ISPs to their network. As the cost of terminating local data calls will exceed the revenue from doing so, connecting ISPs will initially become less profitable for local network providers. As a result, connection and other charges to ISPs, and in turn retail ISP prices, will be likely to rise.

Setting interconnection charges for local data calls *below* the cost of providing the service will *initially* reduce the incentives for local network providers to attract ISPs to connect to their network. In turn, this will be likely to result in:

- higher charges for ISPs; and
- higher retail prices for ISP services.

110. Setting interconnection charges for local data calls below cost will flow through to higher retail prices for internet services to end-users. This is likely to reduce the number and duration of internet calls. In turn, this will result in the more efficient use of the internet. However, it must be recognised that this will occur through 'undoing' some of the effects of the TSO.

111. Say, for instance, that the cost of terminating local data calls is 1 cent per minute, but the Commission sets a price of 0 cents per minute (on the basis of bill-and-keep, for instance). Local network providers terminating local data calls will look to recover the shortfall from ISPs. In turn, ISPs will look to recover the difference from their customers. Consequently, in this example, residential customers will end up paying for the cost of terminating local calls through ISP charges. This is efficient, as users will face a larger proportion of the cost of internet usage. However, it involves residential end-users implicitly paying for some of the costs of local data calls through the retail prices charged by ISPs.

Setting interconnection charges for local data calls *below* the cost of providing the service will be likely to result in the more efficient use of the internet. This occurs because residential users will face more of the costs of local data calls through ISP charges.

112. Since the prices networks charge ISPs to connect to their network are unconstrained, a below-cost interconnection price (including a price of zero under bill-and-keep) will not distort the development of competition among local network providers for ISPs. As noted by Dr Julian Wright:

It is sometimes argued that setting termination charges to zero would leave little incentive for networks to offer termination services, at least those of high quality. This is not in fact true. Firms can still recover revenue directly from customers and so will still want to offer quality termination services if these are desired by consumers. However, whether policy makers will find the resulting increase in price of Internet dial-in acceptable is another matter.<sup>6</sup>

113. Further, by reducing the cost of providing local services to residential users (especially those that use the internet intensively), setting the price of terminating local data calls below costs will be likely to reduce the number of

---

<sup>6</sup> Wright, J., *Terminating Calls to Internet Service Providers*, June 2001, page 25 at <http://metric.eco.auckland.ac.nz/~jwright/isp.pdf>

loss-making residential users. There are two potential consequences of this. First, competition among local network providers for these type of customers may be enhanced. Second, the size, and hence the efficiency cost of funding, the TSO may be reduced.

Setting interconnection charges for local data calls *below* the cost of providing the service will not distort the development of local network competition for ISPs or business users. Further, it will be likely to reduce the effects of the price controls under the TSO in impeding the development of local network competition for residential users.

Setting interconnection charges for local data calls *below* cost could also reduce the size and efficiency cost of funding the TSO.

### **5.1.3. Preliminary view**

114. The key issue in assessing the relative merits of a forward-looking cost-based approach or bill-and-keep for setting interconnection charges for local data calls is the likely effects of setting these charges above or below cost. Compared to setting charges above cost, setting them below cost is likely to:

- result in the more efficient use of the internet (including reducing the risk that users will remain connected to the internet even when they are not using it);
- result in more efficient investment levels in network capacity to service internet traffic;
- promote competition among local network providers in residential areas; and
- result in a lower efficiency cost in recovering the TSO.

115. Given that a bill-and-keep approach, by definition, sets interconnection charges below cost, and has no risk of setting them above cost, it would appear to be an appropriate choice for setting the interconnection charge for local data calls.

It is our preliminary view that setting interconnection charges for local data calls on the basis of bill-and-keep will be most likely to give best effect to the purpose of the Act.

## **5.2. Interconnection for local voice calls**

116. In this section, the relative merits of employing a forward-looking cost-based approach or bill-and-keep for the termination of local voice calls are analysed. Due to the difficulties of setting interconnection charges accurately on the basis of forward-looking costs, it is possible that any price set by the Commission will be *above or below* the true forward-looking costs of terminating local voice calls. Under a pure bill-and-keep approach, the price of the interconnection service is set at zero. As terminating local voice calls will necessarily involve some costs, a price set on the basis of bill-and-keep will necessarily be *below* the forward-looking cost of providing the interconnection service.

### **5.2.1. Consequences of setting interconnection charges for local voice calls above cost**

117. Setting interconnection prices for local voice calls above cost will initially:

- increase the incentives for local network providers to attract customers who are **net receivers** of local voice calls (such as a theatre or a department store); and
- reduce the incentives for local network providers to attract customers who are **net originators** of local voice calls (such as a telemarketing company)

118. The effects of these incentives depend on whether interconnection charges can be passed on to end-users.

#### **Effects on investment and competition among local network providers**

The effects on local network investment and competition will be likely to differ depending on the class of customer. Four cases are considered below.

*Case 1: Business users who are net originators of local voice calls*

119. Setting interconnection charges above cost raises the cost of serving businesses who are net originators of local voice calls. However, as business line rental charges and local call charges are unregulated, these costs can be passed on to these users.

120. A simplified example may assist. Say a business user on Network A makes 10 calls to users on Network B. Further, say that the business user receives no calls. Say also that the costs of providing local calls consists of 1 cent for call origination and 1 cent for call termination. Assume that the terminating access charge is set by the Commission at 2 cents per call. Also assume that the price of a local call is 2 cents per call.

121. The initial outcome (before price adjustment) is detailed in Table 1 below. Network A will:

- receive call revenue of 20 cents (10 calls *multiplied* by the price of 2 cents per local call);
- incur costs of 10 cents in originating the calls on its network; and
- pay Network B 20 cents (10 calls *multiplied* by 2 cents per call) for terminating calls made to Network B.

122. Network A will initially make a loss of 10 cents. Given that terminating access charges are above cost, the business user (as a net originator of calls) is unprofitable. However, as charges for business users are not constrained under the TSO, this outcome is not sustainable. Charges to the business user will increase to 30 cents (this could be through an increase in call charges or line rental charges), where the business user is just profitable.

**Table 1: Business user - net originator of calls**

	Call revenue from business customer (cents)	Network costs (cents)	Payments to other network provider (cents)	Profit/loss (cents)

## *Interconnection Pricing Methodology*

---

<i>Before price adjustment</i>	20	10	20	10 (loss)
<i>After price adjustment</i>	30	10	20	0

123. Although the higher retail prices to businesses who are net originators of local calls will be likely to have some effect on the number of local calls, setting interconnection charges above cost will not impede particular network providers in competing for these business users. As local network providers will be able to compete based on their relative merits, setting interconnection charges above cost is competitively neutral. Further, setting interconnection charges above cost will not undermine the incentives for local network providers (including Telecom) to invest. Any initial disincentive will be nullified by the increase in retail prices.

Given that retail prices can adjust, setting interconnection charges for local voice calls above cost:

- will not undermine the incentives for local network providers to invest to provide local services to business users who are net originators of local voice calls; and
- will not encourage inefficient entry or discourage efficient entry of competing local network providers.

### *Case 2: Business users who are net receivers of local voice calls*

124. Setting interconnection charges for local voice calls above cost makes business customers who are net receivers of local voice calls more profitable. This will enhance the incentives for local network providers to attract net receivers of calls. In turn, retail charges for these users will be bid down.

125. Say a business user on Network A receives 10 calls from users on Network B. Further, say that the business user makes no calls. Using the costs and charges in the previous example, Network A will initially make a profit of 10 cents. Given that interconnection charges are above cost, the business user that is a net recipient of calls is profitable. Competition for these users

will result in retail charges decreasing until economic profits fall to zero. In the example below, local networks will pay the user to connect to their network.<sup>7</sup>

---

<sup>7</sup> More realistically competition for these types of users will reduce line rental charges below the cost of connecting the users to the network.

---

**Table 2: Business user – net receiver of calls**

	Revenue from business customer (cents)	Network costs (cents)	Payments from other network provider (cents)	Profit/loss (cents)
<i>Before price adjustment</i>	0	10	20	10 (profit)
<i>After price adjustment</i>	-10	10	20	0

126. Although the lower retail prices to businesses who are net receivers of local calls will be likely to have some effect on the number of local calls, setting interconnection charges above cost will not impede particular network providers in competing for these business users. As local network providers will be able to compete based on their relative merits, setting interconnection charge above cost is competitively neutral.

Given that retail prices can adjust, setting interconnection charges for local voice calls above cost:

- will not undermine the incentives of local network providers to invest to provide local services to business users who are net receivers of local voice calls; and
- will not encourage inefficient entry or discourage efficient entry of competing local network providers.

*Case 3: Residential users who are net originators of local voice calls*

127. A third case is residential users who are net originators of local voice calls. To the extent it will have an effect, setting interconnection prices for local voice calls above cost may discourage local network providers from attracting these customers. However, unlike for business users, retail line rental and local call charges are constrained by the price controls under the TSO and hence cannot increase. This may make these types of residential users unprofitable and hence discourage the development of local

competition for these users. However, for a number of reasons, the effect may not be important in practice.

128. First, there are unlikely to be many residential customers who have large imbalances of local voice calls. That is, there are unlikely to be many residential users who make sufficiently more local voice calls than they receive to actively discourage local networks from offering them local services.

129. Second, even if there are, they are unlikely to be costly to serve. That is, given that the local network provider has made the decision to invest in local network infrastructure in a particular street or area, the additional cost of providing local services to any particular customer may be small.

130. To the extent that there is an issue, it is where, through chance, a local network provider connects a large proportion of residential users who are net originators of local voice calls. In this case, the scope for a competing local network provider to recover costs may be undermined. This prospect may, at the margin, discourage efficient entry of competing local networks.

131. Although setting interconnection charges above cost may reduce competition among local networks at the margin, it will not undermine Telecom's ability to recover the costs of providing local services to residential users. These should be preserved by the TSO.

*Case 4: Residential users who are net receivers of local voice calls*

132. The final case is residential users who are net receivers of local voice calls. To the extent it will have an effect, setting interconnection charges for local voice calls above cost will enhance the incentives for local network providers to attract these customers. In turn, this will place downward pressure on the line rental for local services. As the TSO does not place a floor on retail prices for local services provided to residential users, the effects (to the extent there will be any)<sup>8</sup> will be similar to those for business users who are net receivers of local calls.

---

<sup>8</sup> The extent to which there will be an effect will depend on whether there are many residential users who receive many more local voice calls than they make.

Setting interconnection charges for local voice calls above cost:

- should not undermine Telecom's ability to recover the costs of providing local services to residential users; but
- may reduce the development of local network competition in residential areas at the margin.

### **Implications for the number and duration of local voice calls**

133. As noted above, the total benefits from a telephone call are the joint benefits gained by both parties. In most cases, both parties benefit from the call. However, there can be unwanted calls where the party receiving the call incurs a dis-benefit (such as some calls from telemarketers). The higher the price of local voice calls the less wanted and unwanted calls will be made.

134. Setting interconnection charges for local voice calls above cost is unlikely to have a significant impact on the number or duration of wanted or unwanted local voice calls. Setting interconnection charges above cost will not alter the price of local voice calls faced by most residential users. This price is capped at zero under the TSO. The price of local voice calls to businesses who are net originators of such calls may increase. This may, at the margin, discourage both wanted and unwanted calls. The effects on economic efficiency are not clear.

Setting interconnection charges for local voice calls above cost may, at the margin, reduce the number of wanted and unwanted local voice calls. Whether or not on balance this will result in the more efficient use of local telephone services is unclear.

### **5.2.2. Consequences of setting interconnection charges for local voice calls below cost**

135. Setting interconnection prices for local voice calls below cost will initially:

- enhance incentives for local network providers to attract customer who are **net originators** of local voice calls; and
- reduce incentives for local network providers to attract customers who are **net receivers** of local voice calls.

136. Again, the effects of these incentives depend on whether interconnection charges can be passed on to end-users.

*Business users*

137. Setting interconnection charges for local voice calls below cost will result in a reduction in retail charges to business users who are net originators of local voice calls and an increase in retail charges to business users who are net receivers of local voice calls. The implications for investment, competition and the use of local voice services are similar to those where interconnection charges are set above cost.

Given retail prices can adjust, setting interconnection charges for local voice calls below cost:

- will not undermine the incentives for local network providers to invest to provide local services to business users; and
- will not encourage inefficient entry or discourage efficient entry of competing local networks.

At the margin, it may increase the number of wanted and unwanted local voice calls. Whether or not on balance this will result in the more efficient use of local telephone services is unclear.

*Residential users*

138. Setting interconnection charges for local voice calls below cost may place some upward pressure on the retail charges for local services offered to residential users who are net receivers of local voice calls and downward pressure on charges for net originators of local voice calls. While the TSO allows these charges to fall, it places a cap on these charges. As a result, some residential customers who are net receivers of local voice calls may become unprofitable. To the extent this will have an effect, it may, at the margin,

discourage the entry of competing local networks in residential areas. Specifically, if a competing local network provider perceives a risk of connecting a large proportion of residential users who are net receivers of local voice calls, it may decide not to enter.

139. Although setting interconnection charges below cost may reduce competition among local networks at the margin, it will not undermine Telecom's ability to recover the costs of providing local services to residential users. These should be preserved by the TSO.

Setting interconnection charges for local voice calls below cost:

- should not undermine Telecom's incentives to invest to provide local services to residential users; but
- may reduce the development of local network competition in residential areas at the margin.

### **5.2.3. Implications for setting interconnection charges for local voice calls on the basis of TSLRIC and bill-and-keep**

140. The likely consequences of setting interconnection charges for local voice calls above or below cost are unlikely to be significant. These consequences do not provide strong reasons to favour setting these charges on the basis of TSLRIC or bill-and-keep.

Differences in the likely consequences of setting interconnection charges for local voice calls above or below cost do not provide strong reasons to favour setting these charges on the basis of forward-looking costs or bill-and-keep.

### **Potential distortions in locating points of interconnection**

141. Under bill-and-keep, each network provider has an incentive to minimise its own costs of carrying a call. That is, the network provider originating the call has an incentive to establish a point of interconnection as close as possible to its customers, and the network provider terminating the

call has the incentive to establish a point of interconnection as close as possible to its customers. Neither may be the most efficient point of interconnection.

142. Although such incentives may exist, the Commission can, on an access determination, make a determination concerning the terms of interconnection, including the points of interconnection and the costs of physical interconnection between networks (such as the cost of transporting calls between networks). In practice, it appears that we can address any adverse incentives concerning the locations of the points of interconnection created under a bill-and-keep regime.

### **Consistency between the approach to setting interconnection charges for local voice and data calls**

143. In our view, if bill-and-keep is used to set interconnection charges for local data calls, then the merits of employing bill-and-keep for local voice calls are enhanced. Specifically, adopting the same approach reduces the incentives for local network providers to 'disguise' the call type. Allowing a local network provider to charge for terminating local voice calls but not local data calls will create artificial incentives to 'disguise' data calls as voice calls. Such activity is unproductive.

In our preliminary view, if bill-and-keep is used to set interconnection charges for local data calls, then it should also be used to set interconnection charges for local voice calls.

### **5.3. Using bill-and-keep for in-balance traffic, or up to a pre-specified limit of out-of-balance traffic**

144. Although bill-and-keep may be preferable to forward-looking costs as a basis for setting interconnection charges for local calls, it must be recognised that there are problems with bill-and-keep. Specifically, under bill-and-keep a local network provider may be disadvantaged if it acquires a high proportion of residential users (relative to its size) that receive more local calls than they make. Under bill-and-keep, for each call a residential user receives from another local network, the network incurs a cost but achieves no revenue. Subjecting local network providers to this risk may undermine their incentives to enter and compete, particularly in areas with a high proportion of residential users.

145. One way in which this risk can be reduced is by adopting a hybrid approach. A hybrid approach involves employing bill-and-keep for in-balance traffic (or out-of-balance traffic up to a pre-specified limit), and then TSLRIC for the remainder of the traffic. This provides local network providers with some insurance against acquiring a high proportion of residential users who are net receivers of local calls. The degree of the insurance depends upon the 'trigger point' for TSLRIC to be employed for out-of-balance traffic. The more out-of-balance traffic there must be before the local network provider can charge for terminating local calls, the less the insurance.

146. Although the hybrid approach can limit the risks associated with bill-and-keep, there is a prospect that it can undermine the benefits of a bill-and-keep approach itself. This can occur in a number of ways.

147. First, if the Commission is required to determine the charge for out-of-balance traffic, the advantages of lower implementation costs of bill-and-keep may disappear.

148. Second, the hybrid approach may encourage behaviour that the pure bill-and-keep approach is designed to avoid, should the charge for out-of-balance traffic be set above one network's termination costs. There is a trade-off.

*Specified limit of out-of-balance traffic*

149. One factor affecting this trade-off is the out-of-balance traffic limit before interconnection charges are payable. The smaller the specified limit of out-of-balance traffic, the more local network providers are insured against acquiring residential users who are net receivers of calls. However, the smaller the limit the greater is the likelihood of outcomes that bill-and-keep is designed to avoid.

150. Without information on the local call traffic profiles of residential users, it is difficult to make comment on the appropriate specified limit on out-of-balance traffic. However, we note that in the interconnection agreements between Telecom and Clear and Telecom and Telstra-Saturn, this limit is set at 30 per cent of local call traffic.

*Callsinks*

151. Another way of altering the trade-off is to apply pure bill-and-keep to some local call traffic and the hybrid approach to other types. For instance, as

discussed above, the risks associated with setting interconnection charges for local data calls on the basis of TSLRIC are greater than for setting interconnection charges for local voice calls. It may be desirable to employ pure bill-and-keep for local data calls and the hybrid approach for other local calls. In such a case, recipients of local data calls are referred to as callsinks.

152. Callsinks create the potential to improve on the hybrid approach. The key issue in designing callsinks is determining how calls within and outside the callsink are defined and classified. There are three options.

*Defining calls by call type*

153. One option is to define local calls by their type (such as voice calls or data calls). The difficulty with this option is that it may encourage local network providers to 'disguise' the call type. Allowing a local network provider to charge for terminating local voice calls, but not local data calls, will create artificial incentives to 'disguise' data calls as voice calls. Such activity is unproductive.

*Defining calls by call characteristics*

154. A second option is to define local calls by their characteristics; that is, to include in the callsink calls for which traffic is, say, 10 times out-of-balance. This is the approach taken in the interconnection agreement between Telecom and TelstraSaturn.

*Defining calls by user*

155. A third option is to define calls in the callsink by the users. For example, all calls made or received by business users could be included in the callsinks. In such a case, charges for terminating local calls between residential users would be determined using the hybrid approach and charges for terminating all other local calls would be determined using a pure bill-and-keep approach.

In our view, a hybrid approach for setting interconnection charges for local calls, combined with a callsink, can potentially improve on pure bill-and-keep. The success of such an approach will depend on two factors. The first is the specified limit of out-of-balance traffic before cost-based interconnection charges are payable. The second is the calls that are included in the callsink and how they are defined.



## **6. Interconnection for toll calls**

### **6.1. Interconnection for toll-bypass calls**

156. Toll-bypass operators require originating and terminating access (most often from Telecom) in order to provide national toll calls to end-users. In New Zealand, many providers of toll calls are toll-bypass operators.

157. Under a bill-and-keep regime, toll-bypass operators would not pay the local network provider to provide originating and terminating access services. Under a forward-looking cost-based approach, charges for these services would be based on cost. The approaches will potentially have significant implications for the development of competition and the incentives for Telecom to invest efficiently in its fixed PSTN.

#### **6.1.1. Setting interconnection charges for toll-bypass calls on the basis of bill-and-keep**

##### **Incentives for Telecom to invest in its fixed PSTN**

158. National and international toll calls constitute a significant proportion of the capacity of Telecom's fixed PSTN. If a pure bill-and-keep approach is used, toll-bypass operators would make no contribution to the cost of Telecom's fixed PSTN. Further, depending on the degree of competition between these providers and Telecom in the provision of toll calls, a pure bill-and-keep approach will reduce the extent to which the revenues that Telecom achieves from providing toll calls to its own customers can contribute to the costs of its fixed PSTN. That is, competition will push retail prices for toll calls down to the point that they contain little or no margin to contribute to the costs of Telecom's fixed PSTN.

159. In order for Telecom to have the appropriate incentives to maintain, upgrade and invest in its fixed PSTN, it must have the expectation of recovering the efficiently incurred costs of doing so. If national and international toll calls make little or no contribution to the costs of the fixed PSTN, then the costs must be recovered from other sources. There are a few options.

160. One option is charges for other services provided using the fixed PSTN. The major other service using the fixed PSTN is local calls. As Telecom

must offer free local calls to residential users, the scope for local calls to cover these costs is likely to be limited.

161. Another option is line rentals. However, the price cap on residential line rentals prevents an adjustment of these charges to recover any shortfall in revenues from toll calls.

162. A third option is the TSO scheme. However, the TSO does not cover net losses made by Telecom as a result of providing toll calls or interconnection services provided to toll-bypass operators.

163. A fourth option is for Telecom to create a separate retail charge for both originating and terminating toll calls. There are a number of problems with such an approach, however. First, it is not clear whether such a charge is possible under the TSO. Second, even if it is possible, it does not solve the problem of regulating these charges. As originating and terminating access services are necessary inputs into providing toll calls, Telecom has significant discretion over the charges. Failing to regulate these retail charges would enable Telecom to set monopoly prices for these services and to price discriminate in providing national and international toll calls in a way that artificially favours itself. Neither would promote efficient outcomes. If bill-and-keep is used to set interconnection charges for toll calls, the need for cost-based regulation is simply transferred to retail price regulation. The Commission has no power to regulate such retail charges.

Using bill-and-keep to set interconnection charges for toll-bypass calls can potentially undermine Telecom's ability to recover efficiently incurred costs in providing originating and terminating services. This may inefficiently discourage Telecom from investing in its fixed PSTN.

### **Development of local network competition**

164. To the extent Telecom's incentives to invest in its fixed PSTN are adversely affected, so will be the incentives of other providers to deploy competing local networks. If bill-and-keep is applied to originating and

terminating services on competing local networks, the incentives to invest in these networks would similarly be inefficiently undermined.<sup>9</sup>

Using bill-and-keep to set interconnection charges for toll-bypass calls will be most likely to inefficiently discourage the development of local network competition.

### **Competition in the provision of national and international toll calls**

165. In order for competition in the provision of national and international toll calls to be efficient, providers of toll calls must be able to compete based on their relative merits. To the extent that local network providers attempt to recover some of the costs of providing originating and terminating access through their own national and international toll call prices, they will be artificially disadvantaged in competing against toll-bypass operators. In this way, competition in the provision of national and international toll calls will not be neutral.

Using bill-and-keep to set interconnection charges for toll-bypass calls will be most likely to distort competition in the provision of toll calls.

In our view, setting interconnection charges for toll-bypass calls on the basis of bill-and-keep will be most likely to undermine the incentives for efficient investment in local networks and may impede the development of efficient competition among local networks and among providers of national and international toll calls. Although some of these risks are also prevalent under a forward-looking cost-based approach, the potential downsides are significantly smaller.

---

<sup>9</sup> Competing network providers need to offer prices for local network services that are competitive with those offered by Telecom. If Telecom cannot charge for originating and terminating access for toll calls, competing network providers will be similarly constrained.

In our view basing interconnection for toll-bypass calls on the basis of forward-looking costs will give best effect to the purpose of the Act.

## **6.2. Interconnection for the provision of toll-free calls**

166. Network providers require originating access (most often from Telecom) in order to provide toll-free services. For example, say a customer connected to Telecom's fixed PSTN makes a call using a toll-free number to a business connected to TelstraClear's network. In order for the toll-free call to be completed, Telecom must convey the call to a POI with TelstraClear, who then completes the call. Telecom would not charge its own customer for the call (as the call is toll-free). The issue is whether, in this example, TelstraClear should make a payment to Telecom for originating the call.

### **6.2.1. Setting interconnection charges for toll-free calls**

167. The implications of setting interconnection charges for toll-free calls on the basis of bill-and-keep are similar to those for setting interconnection charges for toll-bypass calls. That is, setting these interconnection charges on the basis of bill-and-keep may:

- undermine the ability of local network providers (including Telecom) to recover efficiently incurred costs in originating toll-free calls; and
- inefficiently discourage the development of local network competition at the margin.

168. Consider Telecom's ability to recover the costs of originating toll-free calls that are terminated by another network provider. Under bill-and-keep, the network provider providing the toll-free service would make no contribution to the cost of originating the call. As for toll-bypass calls, Telecom's options to recover these costs are limited. The TSO does not cover net losses made by Telecom as a result of providing interconnection services for toll-free calls. Nor is it possible to charge the party making the calls (as it defeats the purpose of toll-free calls). Under bill-and-keep, Telecom's ability to recover efficiently incurred costs in originating toll-free calls may be undermined. In turn, this will be likely to undermine the incentives for Telecom to efficiently invest in its fixed PSTN.

169. If bill-and-keep is applied to toll-free calls on competing local networks, the incentives to invest in these networks would similarly be affected.

Using bill-and-keep to set interconnection charges for toll-free calls can potentially undermine the ability of local network providers (including Telecom) to recover efficiently incurred costs in originating toll-free calls. This may inefficiently discourage Telecom from investing in its fixed PSTN and inefficiently discourage the development of local network competition.

In our view, basing interconnection for toll-free calls on the basis of forward-looking costs will give best effect to the purpose of the Act.

## **7. Mobile-to-fixed interconnection**

170. As noted above, mobile-to-fixed interconnection services are interconnection services between mobile network providers and fixed network providers. As shown in Figure 5 above, if an end-user connected to a mobile phone calls an end-user connected to a fixed PSTN, the fixed local network provider provides a terminating service to enable the call to be completed.

171. In considering the approach to interconnection charges for mobile-to-fixed calls, it is important to recognise that the reciprocal access service (terminating fixed-to-mobile calls) is not a designated service. Although the Commission can set a zero charge for terminating calls in one direction, we have no powers to do so in the other direction. It appears, therefore, that our only option is to set interconnection charges for mobile-to-fixed calls on the basis of forward-looking costs.

## **Appendix 1: FCC Working Paper proposals**

172. Bill-and-keep arrangements have been proposed as an alternative to the existing suite of interconnection arrangements in the United States in two Working Papers released by the Federal Communications Commission (FCC), the first by Patrick DeGraba, and the second by Jay Atkinson and Christopher Barnekov.<sup>10</sup> The papers by DeGraba and Atkinson and Barnekov are similar in many respects, but arrive at slightly different recommendations with respect to liability for transport costs between interconnected networks. Both papers suggest that their versions of bill-and-keep should be default rules only: networks should be free to agree to any interconnection arrangement that they prefer. Also, both papers argue that their approaches are applicable to any type of interconnection arrangement, regardless of the balance of traffic between the two networks, or the relative costs of the two networks.

173. The DeGraba proposal is more complete, and has been the subject of the greatest scrutiny in the US. DeGraba proposes a model termed central office bill-and-keep, or COBAK. COBAK entails two rules:

- the called party's network cannot charge the calling party's network for terminating the call; and
- the calling party's network is responsible for carrying the call from the calling party's central office (local switch) to the called party's central office (local switch). (In the case of a call involving three networks, such as a call from a local carrier to a separate long distance carrier, which then connects with a another local carrier, the rule is slightly modified. In this case, the calling party's carrier would be responsible for the costs of carrying the call to the long-distance carrier's point of presence (POP), the inter-exchange carrier would be responsible for carrying the call to the central office of the called party's central office, and the called party's network would be responsible for terminating the call. Each party would then bill their own end-users directly.

---

<sup>10</sup> DeGraba, P. Bill and Keep at the Central Office As the Efficient Interconnection Regime, *Federal Communications Commission, OPP Working Paper Series No.33*, December 2000 and Atkinson, M. and Barnekov, C. A Competitively Neutral Approach to Network Interconnection *Federal Communications Commission, OPP Working Paper Series No.34*, December 2000

174. Atkinson and Barnekov arrive at a slightly different rule, which they term BASICS ('Bill Access to Subscribers, (incremental) Interconnection Costs Split'). As in COBAK, BASICS does not allow the called party's network to charge termination fees to any other network. However, the 'incremental costs of interconnection' should be split equally between the interconnecting networks. Assuming the incremental costs of interconnection can be roughly interpreted as the costs of transport between the two networks, the key difference between COBAK and BASICS is that the former requires a 100 per cent allocation of these costs to the calling party's network, while the latter requires them to be shared equally.