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Converging Industries Research Foundation

Practical Solutions for Communications Policy

Loop Dreams: The Price of Connection for Local Service Competition

July 21, 1995

Presentation at the July 1995 NARUC Meeting
San Francisco, CA

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Telecommunications Industries Analysis Project:
Loop Dreams: The Price of Connection for Local Service Competition

Carol Weinhaus, Sandra Makeeff, Peter Copeland, *et al*.
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The Telecommunications Industries Analysis Project is associated with the Public Utility Research Center at the University of Florida College of Business Administration.

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Project Information

List of Participants in the Telecommunications Industries Analysis Project

June 27, 1995

State Regulators	NARUC representatives from: Illinois Commerce Commission Iowa Utilities Board Massachusetts Department of Public Utilities New York Public Service Commission Ohio Public Utilities Commission Washington Utilities and Transportation Commission
Regional Holding Companies	Ameritech Bell Atlantic BellSouth NYNEX Pacific Telesis SBC Communications Inc. US WEST
Independents	Anchorage Telephone Utility GTE Sprint Local Telecom Division
Interexchange Carriers	AT&T Sprint
Foreign Domestics	InfoCom Research, Inc. NTT America
Local, National, and International Services	BT France Telecom North America
Materials Manufacturers	Corning
Telecommunications Equipment Manufacturers	Nortel

Sponsors:

Corporation for Public Broadcasting

Assisting with *public* data:

Bellcore
Federal Communications Commission
National Exchange Carrier Association

Background on the Telecommunications Industries Analysis Project

The goal of the Telecommunications Industries Analysis Project is to provide information to support the development of alternative communications policies to meet the needs of stakeholders in an environment that includes competitive and non-competitive markets, federal and state regulatory jurisdictions, and a proliferation of new services made possible by technological advances. The purpose of the project is to produce research and analysis which will assist policy makers in making informed decisions.

The project is a neutral forum of communications industry stakeholders exploring multiple viewpoints of selected issues. This forum incorporates the following elements:

- **Broad representation:** The current forum includes foreign and domestic local exchange carriers (LECs), interexchange carriers (IXCs), materials and equipment manufacturers, and federal and state regulators. The project actively seeks expansion of this forum to include other communications industry representatives such as competitive access providers, cable television companies, computer companies, electric power utilities, or publishers.

- **Multiple viewpoints:** Participants are required to play an active role in the research and analysis, to represent their own interests, to understand and to assist in developing others' perspectives, and to work toward the common goal of representing multiple views. Since papers reflect multiple viewpoints and ideas, authors and reviewers may not agree with particular views or approaches expressed in the papers. The objective is to lay out ideas and options to assist policy makers in their decisions.

- **Analysis and results of alternative policies:** Research tools, including a jointly produced data base and computer software models, and data analysis developed by this forum create a common language for examining issues. The common language allows the participants to focus on underlying issues. Appropriate computer software tools, including modifications to existing tools, are developed.

- **All data, analysis methods, and results are public:** Data used by this project must be publicly available on a nationwide basis. Research products become public domain information.

- **Neutral setting:** The project resides in a neutral setting, free of partiality, thereby ensuring objective and independent research.

Project Information, cont.

What the Project has Done

The project has conducted public workshops at the national meetings of the telecommunications industry regulators. The project's research papers have been the basis for meetings with the Federal Communications Commission (FCC), Congressional staffs, the Congressional Research Service, and the National Telecommunications Information Administration.

The project has also produced a number of papers plus software modeling tools for the analysis of financial impacts of new technology deployment and of changes in the financial structures themselves

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List of Acronyms

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ALEC	Alternative Local Exchange Carrier
ARMIS	Automated Reporting Management Information System
Cable TV	Cable Television
Caller ID	Caller Identification
CCLC	Carrier Common Line Charge
COE	Central Office Equipment
DC	District of Columbia
FCC	Federal Communications Commission
FDC	Fully Distributed Cost
GSF	General Support Facilities
IOT	Information Originating and Terminating Equipment
ISDN	Integrated Services Digital Network
LEC	Local Exchange Carrier
NECA	National Exchange Carrier Association
RBOC	Regional Bell Operating Company
SLC	Subscriber Line Charge
SS7	Signaling System 7
USF	Universal Service Fund

I. Introduction

Introduction

This is the first in a series of papers that will address the issues related to the interconnection of competing local exchange carriers.[1] The purpose of the paper is to compare the current price of basic local service with the major cost component of basic service, the loop. Loop costs are measured using several cost methodologies. The paper seeks to point out areas of current local service cost allocation and pricing policies that will conflict with the introduction of competition into the local service market.

This paper examines the issues of cost based pricing for basic local exchange service elements and current local service prices. It discusses how current cost allocation procedures and pricing structures may conflict with the goal of local service competition. The paper sets the stage by discussing the need to unbundled/resale rates. The costing issues will focus on the major cost component of local service, loop costs. Some of the questions addressed are:

- What is the cost of a loop?
- How are loop costs recovered today?
- What is an appropriate loop charge to a competitor?
- Should the loop charges to the competitor be imputed in the incumbent Local Exchange Company's (LEC) local service rates?
- Should there be price distinctions based upon how the service is used or who uses it?

While, this paper does not attempt to answer these questions, it does lay out the associated framework and issues. To assist decision makers in answering these questions, this paper uses a variety of definitions for the cost of a local loop: embedded, embedded without overheads, current proxy costs, future costs, and unbundled rates **(Section II)**. The paper also presents examples of current rate structures **(Section III)**, compares selected loop rates and costs **(Section IV)**, and discusses price discrimination **(Section V)**. The paper indicates that the introduction of competition in the local service market conflicts with current cost pricing policies and that, in many areas, prices charged for local service are inadequate to cover the cost of loops used to provide this service **(Section VI)**.

Future papers on the interconnect issue will address the following:

- Interconnection arrangements for various service providers. How those arrangements differ in service and pricing.

- Investment decisions: How do prices charged for interconnection and various aspects of regulation affect investment decisions of regulated and non-regulated companies?

[1]A previous paper by the Telecommunications Industries Analysis Project also examined pricing and costing issues raised by interconnection and competition. See Carol Weinhaus, Mark Jamison, *et al.*, *New Wine and Old Wineskins: Modeling Effects of Competition and Expanded Interconnection in the Local Exchange*, Alternative Costing Methods Project, Program on Information Resources Policy, Harvard University, Cambridge, MA, July 27, 1992.

I. Introduction

Why are Loop Costs Important?

The introduction of competition into the local service market requires the incumbent LEC to develop charges for connections offered to the competing networks. Different types of competitors will require different facilities. Competitors could own their own facilities, re-sell facilities purchased from the incumbent LEC, or provide service from some combination of the two. However, it is unlikely that even a facilities based competitor will duplicate all of the telephone network, especially in the short term. If the competitor is going to serve a significant geographic area in an exchange, without duplicating all the outside plant facilities of the incumbent, the incumbent LEC will also need to provide the basic network elements of local service for resale.

Numerous states are attempting to define the basic elements of local service. The parties involved can usually agree that access to the loop is essential for the development of local competition. Any disagreements generally include costs and prices for the loop.

This paper focuses on the cost and pricing of one element of local service: the loop or link. The loop is the connection between the customer's premise and the central office. It is important to properly price this element of local service to ensure that there is no discrimination in the price charged to the competitor and to ensure that subsidies do not exist that would foster uneconomic competition. Uneconomic competition would exist if subsidies either protected high-cost competitors by providing a price umbrella, or prevented low-cost competitors from competing in subsidized markets.

What is the Cost of a Loop?

Local service competition is in the embryonic stage today. Many states are in the process of removing legislative restrictions prohibiting local service competition. In states where local service competition is permitted, rules are being developed for the interconnection of competing networks. How fast competition grows may depend, in large part, on the interconnection prices and rules set by regulators. The transition to competition will require prices that are fair to both the emerging competitor and the incumbent LEC. Until local competition is viable and there are several options for connecting customers to competitive providers, regulators will probably rely upon cost measurements in an attempt to ensure that the new entrant is charged a reasonable rate and that the incumbent LEC is appropriately compensated for the use of its facilities.

There are numerous measures of cost and numerous cost methodologies. This paper does not prescribe one cost measure over another. The cost methodologies used in this paper are limited only because of the lack of publicly available studies.

Embedded Costs

One cost measure that is easily available is the local loop cost calculated for the Universal Service Fund. These are the embedded or actual non-traffic sensitive costs such as wires, poles and other network facilities needed to connect the customer to the incumbent LEC's public switched network. The cost also includes allocations of overhead or joint and common costs such as administration and accounting expenses. They are based on actual dollars expended by the company during this or previous time periods. **Figure 1** shows the range of loop costs by state, including Washington D. C., using the National Exchange Carrier Association's data for the calculation of the 1994 Universal Service Fund based on 1993 data. This paper refers to these costs as "embedded costs."

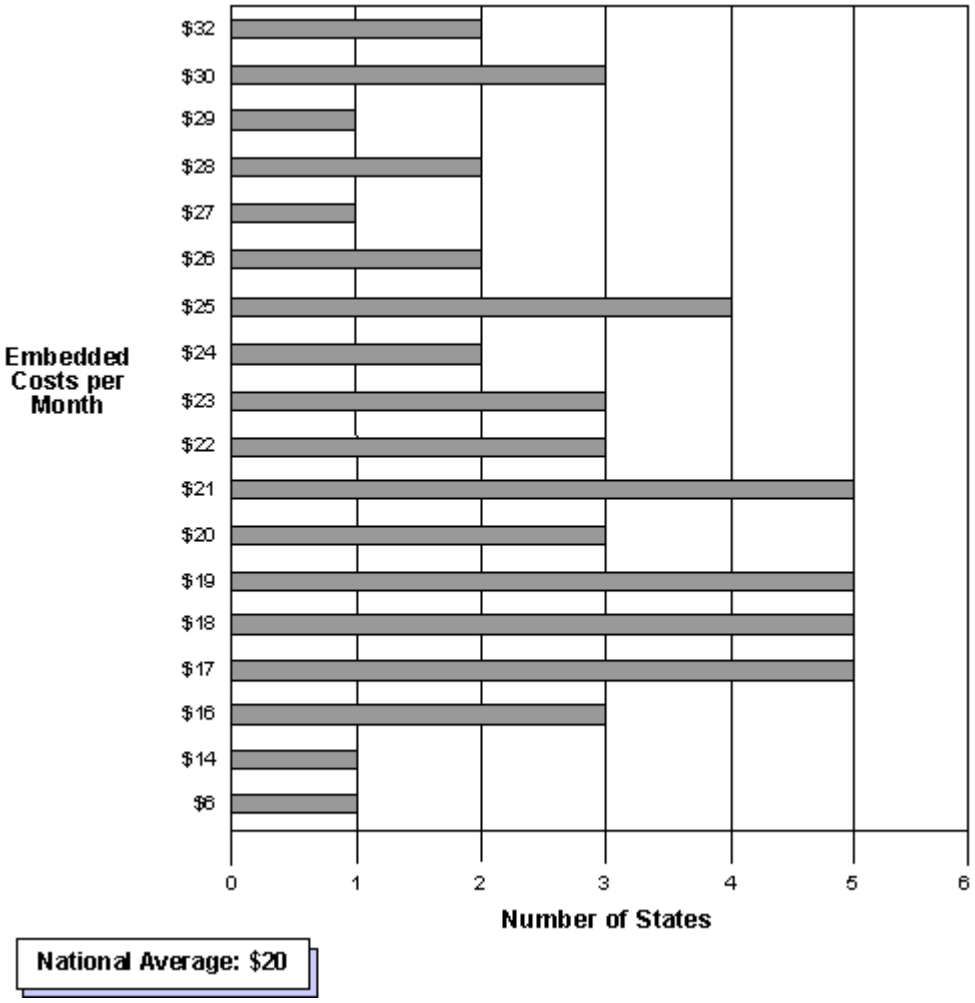
In **Figure 1**, each bar indicates a different loop cost rounded to the nearest dollar. The length of each bar indicates the number of states within the range covered by each bar. For example, the first bar shows that only Washington, DC, has loop costs of $6. For the second bar, just one state, Illinois, has loop costs of $14. The third bar shows that 3 states have loop costs of $16. The national average loop cost is $20.[2]

Figure 2 uses the calculated loop cost in **Figure 1** but excludes certain of the overhead costs. Hereinafter, these costs are referred to as "embedded costs without overheads." The overheads are removed to indicate the magnitude of the fixed costs. The result is a national average loop cost of $15.[3]

[2]See **Section VII, Appendix A, Figure 9**, for a listing of the individual embedded state costs from the Federal Communications Commission (FCC), *Monitoring Report*, CC Docket No. 87-339, Prepared by Federal and State Staff for the Federal-State Joint Board in CC Docket No. 80-286, May 1995, Table 3.3. The loop definition is that used by NECA for this Universal Service Fund (USF) filing.

[3]Data are from the National Exchange Carrier Association (NECA) for the calculation of the 1994 Universal Service Fund (USF) based on 1993 data. See **Section VII, Appendix A, Figure 9**, for the list of individual embedded state costs excluding overheads and for the list of excluded accounts.

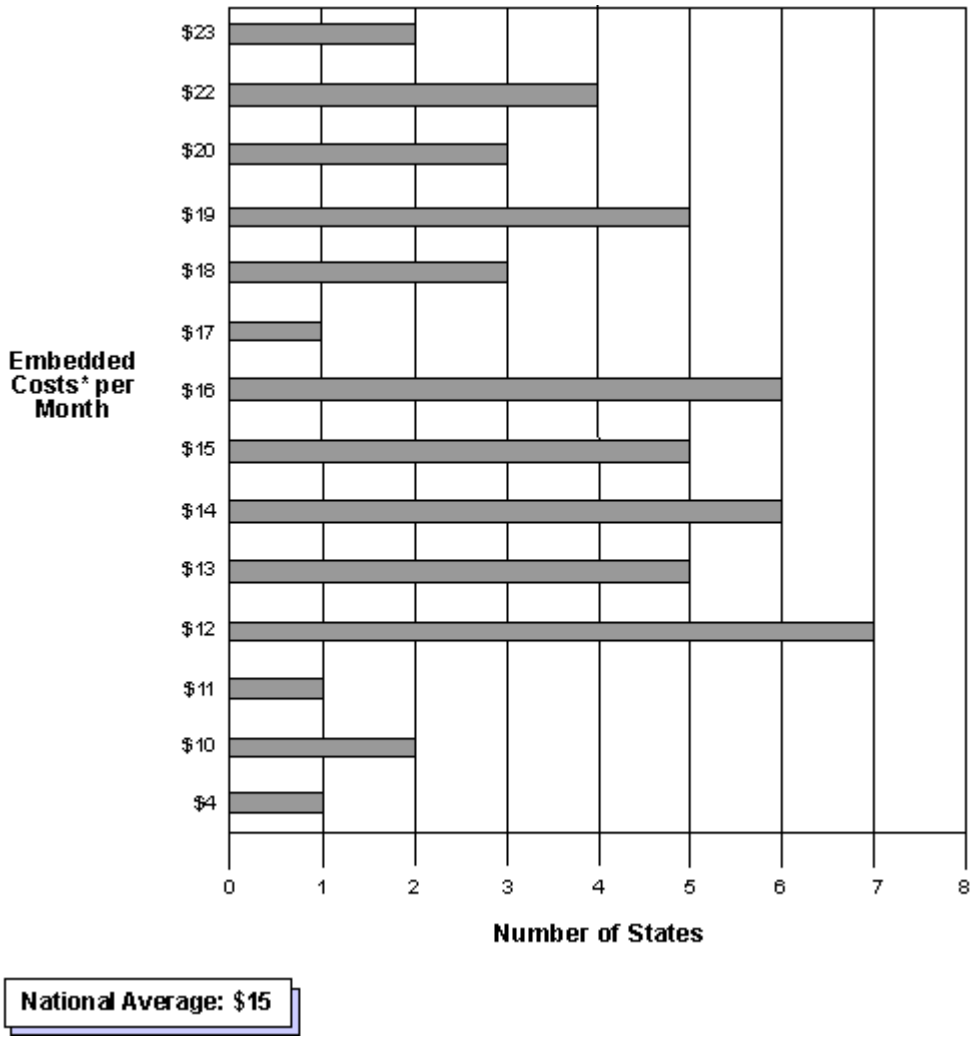
Figure 1: Embedded Loop Costs: Number of States with Equivalent Costs



Note: National average excludes Puerto Rico, Virgin Islands, and Micronesia.

Source: FCC, *Monitoring Report,* Table 3.3. The loop definition is that used by NECA for this USF filing.

Figure 2: Embedded Loop Costs (without Overheads): Number of States with Equivalent Costs



Note: National average excludes Puerto Rico, Virgin Islands, and Micronesia. The excluded accounts are as Network Support Expense (Account 6110), General Support Expense (Account 6120), Executive and Planning Expense (Account 6710) and General and Administrative Expense (account 6720), Total Rents, and Total Benefits.

Source: NECA data for the calculation of the 1994 Universal Service Fund based on 1993 data.

While the average embedded costs are verifiable and easy to obtain, many parties argue that embedded costs should not be used as a basis for pricing. Embedded costs are used here to illustrate the pricing problem. The use of the average embedded costs may provide a conservative estimate of the magnitude of the problem. It should also be noted that loop costs have not been segmented between residential and business nor between areas which are high and low cost to provide service.[4]

Incremental Costs: Current Proxy Costs

One alternative to actual embedded costs is the use of current proxy costs. The examples in this paper use unit investment and density per square mile from a report by Bridger Mitchell.[5] These 1990 long-run incremental costs are for loops using copper transmission facilities. To develop examples of incremental costs based on population density and distance from the telephone company's central office, this paper assumes densities and distances for three examples and applies the Mitchell unit investments:

- Current Proxy Cost 1: High-density, close to the central office.
- Current Proxy Cost 2: Medium-density, further from the central office.
- Current Proxy Cost 3: Low-density, far from the central office.

Figure 3 indicates that costs for these examples range from approximately $10 to almost $100, depending mainly on population density.[6]

Future Costs for New Services

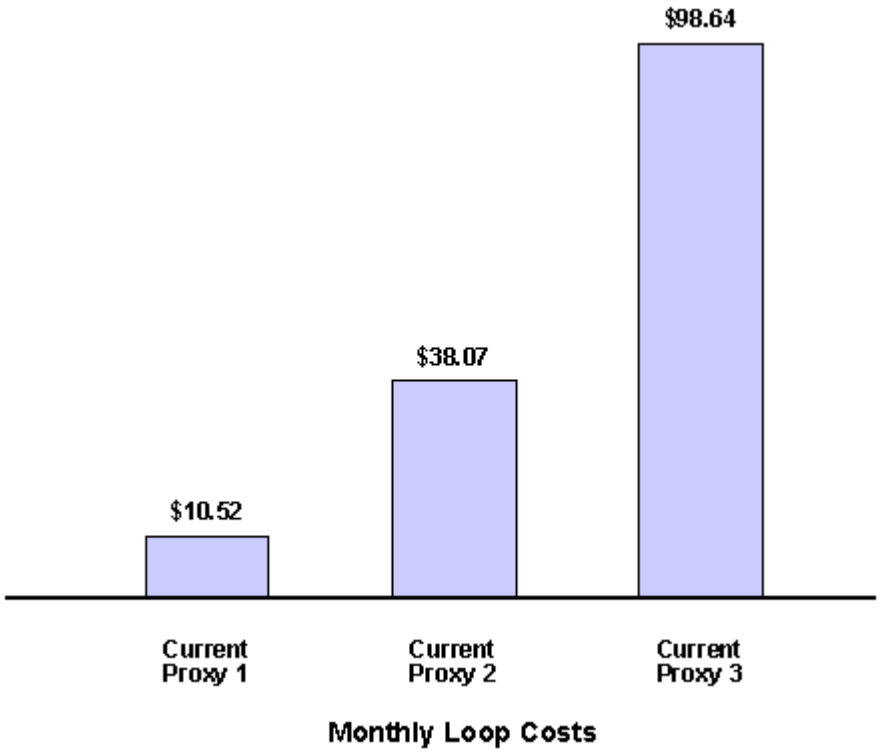
A third way to look at costs is to base them on future technology. The Telecommunications Industries Analysis Project (TIAP) *New Technology Deployment Model* developed a cost estimate of deploying broadband technology. Since the model

[4]Carol Weinhaus, Sandra Makeeff, et al., *What is the Price of Universal Service? Impact of Deaveraging Nationwide Urban/Rural Rates*, Presentation at the National Association of Regulatory Utility Commissioners Meeting, San Francisco, California, July 25, 1993, Telecommunications Industries Analysis Project, Boston, MA, 02138.

[5]Bridger M. Mitchell, *Incremental Costs of Telephone Access and Local Use*, Prepared for the Incremental Cost Task Force, The RAND Corporation, Santa Monica, CA, R-3909-ICTF, July 1990, Figures C.1, C.2a, and C.2b, pages 86-88.

[6]See **Section VIII, Appendix B, Figure 10**, for assumptions and calculations for the examples.

Figure 3: Examples of Current Proxy Loop Costs



Note: Calculations for current proxy costs apply the Mitchell study's unit investments to TIAP distance and density assumptions in order to calculate total investment. Total investment is then multiplied by the assumed ratio of 0.2952 and divided by 12 to calculate a monthly revenue requirement (cost). See Figure 8 for a more detailed description of this ratio.

Source: Long-run incremental costs are from Bridger M. Mitchell, *Incremental Cost,* Figures C.1, C.2a, and C.2b, pages 86-88

provides total costs instead of just loop costs,[7] the output has been adjusted to allow comparisons with other methods for determining loop costs.
Hereinafter, this paper refers to these TIAP costs as "future costs."

The amounts shown in **Figure 4** represent monthly loop revenue requirements for broadband technology for nationwide average ($16.91), urban only ($11.61), and rural only ($38.81). The amounts shown in **Figure 4** are for deploying a broadband infrastructure and represent a particular set of assumptions.[8] The cost of broadband varies according to the length of time chosen for deployment and the point in time during that deployment. **Figure 4** shows costs at the end of a 20-year deployment of a nationwide broadband infrastructure.

Unbundled Rates

In order to promote local competition, some states have already begun the process of unbundling and pricing local service elements that are available for resale. **Figure 5** displays some of the rates currently in place. They indicate political negotiations and compromises on the definition of costs. The detailed cost information for developing these rates is not public information. The NYNEX New York rate is tied to the embedded costs. The Michigan rate is a negotiated interim interconnection rate for the Grand Rapids area only. The Illinois rates are based upon density zones and set to recover 100% of the loop costs using a long-run incremental cost methodology.

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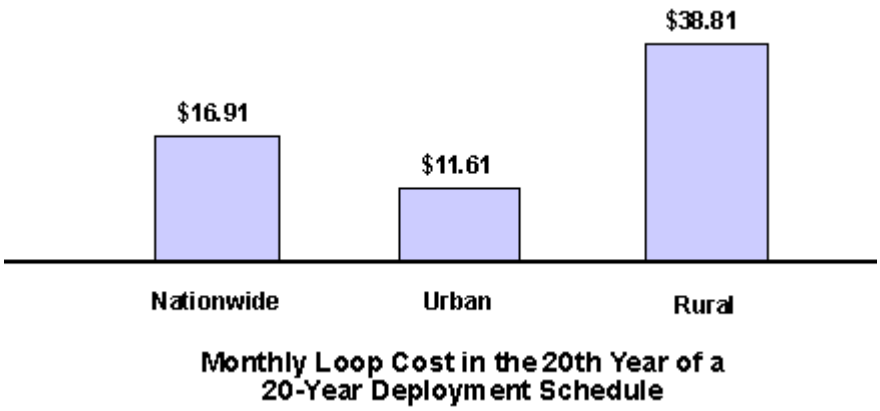
[7]The model produces a monthly revenue requirement per line for *all* of the current LEC networks. This is much more than a "loop cost" and includes not only switching, but also other overheads such as General Support Facilities (Account 6610), Operator Services (Account 2220), and Information Originating and Terminating Equipment, or IOT, (Account 2310). The costs in these accounts are *not* included in the embedded cost per loop numbers. See **Section IX, Appendix C**, for the derivation of the future cost per loop used in this paper. See the Carol Weinhaus, Linda Garbanati, *et al.*, *Overview of the New Technology Deployment Model: Broadband with Associated Depreciation and Overheads*, Telecommunications Industries Analysis Project, Public Utility Research Center, College of Business Administration, University of Florida, March 15, 1995. For greater detail, see the *New Technology Deployment Model: Broadband with Associated Depreciation and Overheads, User Guide, 1992 Nationwide Data Set*, March 17, 1995, associated with the model (hereinafter referred to as the *1995 Broadband Model User Guide*).

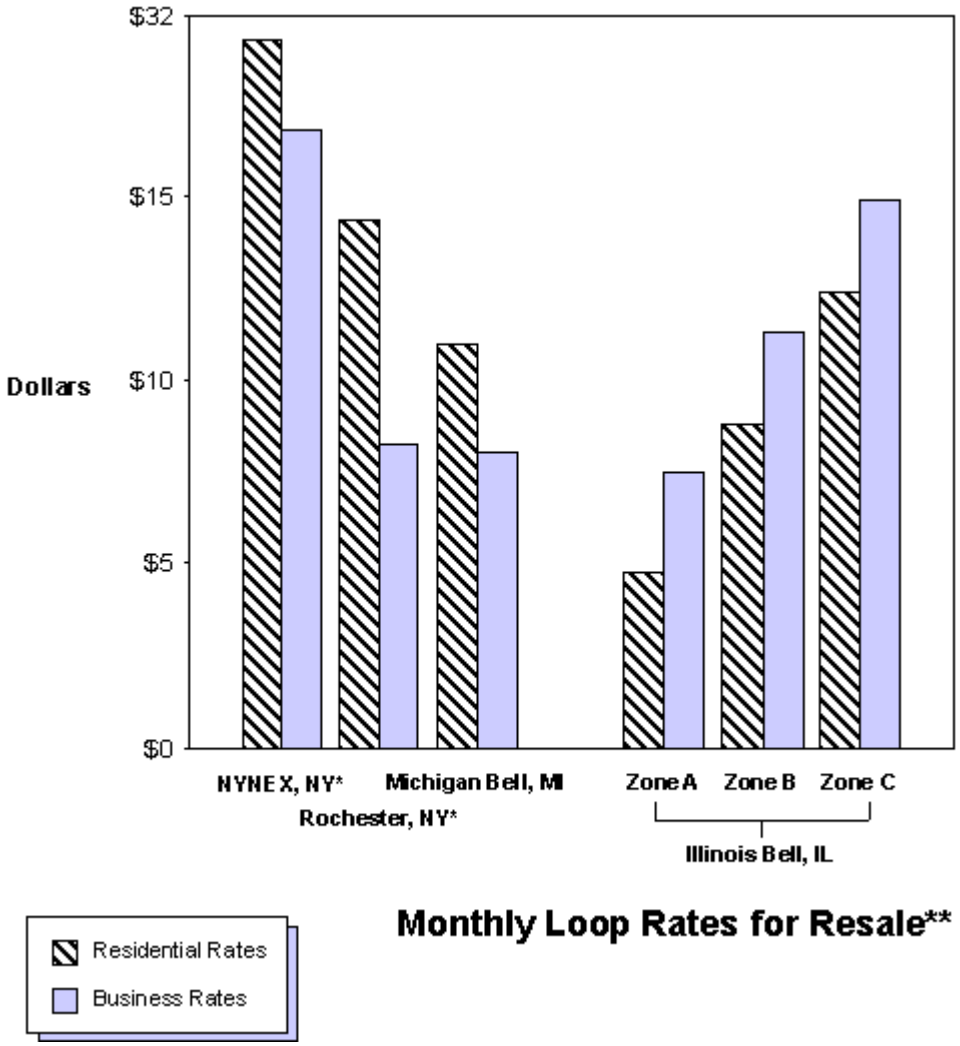
[8]See **Section IX, Appendix C**, for a list of the assumptions. See the *Overview of the New Technology Deployment Model* and the *1995 Broadband Model User Guide* for greater detail.

Figure 4: Future Costs Based on TIAP *New Technology Deployment Model*



Source: *Broadband Model User Guide, Figure 24, page 77.*

Figure 5: Current Examples of Loop Charges in Markets Open to Competition



*New York rates are based on embedded costs and includes SLC.
*The rates are *tariffed* rates for resale loops.

Sources: New York information provided by the New York Department of Public Service. Michigan data from Michigan Bell Telephone Co. Tariff M.P.S.C. No. 25R. Illinois data from Illinois Bell Telephone Co. Tariff III CC No. 5, Part 2, Section 26, 2nd Revised Page 4.

How are Loop Costs Recovered Today?

Historical Background

Historically, cost assignments for telephone services have been made using fully distributed cost (FDC) studies. This type of cost study allocates all joint and common costs and fixed overhead costs to all products or services provided. In an FDC study the loop is usually considered a common cost. According to this allocation method the loop is the basic access service that is used to provide all services, so all services must bear a proportionate cost of the loop. Through jurisdictional separations, approximately 25% of the cost of the loop is allocated to interstate toll service. An additional 2%, on average, is recovered through the USF[9].

Most state regulatory bodies have made an allocation of the intrastate loop costs to intrastate toll. States that use FDC studies may treat the loop as common costs for cost of service studies. This cost methodology results in the allocation of loop costs to almost all of the services a telephone company provides. For example, costs assigned to custom calling services such as call forwarding and call waiting, and to SS7 services such as caller ID, call trace, etc., would include some portion of loop costs, using this methodology.

These cost studies are often used by regulators to assure that prices for the non-essential services exceed costs and provide a contribution to more essential services. In regulatory proceedings where the prices for services are designed to allow a company to earn a set rate of return on its investment, the basic local service price is usually based on a residual of total required revenue. Therefore, the actual allocation of cost to local service may not be made and, furthermore, the price of local service may not be related to the underlying cost.

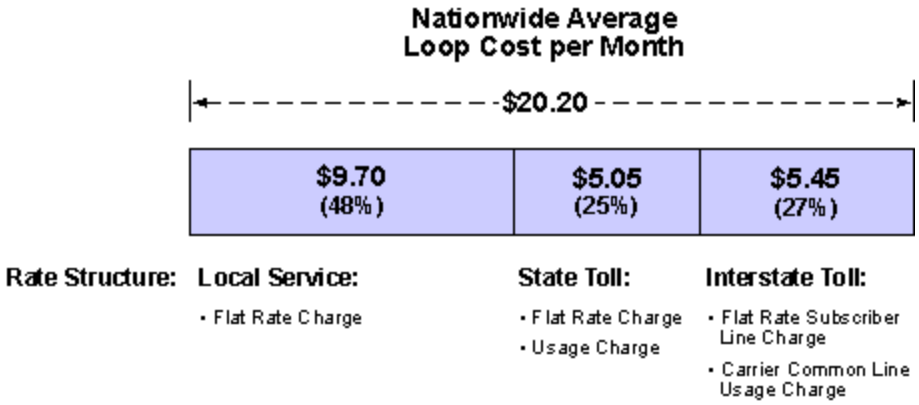
In order to demonstrate how the costs of the local loop are currently recovered, this paper uses simplifying assumptions. First, the paper will consider just the major categories of local service, interstate toll service and state toll. Secondly, for the sake of simplicity, the paper assumes the same allocation of loop costs to state toll as to interstate. The loop cost is then allocated 48% to local, 25% to state toll and 27% to interstate toll.[10]

Example of Current Rate Structure

Figure 6 is representative of the local loop segmented into the rate structures used to recover the cost of the loop. The per month average 1994 unseparated loop cost of $20.20, calculated from USF data, has been allocated according to the jurisdictional and assumed service percentages. In **Figure 6**, underneath the three service categories - local, state toll, and interstate toll - are some of the rate structures in place to recover the assigned loop costs.

[9] The percent of state loop costs recovered from the USF ranges from a high of 24.7% to a low of 0%. FCC, *Monitoring Report*.
[10] In reality the allocation to local and intrastate toll will vary by state.

Figure 6: Example of Current Rate Structure for Recovery of Local Loops Costs



Source: Federal state jurisdictional allocations are from the FCC, *Monitoring Report*, page 79.

IV. What are the Loop Charges?

As shown in **Figure 6**, the local exchange companies have both flat and usage rate structures in place for recovery of loop costs.

- **Local Service Charge**
  For end user customers whose local exchange service is priced on a flat rate. The loop costs are recovered through a bundled rate that also recovers other provisions of local service. The customer is paying for the use of, in its simplest form, a loop to connect the customer to a switch in the central office, the use of the switch to transfer the call and perhaps connection to another central office where the call is then directed to the loop of the called party. The basic local service rate also includes a listing in the local directory, and access to a local operator. There are at least two different rates available one for residential users and one for business users. In most cases the business rate is higher than the residential rate.

- **State Toll**
  The percentage of loop costs assigned to state toll and the price mechanism to recover those costs varies among the states. Some states have in place a flat rate charge for end user customers similar to the inter-state Subscriber Line Charge (SLC). The more prevalent charge in most states, is the carrier common line charge (CCLC) like the inter-state charge. Some states, like the inter-state jurisdiction, have a combination of the flat rate and usage charge.

- **Interstate Toll**
  The rate elements that recover the loop costs assigned to interstate toll are the flat rated SLC and the CCLC. The current SLC maximum monthly charges are $6.00 for multi-line business and $3.50 for both single line business and residential customers. The rates may be lower in some low cost areas. The average 1995 CCLC is $0.0097 per minute for both originating and terminating access.[11]

  Recovering fixed costs from usage-based prices for services produces two patterns. On one hand, customers that have very little or no usage may not generate enough revenue to cover the cost of their service. On the other hand, customers with high usage will generate much more revenue than the costs of their service. With the onset of competition, new competitors will probably target customers whose total service generates a profit.

What is an Appropriate Loop Charge to the Competitor?

The rate for resale of loops has been set by state regulation where allowed. If the costs in **Figure 6** were used to set the rate, then based upon state costs, the rate would be $14.75. If

[11]NECA data filed in Tariff Federal Communications Commission No. 5, 27th Revised Page 17-1, effective March 16, 1995. This filing is for NECA's Long-Term Support mechanism. This mechanism supports the CCLC rates for the NECA pool companies. For details, see Carol Weinhaus, Sandra Makeeff, Mark Jamison, *et al.*, *Who Pays Whom? Cash Flow for Some Support Mechanisms and Potential Modeling of Alternative Telecommunications Policies*, Alternative Costing Methods Project, Program on Information Resources Policy, Harvard University, Cambridge, MA, pages 23 and 29 and Figure 17, page 28.

all other prices are cost-based, this could leave the incumbent LEC with monthly unrecovered costs of $5.45 unless other services cover these costs. If the total cost is to be recovered, either the state rate must be set at 100% of the cost or some pricing scheme must be developed for the interstate jurisdiction in order to recover the loop costs assigned to interstate. If 100% of the cost is recovered from a state rate, revenue and cost will not be matched jurisdictionally unless 100% of the costs are also assigned to the intra-state jurisdiction.

Should the Loop Charges to the Competitor be Imputed in the Incumbent LEC's Local Service Rates?

If the incumbent LEC is required to impute the cost based loop and other local service elements into its rates for its own customers, in many areas those rates could be above the current price of residential service (unless adjustments are made to accommodate subsidies). In some high cost areas that could force residential local service rates to be substantially increased.

Local Service Rates Compared to Loop Costs

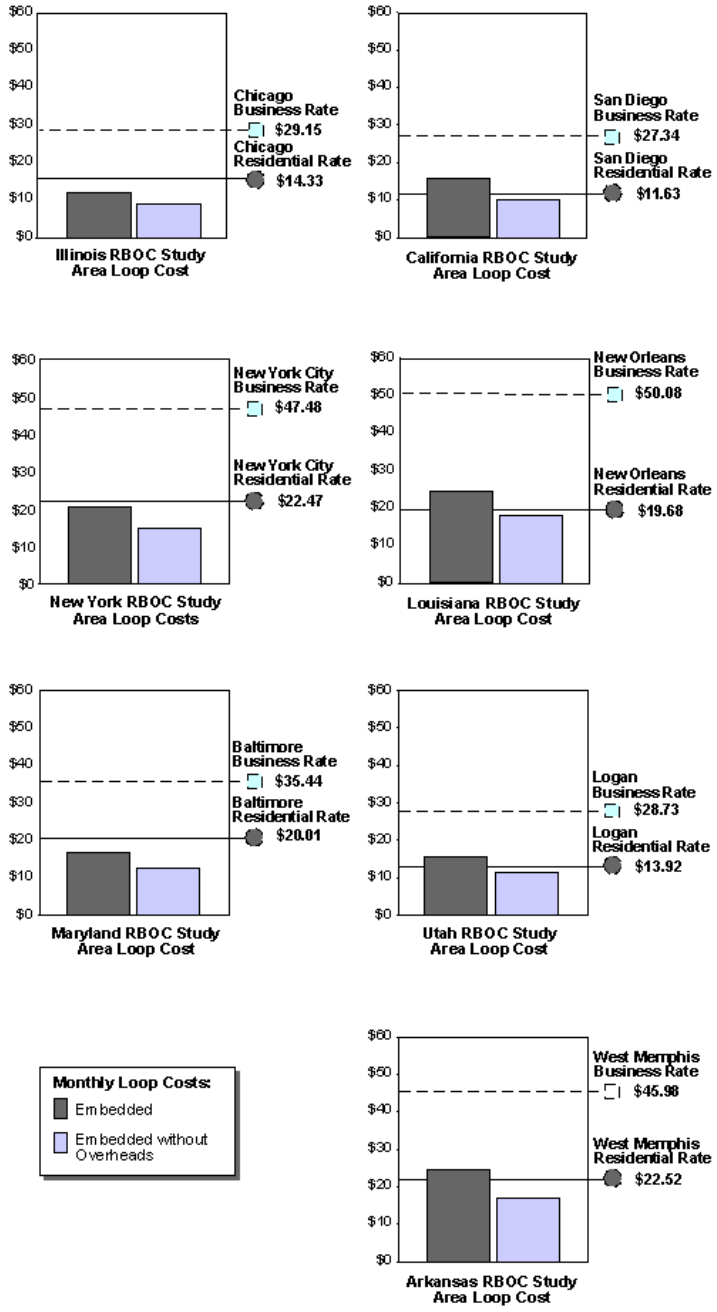
Figure 7 compares 1993 rates for basic local services (single-line business and residential, including the SLC) in selected cities with the 1993 average embedded Regional Bell Operating Company (RBOC) loop costs in that same state. Costs are for loops only and are statewide. Rates are for all basic local services for specific cities.

While the rates and costs are not directly comparable, **Figure 7** shows that, in some cases, the embedded loop costs exceed the residential rates. In all cases, the business rates exceed the fully loaded embedded costs. Imputing the loop cost plus other local service elements, such as switching and transport costs, into the local service rates could cause substantial increases in some areas (unless adjustments are made to accommodate subsidies)[12].

Figure 8 uses the weighted average residential and business local service rates and compares it to the various costs previously shown. The SLC is added to determine if a customer taking only local service is generating sufficient revenue to recover the revenue

[12] See **Section X, Appendix D, Figure 12,** for costs and rates for sample Regional Bell Operating Company (RBOC) Cities. Costs are from the FCC, *Monitoring Report*. Rates are from Jim Lande, *Reference Book: Rates, Price, Indexes, and Household Expenditures for Telephone Service,* FCC, Industry Analysis Division, Washington, DC, July 1994.

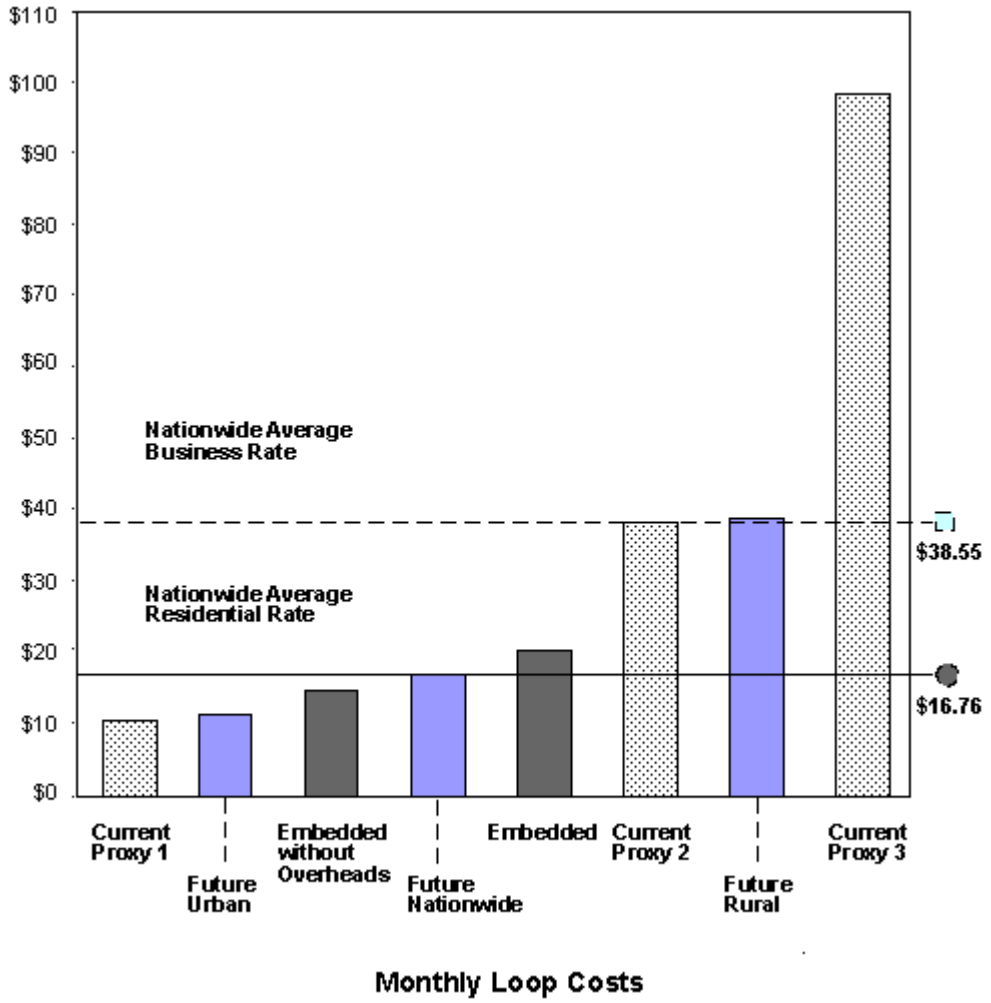
Figure 7: Comparison of 1993 Individual Rates (Residential and Business) for Selected Cities with Average RBOC Study Area Loop Costs in the Same State



Note: Embedded costs are for loops-only and are statewide. Rates are for all basic local services for specific cities. Services are for single-line residential and business. *Reference Book* definitions are as follows: Private, single-party residential access line rates include SLCs. Rates are for unlimited calling where offered, and are for measured service with 100 five-minute calls elsewhere. Rates exclude taxes. Single-line business Touchtone access line rates include SLCs. Rates are for unlimited calling where offered, and are for measured service with 200 five-minute calls elsewhere. Rates exclude taxes.

Sources: Costs the FCC, *Monitoring Report*. Rates are from Lande, FCC Reference Book, Appendix 4, pages 103 and 104.

Figure 8: Comparison of 1993 National Average Residential and Business Rates with Loop Costs



Sources: Embedded costs are from the FCC, *Monitoring Report*, Table 3.3; the other costs are developed in the paper. The 1993 nationwide average residential rate is an unlimited service base rate of $13.21 and subscriber line charges (SLCs) of $3.55 for a total of $16.76. The 1993 nationwide average business rate is an unlimited calling rate of $34.85 and SLCs of $3.70 for a total of $38.55. Lande, *FCC Reference Book*, Table 2, page 19, and Table 3, page 26.

requirement of the loop.[13] The difference between costs and rates may be much greater due to customer location and the density of customers in an area.

However, the loop is not the only cost element of local service. Comparing loop cost to the local service rates understates the costs associated with the revenues. Local service also includes the costs for switching, transport and operator service. Even though costs are understated in the comparison, **Figure 8** shows that on average the embedded loop costs exceed the flat rate residential local service rate, including the SLC. Making the same comparison with the business rates shows that in most cases the business local service rate including the SLC is sufficient to cover average embedded cost.

Rate and Cost Averages

Using the average loop cost for each state disguises the fact that within a state there are probably areas with low loop costs. The embedded average monthly loop costs of the states, ranges from a low of $6.34 to a high of $32.34, and reflects the same type of variation that exists in the loop costs of the study areas within a state.

Two of the major factors driving loop cost are customer density and distance from the central office. With these factors considered, the *New Technology Deployment Model* calculates average rural costs as 173% higher than average urban costs. The incremental proxy examples, which reflect distance increasing from one miles to ten miles and density decreasing from 3,077 to 400 lines per square mile, calculates costs increasing by approximately 800%. Since embedded costs for the average study area are not segmented into urban and rural costs, the embedded costs would overstate the urban costs and understate rural costs.

Since local service rates are also averaged, some customers will generate sufficient revenue to cover the cost of their services while others will not. Also customers who have a great deal of toll usage or subscribe to ancillary services may pay rates that greatly exceed their cost of service. Residential bills for 1992 were on a nationwide average, $51.92 per month.[14]

Local exchange competition is most likely to start with the most profitable customers. This raises the concern that incumbent LECs will be forced to continue to serve unprofitable customers, but will have lost some of the profits that have been used to subsidize these customers. Some states are requiring either a universal service type of payment to the incumbent LEC or are requiring that the ALEC have a mix of residential and business customers equal to the percentages of the incumbent LEC (Maryland, New York, and Iowa). Still other states are considering subsidies that would be available to any carrier that serves these unprofitable customers.

[13]Lande, *FCC Reference Book*, Appendix 4, pages 103 and 104.

[14]Lande, *FCC Reference Book*, page 40.

Requiring the competitor to make a payment to the incumbent LEC for the carrier of last resort obligation perpetuates the pricing problem and the need for a carrier of last resort. It is unlikely that the low-volume usage customers will have competitive alternatives unless costs go down or their local rates are increased. Also any required payment to the incumbent LEC would require regulation to enforce and monitor to determine that the payments are equitable. The goal should be to transition to a pricing structure that would encourage economic competition so that regulation my be phased out.

There is also the possibility that over a long transitional period local telephone rates will never rise to a level above today's costs. One of the benefits of competition should be lower costs. Over time, costs should be reduced as companies seek to provide service in the most cost-effective manner in order to compete effectively.

If basic services are allowed to rise to cost, it should be a progressive increase over time, consistent with the level of competition. Also, as the distinct lines between companies such as cable TV, electric, computer, and telephone, disappear, telephone service may not be the cost driver. Telephone service could become the ancillary service to cable TV or electricity services.

V. Should There be Price Distinctions?

Should There be Price Distinctions Based upon How the Service is Used or Upon Who Uses It?

Loss of Call Distinction

Historically, telephone service has been priced based upon the use of the service. Is it interstate or intrastate? Is it a business or residential customer? Is the service for resale or the company's own customer? The answer to all of these and other usage questions determined the price you would pay for a service. As local competition evolves and resale of service occurs, the ability to make this distinction may be lost.

With the resale of services, it will become increasingly difficult for the LEC to obtain information required to determine who made the call or how it was used. The competitor that provides service to the end-user customer would have the information to determine if the line is used by a business or residential customer or used for local or toll calls. Requiring the incumbent carrier to obtain this information in order to maintain usage distinctive rates may become impractical if not impossible.

For example, rate elements such as the SLC are based on the type of customer, residential or business. Resale of services such as Centrex or ISDN, currently classified as business lines, could be offered to residential customers, blurring the distinction between the residential and business classification. If an ALEC resells a Centrex line to a residential customer, what SLC should apply?

Discrimination

Charging different rates for different types of interconnection that use identical or similar facilities (e.g. local service access, toll access, cellular access, etc.) may not make sense and could be construed as discrimination. Also as the distinctive lines regarding providers of service and types of calls disintegrate it will become increasingly difficult to determine the type of provider and call. For example, suppose a cable TV company uses its wire line facilities in conjunction with cellular facilities and purchases access from the local telephone company, is this cellular access, toll access, or local access?

Also the distinction between local and toll calls may disappear as competing companies have differing local service areas in the same serving area. This is already occurring as cellular companies often offer a different local calling area than their competitors and the local exchange companies where they serve.

A Universal Access Tariff

Since many of the access services are technically indistinguishable, it may be appropriate to develop a simplified carrier to carrier access tariff. As the distinctions between local and toll disappear it may be impossible to maintain artificial tariff

distinctions. Maintaining separate access tariffs can create opportunities for arbitrage customers that are supposed to pay higher prices may find ways around tariff distinctions in order to qualify for the lower prices.

Regulation has traditionally set the jurisdictional boundaries for local and toll calling. Maintaining separate tariffs for local and toll access may perpetuate the boundaries set by regulation. Customers will benefit if competitive choice becomes the mechanism that offers alternative boundaries for local calling areas as well as other service alternatives.

VI. Policy Issues

Policy Issues

The introduction of competition into the local service market conflicts with the following current cost pricing policies:

- Allocation of loop costs to various services.
- Pricing basic local service below cost.
- Recovery of fixed costs on a usage basis.

Results of Current Policies

- ***Over and Under Recovery of Costs***
  The allocation of loop costs to other than basic local service and the resulting pricing will mean that customers that take only local service will not cover the cost of their service. The recovery of fixed loop costs from usage sensitive rates results in over recovery of costs from some customers and under recovery from others.

- ***Markets without Competition***
  Where competition does not exist, the current policies do not conflict since on average a company recovers its costs. In fact, these policies have been used to promote universal service by keeping basic service rates affordable.

- ***Markets with Competition***
  However, the introduction of competition makes the current policies unworkable. Companies have the incentive to serve only those customers that are profitable.

  To prevent rate shock, increases to basic service rates should be phased in over a relatively long period of time. Also, in the future, telephone service could be an ancillary service provided at a low price. Also new technology could transform high cost areas into low cost areas. This could mean that basic local service prices may never rise to the level of current costs.

  Furthermore, the introduction of competition will necessitate development of an appropriate charge to competitors for the use of the incumbent LEC's loop facilities. In order for viable local competition to develop, regulators and companies must develop effective and workable solutions to these challenges.

VII. Appendix A, Figure 9:
Background Data for Figures 1 and 2: Embedded Loop Data with and without Overheads

Monthly Embedded Cost per Loop						
State	Total	Without Overheads*	Total Rounded to Nearest Dollar	Total Grouped by Dollar Amount	Without Overheads Rounded to Nearest Dollar	Without Overheads Grouped by Dollar Amount
District of Columbia	$6.34	$4.29	$6	1	$4	1
Illinois	$13.59	$9.86	$14	1	$10	2
Nevada	$15.83	$10.26	$16	3	$10	
New Jersey	$15.97	$11.87	$16		$12	7
Utah	$16.26	$11.62	$16		$12	
Iowa	$16.52	$10.91	$17	5	$11	1
Maryland	$16.66	$12.41	$17		$12	
Pennsylvania	$16.90	$12.16	$17		$12	
Nebraska	$17.23	$11.65	$17		$12	
Delaware	$17.34	$12.62	$17		$13	5
California	$17.70	$12.45	$18	5	$12	
Minnesota	$17.72	$11.80	$18		$12	
Rhode Island	$17.90	$13.16	$18		$13	
Ohio	$18.03	$13.45	$18		$13	
Massachusetts	$18.44	$13.24	$18		$13	
Michigan	$18.59	$13.54	$19	5	$14	6
Colorado	$18.59	$13.11	$19		$13	
Wisconsin	$18.68	$13.78	$19		$14	
Indiana	$18.93	$13.89	$19		$14	

Monthly Embedded Cost per Loop						
State	Total	Without Overheads*	Total Rounded to Nearest Dollar	Total Grouped by Dollar Amount	Without Overheads Rounded to Nearest Dollar	Without Overheads Grouped by Dollar Amount
Connecticut	$19.33	$13.56	$19		$14	
Washington	$19.57	$13.91	$20	3	$14	
Hawaii	$19.86	$14.73	$20		$15	5
Virginia	$20.38	$14.73	$20		$15	
South Dakota	$20.62	$14.27	$21	5	$14	
New York	$20.69	$14.83	$21		$15	
North Dakota	$21.42	$16.94	$21		$15	
Missouri	$21.46	$16.42	$21		$16	6
Arizona	$21.50	$15.11	$21		$15	
Tennessee	$21.58	$16.16	$22	3	$16	
Texas	$22.16	$16.03	$22		$16	
Oregon	$22.25	$15.83	$22		$16	
Alabama	$22.59	$18.55	$23	3	$19	5
Kansas	$22.88	$16.36	$23		$16	
Oklahoma	$23.07	$16.17	$23		$16	
Kentucky	$23.99	$18.04	$24	2	$18	3
North Carolina	$24.42	$18.70	$24		$19	
New Mexico	$24.57	$17.38	$25	4	$17	1
Idaho	$25.02	$17.82	$25		$18	
Montana	$25.33	$18.34	$25		$18	
Florida	$25.37	$18.81	$25		$19	
Georgia	$25.81	$20.06	$26	2	$20	3

Monthly Embedded Cost per Loop						
State	Total	Without Overheads*	Total Rounded to Nearest Dollar	Total Grouped by Dollar Amount	Without Overheads Rounded to Nearest Dollar	Without Overheads Grouped by Dollar Amount
Louisiana	$25.91	$19.36	$26		$19	
Maine	$26.64	$19.47	$27	1	$19	
New Hampshire	$27.68	$19.66	$28	2	$20	
Arkansas	$27.98	$19.64	$28		$20	
Mississippi	$28.61	$22.43	$29	1	$22	4
South Carolina	$29.50	$22.89	$30	3	$23	2
West Virginia	$29.81	$21.81	$30		$22	
Wyoming	$30.15	$21.69	$30		$22	
Vermont	$31.56	$23.24	$32	2	$23	
Alaska	$32.17	$22.23	$32		$22	
National Average**	$20.20	$14.68	$20	51	$15	51

* The excluded accounts are Network Support Expense (Account 6110), General Support Expense (Account 6120), Executive and Planning Expense (Account 6710) and General and Administrative Expense (Account 6720), Total Rents, and Total Benefits.
** National average excludes Puerto Rico, Virgin Islands, and Micronesia.

Source: Embedded costs are from the FCC, *Monitoring Report,* Table 3.3. Embedded costs without overheads are from NECA data for the collection of the 1994 USF based on 1993 data.

VIII. Appendix B, Figure 10:
Current Proxy Unit Investment, and Distance and Density Assumptions

Line No.	Description	Density - Lines per Square Mile			Calculations
		Less than 400	Greater than 400 but less than 2,500	2,500 or Greater	
1	Feeder Cost per Pair-Foot:	$0.0459	$0.0310	$0.0286	((Ln 2 x Ln 4 x Ln 7) + (Ln 3 x Ln 5 x Ln 8))/ Ln 6
2	Underground	$0.0204	$0.0141	$0.0153	
3	Aerial	$0.0336	$0.0282	$0.0251	
4	Underground Structure	1.40	1.40	1.40	
5	Aerial Structure	1.20	1.20	1.20	
6	Fill Factor	0.75	0.75	0.75	
7	Percent Underground	50%	75%	100%	
8	Percent Aerial	50%	25%	0%	
7	Distribution Cost per Pair-Foot:	$0.2436	$0.2116	$0.1808	((Ln 10 x Ln 13) + (Ln 11 x Ln 14))/ Ln 12.
10	Buried	$0.0909	$0.0604	$0.0452	
11	Aerial	$0.0609	$0.0454	$0.0352	
12	Fill Factor	0.25	0.25	0.25	
13	Percent Buried	0%	50%	100%	
14	Percent Aerial	100%	50%	0%	

Source for long-run incremental costs (Lines 1 through 14): Mitchell, *Incremental Costs,* Figures C.1, C.2a, and C.2b, pages 86-88.

To calculate proxy costs, apply the above unit investments to TIAP distance and density assumptions in order to calculate total investment. Total investment is then multiplied by the assumed ration of 0.2951 and divided by 12 to calculate a monthly revenue requirement (cost).[1]

Examples of Incremental Costs	Assumed Distances and Densities					
	Airline Distance (in Feet)	Distribution Area (in Square Miles)	Total Households (in Distribution Area)	Total Households (per Square Miles)	Feeder Distance (in feet)	Distribution Distance (in Feet)
Current Proxy 1	5,280	0.13	400	3,076.92	5,947	1,428
Current Proxy 2	26,400	0.40	400	1,000.00	32,824	2,505
Current Proxy 3	52,800	1.00	400	400.00	66,347	3,960

Examples of Incremental Costs	Feeder Investment	Distribution Investment	Total Investment	Monthly Revenue Requirement
Current Proxy 1	$170	$258	$428	$10.52
Current Proxy 2	$1,018	$530	$1,548	$38.07
Current Proxy 3	$3,047	$965	$4,012	$98.64

[1] The total investment quantities calculated to this point include only the capitalized costs of the cable and wire facilities and their placement costs. In order to develop a cost that includes depreciation, return on investment and overhead expenses, the investment must be multiplied by an annual cost factor. This example uses an assumed annual cost factor of 0.2951, which falls within the range of annual cost factors that can be calculated using ARMIS (Automated Reporting Management Information system) 4304 data for large LECs. The product of the investment and annual cost factor are divided by 12 to produce a monthly cost.

IX. Appendix C: Derivation and Modeling Assumptions for Future Costs

Derivation of Future Costs

The future cost numbers are based on the *New Technology Deployment Model* numbers adjusted to reflect only loop costs. The factors used in the model were adjusted to reflect only the loop portion. **Figure 11** indicates the factors used for total broadband costs and those developed for loop costs.[15]

Modeling Assumptions from the New Technology Deployment Model

The following list contains the assumptions used to generate the 20-year deployment curves for a broadband infrastructure in the *New Technology Deployment Model*. Some of the basic caveats are also listed. Further details are included in the *Overview of the New Technology Deployment Model and the 1995 Broadband Model User Guide*.[16]

Assumptions:

- 2.35% growth rate in access lines per year. The access line growth was revised from 3% in Beyond Future Shock to 2.35% in this paper.
- A modified S-Shape as defined by the default deployment schedule.
- 0.5% decrease in general overheads per year, which produces a 10% decrease in the lump sum over 20 years.
- 1.81% increase in the direct overheads per year, but assumes a 10% decrease per access line over 20 years. The increase in the lump sum is due to growth in access lines.
- 11.25% rate of return on investment (default).
- 5.1% average state income tax rate (default).
- 35% federal income tax rate (default).

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[15] For a detailed description of the development of these factors, see the *1995 Broadband Model User Guide,* pages 77-79. For an example of a revenue requirement calculation, see pages 80-81.

[16] See *Overview of New Technology Deployment Model*, pages 5-6. For greater detail, see *1995 Broadband Model User Guide,* 26-34, 53-61, 72-81.

Appendix C, Figure 11:
Total Broadband Factors from Model and Derived Loop Portion Factors

		Nationwide		Urban		Rural	
Line No.	Description	Broadband Model	Loop Portion	Broadband Model	Loop Portion	Broadband Model	Loop Portion
	Revenue Requirement Factors:[a]						
1	Basic Loop	11.61	11.61	11.42	11.42	12.51	12.51
2	All Other (Ln 3 through Ln 5)	11.13	1.83	11.19	1.83	10.83	1.83
3	Switching[b]	5.54	0.00	5.59	0.00	5.30	0.00
4	Transmission[c]	4.41	1.83	4.41	1.83	4.43	1.83
5	Other[d]	1.18	0.00	1.19	0.00	1.10	0.00
	Overheads per Line:						
6	Direct Overheads[e]	14.94	1.74	14.97	1.75	14.79	1.70
7	General Overheads[f]	11.3	3.98	11.22	3.97	11.66	4.03
8	Benchmarks Ln 1 + (Ln 3 through Ln 7)	48.98	19.16	48.80	18.97	49.79	20.07

[a] *1995 Broadband Model User Guide,* Figure 24, page 77. In the broadband model, basic revenue requirements include only rate of return on investment of 11.25%, federal income tax (FIT), depreciation costs, and maintenance costs. "All Other Basic" costs are Interoffice Transport, Local Switching, Information Originating and Terminating Equipment (IOT), and Operator Services.

[b] Loop portion removes switching.

[c] Loop portion of Account 6230 (Central Office Transmission Expense).

[d] Loop portion removes Operator Services (Account 2220) and IOT (Account 2310).

[e] Direct overhead costs are General Support Facilities (GSF), Network Operations Expense, and Customer Service Expenses. Loop portion removes General Support Facilities (Account 2110) and Services Expenses (Account 6620).

[f] General overhead costs are Marketing Expenses; General Office Expenses; State, Local & Other Taxes; Materials & Supplies; Plant Under Construction; and Plants Held for Future Use. Loop portion removes Marketing Expense (Account 6610), Property Held for Future Use (Account 2002), Telephone Plant Under Construction (Account 2003).

Assumptions, cont:

- Default book and tax lives:

Account No.	Description	Book Life:	Tax Life:
2212	Digital Electronic Switching	10	5
2232	COE Circuit Equipment	7	5
2362	Loop Electronic Equipment	6	5
2421.1	Non-Metallic Aerial Cable - Exchange	25	15
2422.1	Non-Metallic Underground Cable -Exchange	25	15
2423.1	Non-Metallic Buried Cable - Exchange	25	15
2421.2	Metallic Aerial Cable - Exchange	20	15
2422.2	Metallic Underground Cable - Exchange	20	15
2423.2	Metallic Buried Cable - Exchange	20	15

General Caveats

- The costs are for a nationwide, LEC only deployment
- The broadband infrastructure costs are primarily loop replacement costs. A small amount of switching costs are included.
- Additional costs for provision of broadband services are excluded.
- The model applies the interstate rate of return to all investments regardless of whether the investments are state or interstate.

X. Appendix D, Figure 12:
Background for Figure 7: Costs and Rates for Sample Regional Bell Operating Company Cities

State	RBOC	Monthly Embedded Cost per Loop		Sample Cities	Single-Line Rates	
		Total	Without Overheads*		Residential	Business
Alabama	BellSouth	$20.94	$17.77	Huntsville	$20.85	$53.98
Arkansas	Southwestern	$24.67	$17.10	West Memphis	$22.52	$45.98
Arizona	U S WEST	$20.53	$14.23	Tucson	$15.93	$35.57
California	Pacific Telesis	$15.38	$10.53	San Diego	$11.63	$27.34
Colorado	U S WEST	$18.27	$12.90	Boulder	$18.79	$42.41
Connecticut	SNET	$19.32	$13.56	Ansonia	$15.77	$38.29
District of Columbia	Bell Atlantic	$6.34	$4.29	Washington	$19.42	$32.69
Florida	BellSouth	$26.29	$19.71	Miami	$14.71	$35.06
Georgia	BellSouth	$25.07	$19.63	Atlanta	$19.59	$47.57
Illinois	Ameritech	$12.13	$8.98	Chicago	$14.33	$29.15
Indiana	Ameritech	$16.78	$12.47	Indianapolis	$18.83	$55.01
Kentucky	BellSouth	$23.34	$17.42	Louisville	$20.65	$55.89
Louisiana	BellSouth	$24.41	$18.17	New Orleans	$19.68	$50.08
Massachusetts	NYNEX	$18.43	$13.24	Boston	$19.10	$46.02
Maryland	Bell Atlantic	$16.65	$12.41	Baltimore	$20.01	$35.44
Maine	NYNEX	$26.67	$19.39	Portland	$19.68	$37.11
Michigan	Ameritech	$17.04	$12.32	Detroit	$14.48	$32.14
Minnesota	U S WEST	$15.93	$15.93	Minneapolis	$18.08	$49.45
Missouri	Southwestern	$17.34	$14.00	Kansas City	$14.85	$40.93
Mississippi	BellSouth	$28.24	$22.12	Pascagoula	$21.75	$50.30
Montana	U S WEST	$22.36	$16.14	Butte	$17.34	$42.19

State	RBOC	Monthly Embedded Cost per Loop		Sample Cities	Single-Line Rates	
		Total	Without Overheads*		Residential	Business
North Carolina	BellSouth	$26.32	$20.50	Raleigh	$16.01	$39.34
Nebraska	U S WEST	$14.89	$9.99	Grand Island	$18.90	$42.05
New Jersey	Bell Atlantic	$15.75	$11.73	Phillipsburg	$10.95	$25.27
New York	NYNEX	$20.59	$14.76	Buffalo	$27.85	$47.18
Ohio	Ameritech	$16.51	$12.47	Toledo	$18.75	$43.05
Oregon	U S WEST	$20.24	$14.21	Portland	$19.38	$39.29
Pennsylvania	Bell Atlantic	$15.83	$11.52	Philadelphia	$15.85	$27.75
Rhode Island	NYNEX	$17.90	$13.16	Providence	$20.14	$43.95
Tennessee	BellSouth	$21.58	$16.19	Memphis	$16.43	$48.51
Texas	Southwestern	$19.93	$14.46	Houston	$14.55	$33.53
Utah	U S WEST	$15.64	$11.27	Logan	$13.92	$28.71
Virginia	Bell Atlantic	$19.04	$13.91	Richmond	$17.67	$56.54
Washington	U S WEST	$16.87	$11.77	Seattle	$16.01	$34.93
Wisconsin	Ameritech	$16.07	$11.78	Milwaukee	$15.10	$36.03
West Virginia	Bell Atlantic	$28.43	$20.64	Huntington	$25.50	$66.25

* The excluded accounts are as Network Support Expense (Account 6110), General Support Expense (Account 6120), Executive and Planning Expense (Account 6710) and General and Administrative Expense (Account 6720), Total Rents, and Total Benefits. *Reference Book* definitions are as follows: Private, single-party residential access line rates include SLCs. Rates are for unlimited calling where offered and are for measured service with 100 five-minute calls elsewhere. Rates exclude taxes. Single-line business Touch-Tone access line rates include SLCs. Rates are for unlimited calling where offered and are for measured service with 200 five-minute calls elsewhere. Rates exclude taxes.

Source: Costs the FCC, *Monitoring Report*. Rates are from Lande, *FCC Reference Book: Rates, Price Indexes, and Household Expenditures*.