New Services

The third driver is the impending emergence of digital communications services for the mass market. These services will support both television and computer-based applications requiring digitized transmission of text, audio, and still and moving images. The applications for these services include advanced fax, computer-based imaging, LAN interconnection, videoconferencing, interactive multimedia, video on demand, and interactive television. Today, the market for digital communications services for these applications is relatively small: however, the potential for growth is tremendous, especially when these services are extended beyond large business customers.

Ultimately, the telephone network will provide full broadband, multimedia communications services based on three of the technologies we have mentioned: fiber optics, SONET transmission, and ATM switching. Along the way, intermediate steps will include narrowband Integrated Services Digital Network (ISDN) and video on demand services. Since some of the new services blur the traditional distinctions between telephony, television, publishing, information systems, and computing, they foster a new type of competition focused on the convergence of these industries. In this environment, competitive advantages belong to those companies that can deliver a package of diverse services for the least cost. As it happens, the new technologies allow delivery of multiple services at overall costs that are comparable or less than the traditional delivery mechanisms for the individual services.

Impacts on Depreciation Lives

Alone, any one of these drivers would cause significant change in the deployment of technology. Together, they are forcing unprecedented change that is rendering most of today's telephone network obsolete. Although satisfactory for voice services, today's network is expensive to operate and offers limited functionality in terms of mobility and digital services. It was optimized and constructed for the age of electromechanical and analog switching and copper cable, an age which for a decade has been giving way to digital switching and fiber optics. Much of the equipment placed in the last decade is becoming obsolete in the face of new technologies such as SONET and ATM. Thus, if LECs are to remain viable, they must rebuild their networks—sooner rather than later. This necessitates continued,

massive investment in new technology that requires much shorter lives for existing investment than are currently prescribed by regulators.

Weaknesses in Regulatory Depreciation Methods

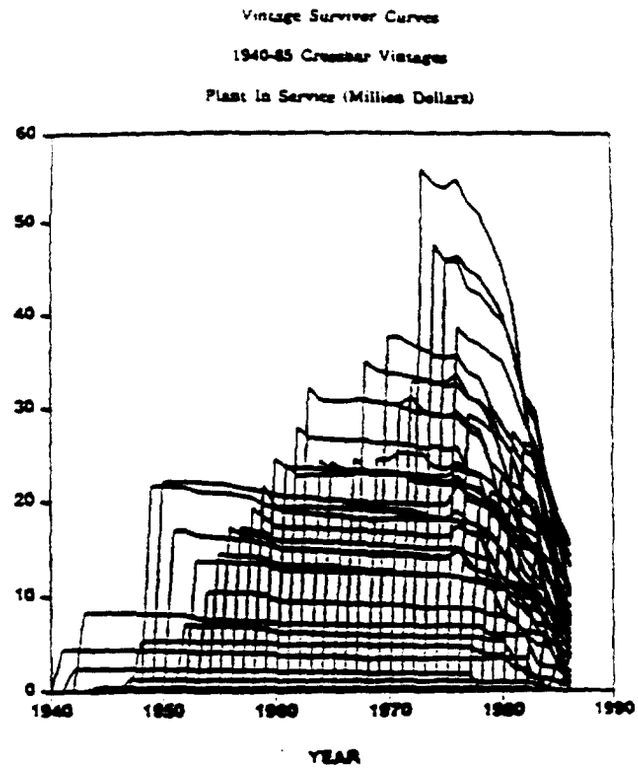
The traditional method for estimating depreciation lives is to examine mortality data for older vintages and assume that all vintages will experience the same age-dependent characteristics. For example, if 60% of the units of a particular technology installed in 1983 were still in service in 1989 (six years later), we would assume that 60% of the units installed in 1990 would still be in service in 1996 (again, six years later). (This greatly over-simplifies, but captures the basic idea.) The assumption of age-dependent retirements reflects a situation where wear-out or breakdown drives the replacement process. Under this model, new technology (or perhaps a new unit of old technology) replaces old technology only when the old technology wears out or breaks. This is an accurate model for some situations; for example, it reflects the way most companies replace motor vehicles.

Today, however, technological obsolescence is a major cause of retirements in telecommunications for switching and circuit equipment, and is also expected to be for outside plant in the near future. (Other drivers—competition and new services—are largely reflected in this driver.) Mortality analysis alone is not appropriate in such a situation. This is made clear in Exhibit 2, which plots the vintage survivor curves for crossbar switching. These are similar to normal survivor curves except that a separate investment life cycle is shown for each vintage of equipment. Note the "avalanche effect" between 1975 and 1980. During this period, all vintages experienced sudden and simultaneous retirements, as electronic switching was rapidly adopted.

One can also see from the avalanche curves that, when technological obsolescence is the major driver for retirements, there is no such thing as a constant service life. Equipment purchased late in a technology generation will have a much shorter life than a piece of equipment purchased earlier. Further, the expected service life of equipment purchased late in the cycle is roughly the same as the average remaining life of existing equipment. These observations are contrary to mortality-based depreciation, but they reflect reality.

Most important, until the avalanche begins, life estimates for the old technology using mortality-based analysis will be based on an extension of the pre-avalanche trend and, thus, will be way too long. Not only will the life estimates be wrong, but they will be wrong right up to the moment the avalanche begins. To use a different metaphor, this is like paddling a rowboat without ever looking forward. You are over the falls before you know anything is wrong!

Exhibit 2
Avalanche Curves



Source: Bellcore

The original replacement technology for crossbar switching was analog stored program control (ASPC) switching, first introduced in the mid-to-late 1960s. Note that the avalanche of crossbar retirements begins in about 1975, more than five years after the introduction of the new technology.

Also note that very large amounts of investment were made in the old technology very late in its life cycle, even after the new technology was available. Although this behavior may seem odd, it is typical of many technologies and can often be perfectly rational. (For example, millions of 486 personal computers have been sold since the introduction of the replacement technology, the Pentium.) It can result from several factors:

(1) The need to maintain existing equipment and service levels.

(2) Restrictions on the availability of the new technology.

(3) High relative costs for the new technology early in its life cycle.

(4) An inherent bias toward the existing technology.

However, we must keep in mind that the last purchases of old technology will have especially short lives.

An important implication of this phenomenon is that recent investment patterns in the old technology tell us little about the likely adoption of new technology, even in the near future. Purchase volumes of the new technology may be smaller than those of the old technology almost to the time the avalanche begins.

Using Technology Forecasting to Estimate Depreciation Lives

Fortunately, there are reliable methods that allow us to forecast future technology changes and, thus, depreciation lives. Developed and tested over many years in telecommunications and other industries, these methods have proven to be very reliable for forecasting. Their basis lies in an understanding of the process of technology change and the use of available data to produce quantitative forecasts.

One technology forecasting method, substitution analysis, has been proven effective in projecting the adoption of new technologies and the obsolescence of old technologies. Substitution refers to the displacement of an established technology by a newer technology when the new technology provides substantially improved capabilities, performance, or economies. With substitution, technological superiority of the new technology—not wear-out—is the driver for replacement.

With substitution analysis, we examine patterns of technology substitution. The pattern is remarkably consistent from one substitution to another, and is characterized by an S-shaped curve when the market share of the new technology is plotted over time. Exhibit 3 shows the S-shaped curve for the Fisher-Pry model. Of the several substitution models available, in general, we have found the Fisher-Pry model—and its extensions, notably, multiple substitution models based on the same principles—to be the most useful for forecasting. The adoption of a new technology starts slowly because, when it is first introduced, a new technology is usually expensive, unfamiliar, and imperfect. The old technology, on the other hand, has economies of scale and is well-known and mature. As the new technology improves, it finds more and more applications, it achieves economies of scale and other economic efficiencies, and it becomes generally recognized as superior. The old technology, because of its inherent limitations and falling market share, cannot keep up. The result is a period of rapid adoption of the new technology, beginning at the 10% to 20% penetration level. This corresponds with a period of rapid abandonment of the old technology, i.e., the avalanche. Toward the end of the substitution, adoption of the new technology slows down again as the last strongholds of the old technology are penetrated.

Since the pattern of how a new technology replaces an old one is consistent, we can apply the pattern to a technology substitution in progress, or one just beginning, to forecast the remainder of the substitution and estimate the end date for the old technology. We can apply substitution analysis even in cases where the substitution has yet to begin by using appropriate analogies, precursor trends, or evaluation of the driving forces. More information on the Fisher-Pry model and its application is provided in Attachment 1.

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In the Matter of	)	
	)	
Price Cap Performance Review for Local Exchange Carriers	)	CC Docket No. 94-1
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REPLY COMMENTS OF AMERITECH IN RESPONSE TO FOURTH FURTHER NOTICE OF PROPOSED RULEMAKING

Ameritech submits these reply comments in response to the Commission's Fourth Further Notice of Proposed Rulemaking in this proceeding.[1] In general Ameritech supports USTA's reply comments, especially in their rebuttal of AT&T's, Ad Hoc's, and MCI's comments.

I. AMERITECH SUPPORTS THE USE OF TOTAL FACTOR PRODUCTIVITY AS CALCULATED BY CHRISTENSEN FOR THE BASIS OF ANY PCI ADJUSTMENT FACTOR.

As USTA points out in its reply comments, the Commission should ignore the comments of those who would have the Commission base the productivity adjustment on factors other than those that are "economically meaningful". It is not appropriate to use this proceeding simply to lower LEC access rates. Rather, the productivity offset factor should only be reflective of local exchange carrier ("LEC") productivity.

Nothing submitted in the comment round of this proceeding impugns adoption of the TFP methodology, as revised and simplified by Christensen, as the appropriate measure of LEC productivity to form the basis for any PCI adjustment factor. As the record demonstrates, the TFP methodology has been simplified by USTA and

[1] In the Matter of Price Cap Performance Review for Local Exchange Carriers, CC Docket No. 94-1, Fourth Further Notice of Proposed Rulemaking, FCC 95-406 (released September 27, 1995) ("Fourth FNPRM").

II. AMERITECH SUPPORTS SOUTHWESTERN BELL'S PROPOSAL TO REPLACE THE SPECIAL CCL CAP WITH AN API CALCULATION.

As noted by Southwestern Bell in its comments,[5] use of the TFP methodology in calculating PCI adjustment factors eliminates the need for any unique carrier common line rate cap factor. The productivity effects of the growth in CCL minutes of use demand is already reflected in the TFP methodology. Therefore, the additional demand adjustment currently included in the PCI for the common line basket should be eliminated. The current CCL rate formula can then be replaced by a simple PCI formula and API calculation identical to those in other baskets. Further, this simplified approach to capping CCL rates sets a framework for the Commission's consideration of potentially permitting the increase in end user common line ("EUCL") rates and the recovery of CCL revenue in other ways since it would allow greater flexibility than exists currently within the common line basket.[6]

III. PRESCRIBED DEPRECIATION RATES ARE PROBLEMATIC.

MCI argues that the Commission should use the currently prescribed depreciation rates in any TFP study.[7] In support of its position, it introduces a study by Microeconomic Consulting & Research Associates, Incorporated ("MiCRA") which purports to prove that LEC claims of the distorted effects of regulatory depreciation

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[5] Southwestern Bell at 35-36.

[6] With the interconnection and unbundling obligations of incumbent LECs contained in the Telecommunications Act of 1996, there is a vital need for the Commission to permit all incumbent LECs to recover any subsidy costs in a competitively neutral manner. See also Section VI, infra.

[7] MCI at 18.

practices are wrong. However, as demonstrated by the paper by Technology Futures, Inc., included with USTA's Reply Comments, MiCRA's analysis is fatally flawed.

MiCRA's theoretical reserve study contains several errors which lead to false or misleading conclusions. For instance, MiCRA performs no new analysis regarding the appropriate life and depreciation patterns of LEC assets. MiCRA simply assumes the FCC's life and salvage results to conclude that there is no reserve "problem." This is to be expected. Starting with the Commission's assumptions, one would expect MICRA to wind up with answers consistent with those assumptions. However, the logic is circular and the problem is with the Commission's assumptions in the first instance.

Conveniently ignored by MiCRA is the fact that MCI uses depreciation factors that produce rates approximately 20 - 30% higher than LECs who use substantially the same equipment to provide functionally identical services and the fact that the FCC's prescribed rates for AT&T are substantially higher than those applied to LEC investment for similar equipment providing essentially identical functions. MiCRA illogically implies that the archaic rules used to calculate LEC profits, different as they are from those used to calculate IXC profits, should be maintained indefinitely.

The real lesson to be learned from MiCRA's analysis is that, at a minimum, the FCC should alter its rules so that all carriers will be measured by the same depreciation factors. Optimally, the Commission should exercise the authority granted it under the Telecommunications Act of 1996 and eliminate depreciation prescriptions for all price cap carriers.[8]

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[8] See also Section V, infra.

TAB 5

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March 1, 1996

Bell Atlantic
Attachment 2

See Tab 1
USTA
Attachment C

Before the
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Washington, D.C. 20554

In the Matter of	)	
	)	CC Docket No. 94-1
Price Cap Performance Review	)	
for Local Exchange Carriers	)	

NYNEX REPLY COMMENTS

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Their Attorney

Dated: March 1, 1996

Third, Dr. Christensen shows that Dr. Norsworthy provides an incorrect explanation of the depreciation rates used in the TFP study. Those depreciation rates were obtained directly from Jorgensen and represent the most appropriate rates for use in a TFP study.[21] Furthermore, those depreciation rates create a symmetry or consistency between measured LEC capital input and measured U.S. economy capital input. Finally, as detailed in Attachment A, Dr. Christensen rebuts other allegations made by Dr. Norsworthy and shows that the Christensen methodology provides the most sound way for calculating TFP.

As for MCI's allegations, Dr. Vander Weide shows in Attachment C that the Baseman/Van Gieson study relied upon by MCI is invalid because it fails to distinguish between accounting concepts and economic concepts.[22] That study purports to show that the RBOCs' profits have not been distorted by inadequate depreciation reserves. Baseman/Van Gieson inappropriately place primary reliance on FCC-prescribed depreciation rates rather than market-determined depreciation rates. The FCC-prescribed depreciation rates do not reflect economic lives, but rather are largely based on noneconomic policy considerations and results negotiated with state commissions and LECs.

API maintains halfheartedly (at pp. 3-4) that the TFP methodology should expand measures of performance to include telecommunications providers other than LECs. However, this approach should not be adopted since, as API concedes (at pp. 6-8), the FCC may face real obstacles in obtaining the necessary data, and there are valid concerns

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[21] Attachment A, pp. 17-18. See also NYNEX Comments, Appendix A, pp. 12-14.

[22] Attachment C, Affidavit of Dr. James H. Vander Weide in Support of Reply Comments of The United States Telephone Association, pp. 15-16.

The Commission should not adopt any methodologies which focus on the reported financial performance of the LECs and use measures such as reported interstate rate of return for establishing a productivity offset. As shown throughout this proceeding, earnings are not a reasonable basis for developing an appropriate X-Factor. Reported interstate earnings are the result of noneconomic accounting and regulatory rules and are not representative of the actual economic performance of an operating entity.

For example, for financial reporting purposes, in 1995 NYNEX instituted provisions of SFAS-101, discontinued SFAS-71 accounting and made a depreciation reserve adjustment of $3.6 billion to reflect the amount which had not been fully recovered under the current depreciation rates.[50] If NYNEX for regulatory purposes had been able to amortize this amount over the five year period under price caps, the reported interstate rate of return would have been reduced by an average of approximately 1.27% per year. This would have reduced NYNEX's average interstate rate of return, as reported on the FCC 492A Reports from 1991 to 1995, from an average of 11.70% to an average of approximately 10.43%.[51] This illustrates the extent to which regulatory rules governing areas such as depreciation can impact reported earnings.

Additionally, this example illustrates the flexibility which will be required by the LECs in order to effectively operate in the intensifying competitive environment. Competitive firms that are not governed by regulatory rules such as mandated depreciation schedules are able to depreciate capital investment based on the actual economic life of the investment.[52] As such, their earnings would reflect these economic decisions. Looking

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[50] Attachment D, TFI, pp. 6-7.

[51] Estimated 1995 NYNEX Interstate Rate of Return for Year End 1995 FCC 492A Report.

[52] See Attachment D, TFI, pp. 7-11. TFI provides comparisons to show how LECs are disadvantaged with respect to competitors based on differences in depreciation.

ahead to a very competitive environment, accelerated by the legislative reform of the Telecommunications Act of 1996, price cap LECs will require the same freedoms which are enjoyed by the competitors. Therefore, any regulation still required as the industry transitions to a fully competitive environment must eliminate regulatory rules based on noneconomic principles.

IV. OPPOSING COMMENTORS PROVIDE NO BASIS FOR THE FCC TO HESITATE TO CARRY THROUGH ON ITS GOALS TO ELIMINATE SHARING AND RATE OF RETURN ELEMENTS

A. Sharing Mechanism

Many opposing parties argue for the retention of a sharing mechanism in the LEC price cap plan.[53] However, sharing has no place in a long term price cap plan and should be eliminated.

AT&T asserts that sharing is needed to encourage LECs to pick a higher X-Factor, and AT&T seeks to discount any blunting of efficiency incentives by sharing.[54] However, the Commission has already firmly concluded that sharing blunts LEC efficiency incentives, and the Commission has established a long-term goal of eliminating sharing.[55]

Other commentors wrongly believe that sharing is needed to ensure that LEC efficiency gains are flowed to ratepayers in cases where, for example, the industry X-Factor differs from an individual LEC's productivity.[56] The moving average TFP alleviates any such concerns, and sharing would only defeat an individual LEC's incentive to improve productivity in an effort to beat the industry average and improve earnings.

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[53] AT&T 36, Ad Hoc 8 ETI 53-65, API 9, Frontier 5, GSA 7, ICA 2, MCI 19, TRA 7-8, Time Warner 3-5.

[54] AT&T 36-38. See also Ad Hoc 7 (referring to "disenchantment of at least some with sharing").

[55] X-Factor NPRM at ¶ 114; LEC Price Cap Review Order ¶¶ 187-89. See also id. at ¶¶ 18, 184, 191, 197.

[56] See Frontier 5, MCI 20-21, TRA 7.

NYNEX
Attachments C and D

See Tab 1
USTA
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because the separations process, by its nature, "burdens" intrastate rates. In light of Sections 2(b) and 410 of the Act, which have superseded it, the exact relevance of *Smith* today may be, as the D.C. Circuit acknowledged, "perplexing,"[19] but its holding certainly would not preclude adopting TFP. *State rates will not be "burdened" by the Commission's decision.*

IV. The X Factor Should Be Based On Economic Depreciation Rates

In the *Fourth Notice*, the Commission asked whether the appropriate depreciation rates in a TFP study should be "'economic' depreciation rates, rather than the depreciation rates prescribed by the Commission." (*Fourth Notice*, para. 37.) MCI (pp. 17-19), AT&T (p. 22), and Ad Hoc (Appendix, pp. 20-23) enthusiastically support the use of Commission-prescribed depreciation rates.

The Commission's depreciation rates, "simplified" though they recently were, have never been useful as a basis for determining economic costs. Like the separations rules, the rates had a different purpose entirely. As the Commission observed in 1992:

> Our current process for determining depreciation rates was born during the 1940's when there was no competition and little technological change in the telephone market. This process was refined over a period in which the Commission regulated telephone earnings on a rate of return/rate base basis. A keen regulatory eye was necessary to ensure "reasonable charges" to ratepayers.
>
> However, since this depreciation prescription process was put into place, the telecommunications industry has experienced considerable change. We now have significant competition in the interexchange market, emerging competition in the local exchange market, and more rapidly changing technology. We have recognized these changes, and have put in place a price cap regulatory plan designed to provide the incentives that occur in a competitive market. Our price cap plan encourages carrier efficiency without allowing them to pass depreciation expense changes onto ratepayers.[20]

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[19] *Illinois Bell Tel. Co. v. FCC*, 883 F.2d 104, 114 n.9 (D.C. Cir. 1989).

[20] *Simplification of the Depreciation Prescription Process*, 8 FCC Rcd 146 (1992), paras. 7, 8.

This eloquently states the case against using Commission-prescribed depreciation rates to determine an X factor that is "economically meaningful." (*Fourth Notice*, para. 16.) It would also be arbitrary to require the X factor to be based on Commission-prescribed depreciation rates, while denying carriers the opportunity "to pass depreciation expense changes onto ratepayers."

V. Changes to the Common Line Formula Should Not Be Considered Except in a Comprehensive Proceeding

As it modifies the price and output controls to which our interstate access services are subject, the Commission will need to make changes to both Parts 61 and Part 69 of its rules. In this docket (which it has already subdivided into Second, Third, and Fourth Further Notices of Proposed Rulemaking), it will consider changes to Part 61, governing overall access price levels and pricing flexibility. In a forthcoming proceeding, it will have to consider complementary "changes in our access charge rules [*i.e.*, Part 69], which govern the pricing and rate structures applicable to interstate access services."[21] We recognize that this arbitrary division into two tracks -- one for Part 61, another for Part 69 -- may be a practical necessity. However, certain issues the Commission has raised in this docket should not be considered in isolation. This includes potential changes to the carrier common line formula.

The carrier common line charge (CCLC) recovers in switching charges costs that are caused by customers for loop service. The charge was intended to subsidize one customer class at the expense of another. As alternative providers of switching service proliferate, and our switching charges begin to exceed the market price, the subsidy will

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[21] *Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers*, CC Docket No. 95-185, Notice of Proposed Rulemaking, FCC 95-505 (released January 11, 1996), para. 17.

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Price Cap Performance Review for Local Exchange Carriers	)	CC Docket No. 94-1
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III. MCI PRESENTS A CONSULTANT DOCUMENT RELATING TO DEPRECIATION THAT MUST BE TOTALLY DISREGARDED.

MCI presents a document prepared by MiCRA that claims to analyze the appropriateness of the Commission's depreciation prescriptions for LECs. MiCRA's report flatly does no such thing.

- MiCRA assumes the answer to the question that it purports to investigate. Using circular logic, MiCRA uses depreciation reserve calculations based on FCC prescribed lives to test the appropriateness of those same lives. MiCRA performs no analysis of the accuracy or the realism of the FCC prescribed lives.[23]

The FCC must totally disregard MiCRA's document and any implications that MCI or any other party might draw from the erroneous conclusions in the MiCRA document.

IV. CONCLUSION

For the foregoing reasons, SWBT respectfully requests that the Commission adopt the Christensen TFP approach to set the

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[23] See Appendix A, "SWBT's Response to the MiCRA Report; and USTA Reply Comments, Attachment D, "Implications of Technology Change and Competition on the Depreciation Requirements of the Local Exchange Carriers," Adrian J. Poitras and Lawrence K. Vanston, Technology Futures, Inc.