The choice of productivity factor is not an exact science, nor can it be made so. Almost every jurisdiction which has adopted a price cap plan has found it necessary on review to raise the productivity factor, just as the Commission has in the case of the LECs.[32] This is either because the commissions have been overly conservative in estimating the productivity the LECs could achieve under a price cap system, or because the incentives to cut costs were even stronger than expected. Whatever the reason, the fact remains that without some increase to the productivity factor, LEC earnings under price cap plans would have risen even higher than they have.

A price cap plan must balance shareholder and ratepayer interests. A competitive market does this by allowing a firm to innovate, make an above-normal profit for a time, and then see those above-normal profits eroded as more companies "learn the secret" and follow the innovator's lead. A properly designed price cap plan, which includes a sharing mechanism, can have the same effect. LECs will earn above their normal authorized rate of return for a time if they are more productive, but those above-normal earnings are recaptured for ratepayers over time. The LEC does not retain that supra-normal earnings level forever.

The Commission has consistently chosen conservative X-factors. Its original choice of 3.3 percent proved to be greatly understated, as the

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[32] For instance, the X-factors used in the price cap schemes in both California and Great Britain have been raised from their initial levels.

Commission recognized when it raised the interim productivity factor. Its choice of 4.3 percent as the minimum X-factor and 5.3 percent as the maximum factor was also conservative, given the record evidence that the LECs had consistently achieved 5.7 percent productivity growth since 1985. The 1995 annual access filings, in which most LECs elected the highest productivity factor, and in which several carriers sought and obtained waivers to apply this election back to January 1, 1995 in order to avoid any sharing obligation for 1995, provides further evidence that the Commission was too conservative in its choice of X-factors in the interim plan.

The LECs have been able to achieve productivity levels well in excess of the levels set by the Commission. Setting the low X-factor based on past LEC performance is thus likely to represent the minimum the LECs can achieve. Therefore, the Commission should continue to impose a sharing obligation on that option, to ensure that ratepayers will receive a reasonable share of the benefits of the cost-reductions that will continue to occur under price caps.

MCI believes that there need to be only two productivity factors. The lower option should have the sharing bands for the original low option; no sharing up to 12.25 percent, 50/50 sharing for earnings between 12.25 percent and 16.25 percent, and full sharing for earnings above 17.25 percent. The high option X-factor can include no sharing, but should be set at a level that will return to ratepayers a share of the benefits the LEC will realize as a result of having no sharing obligation.

LECs should be not be allowed to choose a lower X-factor, once they have chosen the higher factor. If the LECs can choose a lower X-factor, they will have a regulatory incentive to load expenses into a year when they choose the lower X-factor, and then reap the benefits in lower costs the following year when they choose a higher X-factor. Because the LEC knows more about its projected expense stream than the regulator or ratepayers, it can choose its X-factor to ensure that it maximizes its own earnings rather than ratepayer benefits over time. This asymmetry of information will prevent the benefits of price caps from being shared equally by ratepayers and shareholders.

## VIII. THE COMMISSION SHOULD ADOPT THE PER-LINE COMMON LINE FORMULA UNLESS THE METHOD USED TO SET THE X-FACTOR ALREADY REFLECTS DEMAND GROWTH

In the original price cap study, the Commission tailored its study of LEC post-divestiture productivity to the common line formula it adopted. In principle, demand growth can be reflected in the X-factor. If it is, the X-factor will be higher and no common line formula is needed.[33] MCI will examine the X-factor methods submitted in the comments, and discuss the necessity for a common line formula for each of the methods in its reply.

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[33] To give a simple example, ratepayers will receive the same rate reductions under a price cap with an X-factor of 4.0% that explicitly gives ratepayers half the benefits of demand growth when demand growth is 6%, and a price cap that gives no benefit of demand growth to ratepayers but has an X-factor of 7%.

## IX. THE SUBSCRIBER LINE CHARGE REVENUE PER MINUTE USED IN THE COMMON LINE FORMULA MUST REFLECT GROWTH TO BE CONSISTENT WITH THE OTHER PIECES OF THE COMMON LINE FORMULA

The Commission asks whether, if it retains a common line formula, the cap on the carrier common line (CCL) rate should be based on historical rather than forecasted data for end user common line (EUCL) revenues. Noting that the CCL cap is a function of the common line PCI, the growth in minutes of use per line, expected EUCL revenue, base period CCL minutes, and the previously existing CCL cap, the Commission asks whether EUCL revenues in this formula could be based on historical rather than forecasted data, without a loss of accuracy.

MCI is uncertain about what the Commission intends. If what the Commission is asking is whether the EUCL charges can be based on historical data rather than requiring them to be based on projections as the rules currently require, then MCI has no objections to such a change. If however, the Commission is proposing to eliminate the use of the "g" factor (growth in minutes of use per line) in the EUCL term in the CCL formula, or to use existing rather than proposed EUCL rates in the CCL formula, then MCI does not agree that this would be correct.

The CCL formula is used to set the cap on the CCL rates for the coming year. That formula has two parts: a hypothetical Common Line (CL) per minute rate, computed by multiplying the existing CCL and EUCL rates by their

respective historical demand and then inflated by the change in the CL PCI, making it a prospective CL per minute rate; and, a prospective EUCL per minute rate, computed by multiplying the prospective EUCL per line rate[34] by historical line demand and then adjusting the result for half the growth in minutes of use per line, just as the CL per minute rate is adjusted for half the growth in minutes of use per line by the g/2 factor in the CL PCI. This prospective EUCL per minute rate is then subtracted from the prospective CL rate to determine the CCL cap.

The proposed EUCL rates must be used in this computation, because those are the rates that will be charged in the coming year for which the CCL cap is in effect. The EUCL rate must be adjusted for half the growth in minutes of use per line, because both the EUCL revenues and the CCL revenue are adjusted for half the growth in minutes of use per line in the computation of the prospective CL per minute rate. Using historical rather than prospective EUCL rates would not reflect the revenue that would be recovered by the EUCL charge in the year for which the CCL rate cap is in effect, and failing to adjust for half the growth in demand would not correctly reflect the EUCL revenue to be received in the coming tariff year during which the CCL cap will be in effect. This would result in an inaccurate cap on the CCL rate.

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[34] This rate is currently computed by projecting loop costs for the coming tariff year. It is the development of this rate using historical rather than projected data to which MCI has no objection, as discussed supra.

## X. EXOGENOUS COSTS SHOULD BE ONLY THOSE CHANGES THAT CAUSE JURISDICTIONAL SHIFTS, AND MUST BE REFLECTED SEPARATELY IN THE PRICE CAP FORMULAS

Exogenous cost changes should be limited to only those changes which cause a shift of costs into or out of the interstate jurisdiction. This can occur when separations rules are changed, so that more or less costs are assigned to the interstate jurisdiction, or when changes are made to the rules dividing costs between the regulated or non-regulated sectors. Any other change, such as tax or accounting changes, will have their effect on the company primarily because of management decisions to provide service using a certain mix of inputs. Non-regulated companies must determine how to meet these other changes without being able to change their prices, and price cap regulation should mirror this effect of the competitive market.

This criterion for exogenous treatment is unambiguous and simple to administer, thereby eliminating disputes and the consumption of scarce administrative resources. The risk of regulation would then appropriately fall on the LECs' shareholders, not their ratepayers. This basic business risk belongs with the shareholders of the LECs, because it is they who will reap the first rewards if the company is successful.

Indeed, the only reason for including these jurisdictional cost changes

in the plan is the legal and policy necessity for creating a mechanism that recognizes such cost changes. Without such an exogenous cost rule, decisions to shift revenues into or out of the interstate jurisdiction could not be implemented.

## XI. THE COMMISSION SHOULD NEITHER ASSIGN PRODUCTIVITY FACTORS BASED ON THE DIFFERENT LEVELS OF COMPETITION A LEC FACES NOR ADOPT DIFFERENT PRODUCTIVITY FACTORS FOR DIFFERENT GEOGRAPHIC AREAS SERVED BY THE LEC

There is no evidence on the record that LEC productivity varies by geographic area or by amount of competition faced. If the Commission wishes to assign different productivity factors on this basis, it must not do so until it first obtains record evidence that productivity varies over those factors.

It is ludicrous to believe that productivity will fall as competition grows. Even if output falls as competition develops -- and this proposition seems unlikely, given the experience in the interexchange market -- no company will respond to that by failing to cut its costs. As long as inputs are reduced by as much as outputs, productivity will remain constant. In reality, the LECs will have to become more productive as competition increases. There is no reason on the current record to assign a different productivity factor in areas that face competition or in areas where the Commission would grant regulatory relief due to competition.

## XII. THE SIZE OF THE SHARING BANDS SHOULD NOT BE TIED TO THE LEVEL OF COMPETITION

The Commission seeks comment on NYNEX's proposal to tie the sharing bands to the level of competition a LEC faces. As more of a LEC's lines meet some competitive checklist, the sharing bands would be widened. MCI does not agree that this would be a proper approach.

The items on the competitive checklist proposed by NYNEX all reflect removal of regulatory barriers to entry. They do not address other market barriers to entry. Any competitive checklist must also be based on actual competition occurring.

In addition, NYNEX's proposal allows the LEC to increase its earnings as it faces competition. Competition will likely cause the LEC to cut its costs, which will cause its productivity to rise. If the LEC is allowed to retain higher earnings in exactly that situation when its costs are going down, ratepayers will not benefit from these cost savings as they should. Until the LECs' rates are lowered to economic cost, the Commission needs to ensure that productivity gains are flowed through to ratepayers, either by increases in the productivity factor or by sharing.

## XIII. CONCLUSION

For the reasons stated herein, the Commission should not base the productivity factor in the long-term price cap plan on a total company TFP methodology. If it chooses to use this methodology because it believes this

methodology is more economically correct, it must also take steps to ensure that LEC access rates are first driven down to economic cost. Sharing is an important ratepayer safeguard and should be retained. The Commission should adopt a per-line common line price cap formula, unless the growth in minutes is already reflected in a higher X-factor. The proposed EUCL charges should continue to be used in the CCL formula, and exogenous changes should be limited to those rule changes which move costs into or out of the interstate jurisdiction. Finally, neither the X-factor nor the sharing bands should be tied to the level of competition a LEC faces.

Respectfully submitted,
MCI TELECOMMUNICATIONS CORPORATION

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Dated: December 18, 1995

## STATEMENT OF VERIFICATION

I have read the foregoing and, to the best of my knowledge, information, and belief, there is good ground to support it, and it is not interposed for delay. I verify under penalty of perjury that the foregoing is true and correct. Executed on December 18, 1995.

Chris Frentrup

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# APPENDIX A

# Depreciation Policy in the Telecommunications Industry:

# Implications for Cost Recovery by the Local Exchange Carriers

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December 1995

Prepared on behalf of MCI Telecommunications Corporation

## *EXECUTIVE SUMMARY*

The regional Bell operating companies (RBOCs) have repeatedly blaimed federal and state regulators for what the Bells believe are unrealistic depreciation rates. The RBOCs claim this has resulted in a large overvaluation of their rate bases and substantial underfunding of their depreciation reserves. These unfounded claims have been cited by the RBOCs as support for the following propositions:

- Competition threatens the RBOCs' ability to recover the embedded costs of providing local basic exchange telephone service. Consequently, regulators must guarantee that the RBOCs will be able to recover these costs in a competitive environment, possibly through levies on competitors.

- Reported profit levels (on their regulatory books) are overstated because depreciation expense is inadequate. As a result, regulatory controls on their rates -- price caps -- should be loosened, allowing the RBOCs to raise rates to recover additional depreciation expenses.

- Measurements of the "universal service" subsidy based on today's economic costs do not properly account for the RBOCs' historic costs of meeting their universal service obligation due to inadequate depreciation in prior years. Therefore, the universal service subsidy must be much larger than indicated by current economic costs.

We find that the RBOCs' claims about the effects of regulatory depreciation practices are simply wrong. In fact, the RBOCs' claims of a large depreciation problem appears to be motivated largely by their desire to enter non-telephony services. Accelerating depreciation today allows earlier replacement of existing telephone plant with plant capable of providing non-telephony services. The existing plant need not be replaced (on an accelerated basis) for efficient provision of basic local telephone services. The RBOCs' proposals for accelerated depreciation would compel users of basic telephone services to subsidize new services that many basic customers may not want.

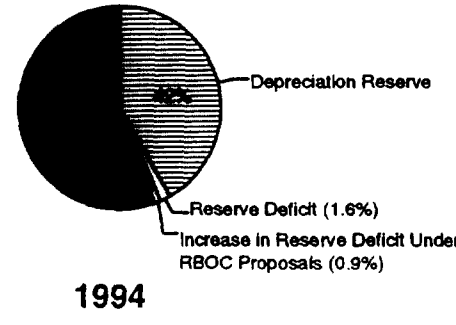
To evaluate the RBOCs' claims, we reviewed comprehensive depreciation studies and analyses filed by the RBOCs' with the FCC. These documents clearly demonstrate the following:

- Changes in FCC depreciation practices during the 1980's have effectively reduced the reserve deficit -- unrecovered depreciation expenses -- from $21 billion in 1983 to over $3 billion in 1994. As a percentage of the gross book value of plant in service (GBV), the reserve deficit has declined from 13% in 1983 to 1.5% in 1994. See Figure 1. Over the same period, depreciation reserves as a percentage of GBV increased from 20% to 41%. Furthermore, the FCC's use of remaining life depreciation rates ensures that the large reserve deficits of the early 1980's cannot recur.

**Figure 1. Depreciation Reserve & Reserve Deficit As a Fraction of Gross Book Value: All LECs.**

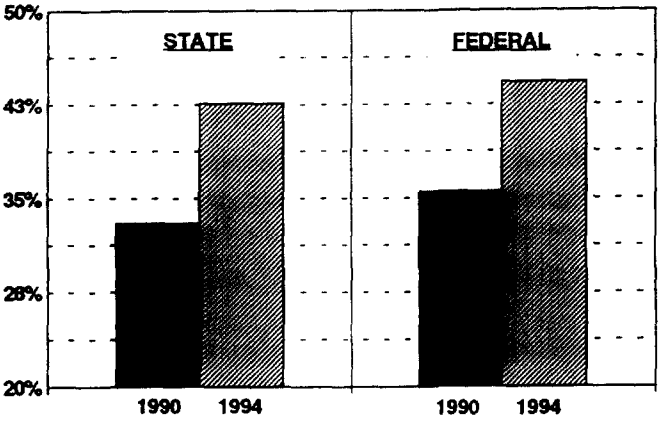
- Even if the reserve deficit is calculated using the RBOCs' depreciation proposals to the FCC (which are based on aggressive deployment of loop facilities designed for video services), it is only slightly higher -- about $5 billion, or less than 2.5% of gross book value. See Figure 2.

**Figure 2. Depreciation Reserve & Reserve Deficit as a Fraction of Gross Book Value: RBOCs.**



- The RBOCs depreciation position improved markedly in the early 1990's. Depreciation reserves as a fraction of the gross book value of investment (i.e., the book reserve ratio) have increased rapidly at both the federal and state level over the last five years. From 1990 to 1994 the book reserve ratio increased from 35.5% to 44.3% at the federal level, and from 33.0% to 42.6% at the state level for carriers in states subject to the FCC's triennial depreciation review in 1995. These states accounted for more than half of total RBOC invesment. See Figure 3.

**Figure 3. RBOC' Depreciation Reserves at State & Federal Level: 1990-1994.***




*Depreciation reserve measured as a percentage of the gross book value of plant. investment.

The RBOCs' own estimates of the reserve deficit appear to be higher than those of the FCC in large part because the RBOCs assume a much shorter useful life for subscriber metallic cable. And they do so for reasons unrelated to the provision of basic telephone services.

- For study areas where subscriber metal cable is identified separately in depreciation reports to the FCC, 75-80% of the difference between the RBOCs' and the FCC's estimates of the reserve deficit in 1994 and 1995 stemmed from different assumptions about the useful life of cable.

In 1995, the gap between the FCC and RBOC of the depreciation reserve deficit widened. As long as the RBOCs were limited to telephone service, their requests for depreciation were not very different from the amounts granted by the FCC. The depreciation "problem" claimed by the RBOCs arises from a desire to replace existing plant, especially subscriber metallic cable, for reasons unrelated to the cost-effective provision of basic telephone service.

There are several important policy implications of this analysis of depreciation issues:

- Regulatory depreciation practices have not led to an overvaluation of the RBOCs' assets. Therefore, to the extent competition threatens the RBOCs' ability to recover their embedded costs, depreciation policy is not to blame. Rather, any competitive threat to the RBOCs' profits must be traced to other factors, such as inefficiencies, excess profits, or poor investments in competitive ventures. None of these provide a justification for imposing levies on competitors to keep the RBOCs "whole."

- Current high profit levels of the RBOCs cannot be explained away by "inadequate" depreciation rates. The depreciation expenses introduced in the past fifteen years were sufficient to correct serious underdepreciation. Current depreciation rates are adequate to allow the RBOCs to fully recover the costs of the investments supporting basic local services over the useful life of the assets. Therefore, the RBOCs' reported profits do not present a false picture, and price caps should not be raised to allow them to earn even higher rates of return.

- The LECs do not require a larger subsidy to universal service than is indicated by economic costs studies -- $4 billion -- to make up for "inadequate" depreciation in prior years. The LECs' much higher estimate of the cost of universal service -- $20 billion -- cannot be explained by depreciation issues.

- Encouraging RBOC investments in video dial tone and other non-basic services is not a legitimate reason for increasing depreciation expenses and, therefore, prices of basic services.

## Introduction

The regional Bell operating companies (RBOCs) have claimed that past and present depreciation policies imposed by the FCC (and state) regulation have created a large depreciation "problem." In their view, regulated depreciation rates have been inadequate to ensure capital recovery for historical investments made by the RBOCs.[1] As evidence of the inadequacy of current federal and state depreciation practices, they claim that their depreciation reserves have been grossly underfunded. Moreover, they argue that the underfunding of their depreciation reserves is in large part due to regulators imposing excessively long asset lives for their telecommunications plant. The result of these past and current regulatory decisions has been, supposedly, to leave the RBOCs saddled with the need for high current depreciation expenses (to compensate for past underfunding of the depreciation reserve) yet insufficient depreciation reserves.

The research described in this paper disproves the RBOCs' claims. Current depreciation policy at the FCC (and in most states) is structured to prevent the accumulation of underfunded depreciation reserves. Changes in the regulation of depreciation in the early 1980s ordered by the FCC corrected for historical problems with excessively long asset lives and low depreciation rates. Current RBOC complaints about allowable depreciation reserves and current expenses are

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[1]For example, see Ameritech's 1994 *Annual Report* at pp. 39-40.

unwarranted in light of the effect of the changes in FCC policies.

MiCRA's research on depreciation is relevant to several current policy questions. The RBOCs (and, more generally, the LECs) have argued in a variety of contexts that they are entitled to recover part of their revenue requirements from local service competitors either through higher interconnection charges or revenue surcharges.[2] One might justify levying surcharges on their competitors, the general body of ratepayers, or the taxpayers, if the RBOCs were saddled with large amounts of underdepreciated plant as a result of past decisions by regulatory agencies to keep depreciation expenses low so as to insure low phone rates. Simply put, MiCRA's research indicates that this is not a material problem.

In addition, depreciation policy is important in implementing and evaluating the performance of price cap regulation. Under the current system of price cap regulation, the FCC evaluates the maximum allowable prices for regulated RBOC services based upon periodic performance reviews of RBOC costs and profits. Depreciation expense is one of the largest components of RBOCs' costs. If depreciation expenses were understated (e.g. through setting excessively low depreciation rates), it could cause RBOC price caps to be set too low. In addition, FCC profit sharing rules require RBOCs to share some or all of their excess profits with ratepayers if the RBOCs' rate of return exceeds certain levels. If depreciation expenses were understated, it could lead to an overstatement of reported earnings and possibly trigger the

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[2]For example, see Bulk Billing: Ameritech, "Supplementary Detail and Support for the Regulatory and Rate Restructuring Proposals of Ameritech's Customers First Plan," Attachment 3. Also see Local Interconnection Charges: "Bell Atlantic-Maryland, "Direct Testimony of John R. Gilbert," Case no. 8584, Phase II, May 5, 1995.

sharing rule.[3] MiCRA's research shows that federal and state depreciation practices have not lead to a significant understatement of depreciation expense under price caps.

MiCRA's research is also directly relevant to policy disagreements over the extent to which RBOCs may be overcharging their captive customers for access, toll, and business services. On the one hand, Hatfield Associates has estimated that only $4 billion in additional revenue (above the current revenues from residential, basic local service) are necessary to provide basic universal service to residential phone customers if LECs used the current, least-cost technology.[4] This $4 billion amount is far below the actual revenues currently collected by the LECs for non-basic services, including usage sensitive access fees for interLATA toll. On the other hand, Strategic Policy Research (SPR), in a study for the United States Telephone Association (USTA), concluded that the margin contribution (the difference between revenues and long-run marginal cost) on non-basic services (switched access services to long-distance carriers and intraLATA message toll) is approximately $20 billion per year.[5] How does one reconcile the $16 billion dollar difference between Strategic Policy Research's estimate of the margin on non-basic services

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[3]As these arguments illustrate, depreciation policy does matter under the current system of price cap regulation. If control over depreciation expenses was left up to the LEC, there is the potential for abuse since the LEC has the incentive to overstate depreciation expenses so as to affect the FCC's performance review and minimize its obligation to ratepayers under the sharing rule.

[4]Hatfield Associates, Inc. "The Cost of Basic Universal Service." July, 1994.

[5]Monson, Calvin and Jeffrey Rohlfs. "The $20 Billion Impact of Local Competition in Telecommunications." Strategic Policy Research. July 16, 1993. Monson and Rohlfs only estimate the marginal contribution from switched access services to long-distance carriers and intraLATA message toll services, but other non-basic service may make a contribution as well.

with Hatfield Associates' estimate that the contribution required from these non-basic services to fund universal service is only $4 billion dollars? One argument the LECs would like regulators to believe is that this difference may be largely attributable to the effects of past regulatory decisions that have left the LECs with high depreciation expenses due to underdepreciation of their telecommunications plant in prior years. MiCRA's study shows that there is little merit to this LEC argument that markups above economic cost must be high because of inappropriate depreciation policies imposed in the past by regulators.

## The Simple Economics of Depreciation

Before describing MiCRA's research, it is useful to provide a simple primer on depreciation issues in telecommunications. This primer is intended to illustrate some of the key issues in depreciation policy.[6]

Consider the following simple example. A local telephone company invests $1000 at the end of year 0 on a piece of new capital equipment. At the time the investment is made, it is anticipated by the carrier and the FCC that the equipment will have a useful life of ten years, and a salvage value of zero when it is retired. Therefore, annual straight-line depreciation expense is $100 per year for ten years. What happens if at the end of year 5, it is apparent that the equipment will have a useful life of only 3 more years?

Under the FCC's pre-1981 rules, depreciation expense was set by a whole-life

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[6]For a more in-depth analysis of the differences between depreciation systems, see Frank Wolf and W. Chester Fitch, *Depreciation Systems*, (Iowa State University Press: Ames), 1994.

depreciation method. Whole life depreciation expense is equal to the original cost of the equipment divided by the useful life of the equipment.[7] In our example, the whole life depreciation expense in years one through five would be $100 (i.e. $1000 / 10). If the useful life of the equipment fell to 8 years, then the whole life depreciation rate would increase to $125 (i.e. $1000 / 8). See Table 1 below.

Table 1. Illustration of Depreciation Concepts: Whole Life Depreciation

| Year | Deprec Expense | Book Deprec Reserve |
|---|---|---|
| 1 | $100 | $100 |
| 2 | $100 | $200 |
| 3 | $100 | $300 |
| 4 | $100 | $400 |
| 5 | $100 | $500 |
| 6 | $125 | $625 |
| 7 | $125 | $750 |
| 8 | $125 | $875 |

The problem with this depreciation method is that there is no mechanism to compensate for underdepreciation (or overdepreciation) of assets in prior years. In our example, actual depreciation expenses in years one through five are $500, but in hindsight total depreciation expenses over that five year period should have been $625. The difference, $125, would not be recovered via depreciation expenses in future years. When the equipment was retired at the end of year 8, the original cost of the equipment ($1,000) would be subtracted from the value of the

[7]Our example is for a single piece of equipment; however, it is easily generalized to a group of equipment. In that case, the average useful life of equipment within the group would be used in determining depreciation expense.

book reserve ($875) , leaving a deficit of $125.[8]

The FCC adopted straight-line remaining life methodology as its depreciation policy in Docket 20188 on November 6, 1980. It did so recognizing that its prior *whole life* depreciation policies -- under which no attempt was made to correct for underdepreciation of assets in prior periods -- created a strong tendency toward insufficient depreciation. Under whole life depreciation, it was always tempting for regulators to simply allow underdepreciation to continue, since to do otherwise would entail increasing current rates or foregoing rate reductions. By the late 1970s, however, it was generally recognized that inadequate depreciation reserves were a serious problem. The FCC adopted a number of measures to resolve this problem. The two most important measures were (1) adopting remaining life depreciation and (2) implementing special amortizations to allow the telephone companies to reduce the depreciation reserve shortfall.[9] As the Commission noted in Simplification of the Depreciation Process (1993), these remedies have been successful to the degree that there is "not a significant overall LEC reserve deficiency at this

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[8]The book depreciation reserve is the sum of depreciation expenses from prior years. It is also called the accumulated depreciation reserve.

[9]Remaining life depreciation rates were adopted in Property Depreciation. See Amendment of Part 31 (uniform System of Accounts for Class A and Class B Telephone Companies), 83 FCC 2d 267 (1980) (Property Depreciation), reconsideration, 87 FCC 2d 916 (1981), Supplemental Opinion and Order, 87 FCC 2d 1112 (1981), aff'd sub nom. Southern Bell Telephone and Telegraph Company v. FCC, No. 84-1638 (D.C. Cir. January 17, 1986). The special amortizations were adopted in a number of orders, the most important of these being: Amortization of Depreciation Reserve Imbalances of Local Exchange Carriers, Report and Order, 3 FCC Rcd 984 (1988).

time."[10]

To illustrate how remaining life depreciation methods can correct for past errors in setting depreciation rates, we return to our previous example. See Table 2 below. Suppose that instead of using the whole life method to calculate depreciation, remaining life had been used. What effect would it have on depreciation expense and the book reserve in each year?

Table 2. Illustration of Depreciation Concepts: Remaining Life Depreciation

| Year | Deprec Expense | Book Deprec Reserve |
|---|---|---|
| 1 | $100 | $100 |
| 2 | $100 | $200 |
| 3 | $100 | $300 |
| 4 | $100 | $400 |
| 5 | $100 | $500 |
| 6 | $166.66 | $666.66 |
| 7 | $166.66 | $833.33 |
| 8 | $166.66 | $1000 |

In our simple example, where net salvage is zero, remaining life depreciation expense in each year is just the undepreciated portion of original cost (i.e. net book value) spread equally over the remaining life of the equipment.[11] For example, remaining life depreciation expense in

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[10]Simplification of the Depreciation Prescription Process, Report and Order, CC Docket 92-296, Adopted September 23, 1993, at 88.

[11]The FCC's remaining life depreciation rate formula also reduces net book value by the value of future net salvage. For example, suppose at the end of the equipment's service life, it could have been sold to a scrap yard for $50. Then, depreciation expense in year one would be ($1000 - $0 - $50) / 10 or $95. More precisely, the FCC's remaining life depreciation rate formula is:

RLDR = [ 100 - Book Reserve Ratio (%) - Future Net Salvage (%) ] / [Ave. Remaining Life].

year one would be equal to ($1000 - $0) / 10 or $100. In year two, it would be ($1000 - $100) / 9 or $100. And so on until the end of year five, when it is discovered that the equipment will only last for three more years. Depreciation expense in year six would increase to ($1000 - $500) / 3 or $166.66, and continue at that level during years seven and eight. The important point to notice is that when the equipment is retired at the end of year eight, the book reserve is equal to $1,000, which is the original cost of the equipment. There is no reserve deficit because the remaining life method increases depreciation expense in years six through eight to compensate for underdepreciation of the equipment in prior years. In this example, remaining life depreciation expense in years six through eight is higher than depreciation expense under the whole life method by $41.66.

We now expand upon our remaining life depreciation example to illustrate several depreciation concepts that will play a major role in our analysis. The *book depreciation reserve* is simply the sum of annual depreciation expenses to date. The *theoretical depreciation reserve* is the sum of depreciation expense that should have been booked to date if the asset is to be fully depreciated when it is retired. The theoretical reserve is based upon current information about useful asset lives and net salvage values. Hence, the theoretical reserve will differ from the book reserve if estimates of useful asset life change after the investment is made.

The difference between the two reserves is the depreciation imbalance. Where that difference (book reserve minus theoretical reserve) is negative, it is referred to as the reserve deficit. Table 3 below illustrates these concepts for the $1000 investment discussed above.

Table 3. Illustration of Depreciation Concepts: Reserve Deficit Under Remaining Life

| Year | Deprec Expense | Book Deprec Reserve | Theoretical Deprec Reserve | Reserve Deficit |
|---|---|---|---|---|
| 1 | $100 | $100 | $100 | 0 |
| 2 | $100 | $200 | $200 | 0 |
| 3 | $100 | $300 | $300 | 0 |
| 4 | $100 | $400 | $400 | 0 |
| 5 | $100 | $500 | $625 | $125.00 |
| 6 | $166.66 | $666.66 | $750 | $83.34 |
| 7 | $166.66 | $833.33 | $875 | $41.67 |
| 8 | $166.66 | $1000 | $1000 | 0 |

When the shorter useful asset life is recognized at the end of year 5, we now know that the asset is five-eighths "used up." The theoretical reserve is then $625 (or 5/8 * $1000), indicating that if the true asset life had been correctly anticipated, $625 of cumulative depreciation should have been booked by the end of year 5. In fact, only $500 of depreciation had been booked, so the reserve deficit is $125. Under remaining life depreciation, the annual depreciation expense is increased to $166.66 in years 6, 7, and 8 so that when the asset is retired, the reserve deficit is reduced to zero.

The above example was intentionally kept simple. In actual practice, to calculate the theoretical reserve, the FCC uses the following formula, which takes into account changing assumptions about salvage values as well as asset lives:[12]

[12]Alternatively, one can calculate the theoretical reserve ratio, which is the theoretical reserve as a percentage of original cost. The formula for the theoretical reserve ratio is:

TR% = (100 - FNS%) - ((100 - ANS%)*(ARL/ASL).