Reply Appendix A
CRITIQUE OF USTA'S TFP STUDY AND REVISED AT&T ESTIMATES
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In his report "Economic Assessment of the 1999 X-Factor Model Proposed by the FCC Staff," (included as Attachment 2 to USTA's comments), Frank M. Gollop makes several adjustments to the FCC model that purport to correct its flaws. These revisions have the net effect of reducing the 1991-98 average X-factor from 6.33% to 3.29%. This appendix provides a critique of the Gollop study. It presents updated X-factor estimates based on several modest revisions to the data used in preparing AT&T's comments.

The latest TFP study submitted by USTA suffers from one overriding flaw: Its cost of capital index is so aggressive in its design that it borders on the absurd. Based on his cost of capital calculations, Gollop would have us believe that the RBOCs have suffered shortfalls in their earnings in the range of $5 billion to over $7 billion per year for each of the last several years. The effect of these inflated capital cost estimates is to reduce the average X-factor for 1991 to 1998 by more than three percentage points relative to that estimated by the FCC staff in its 1999 X-factor model. A further downward bias in the X-factor results from Gollop's use of access lines instead of local minutes to measure the quantity of local output. Other revisions to the FCC model made by Gollop are relatively inconsequential.

LEC cost of capital

A major issue surrounding the Commission's TFP analysis is how to construct a cost of capital index for the LECs. The indexes put forth by the Commission and AT&T both reflect the downward trend in capital costs that has characterized U.S. capital markets over much of the 90s. The cost of capital index developed by USTA's consultant Gollop, on the other hand, implicitly assumes a sharply upward trend in capital costs over the period from 1991 to 1998. Not surprisingly, these divergent approaches result in markedly different values for the X-factor and account for virtually all of the difference between the FCC's results and those of the updated USTA study.

The most significant flaw in Gollop's analysis is its calculation of the capital rental price index shown on his Chart D9. Gollop uses the rate of return series reported by Value Line for its sample of 875 large industrial firms to measure the relevant opportunity cost of capital (Gollop, 7). Gollop's analysis, however, suffers from two serious deficiencies. First, the Value Line rate of return does not provide a reasonable estimate of the trend in the LECs' cost of capital over the period. And second, it is improperly applied in the TFP model to calculate the capital rental price index.

The Value Line rate of return, shown on Gollop's Table 1 (p. 8), declined precipitously in 1991 to a cyclical low of 8.5%, recovered in subsequent years, and stood at 11.9% in 1998. Gollop, however, the 1991 figure as his starting point and adjusts the earnings component of the capital rental price upward in subsequent years based on increases in the Value Line rate of return from 1991 forward.

The problem with these calculations is that corporate earnings in the U.S. were at depressed levels in 1991 because of the recession. Thus, any trend that uses 1991 earnings as the starting point will be distorted. Because a TFP study is essentially a trend analysis, it is the trend in these returns, rather than their absolute level, that drives the X-factor. Gollop's analysis uses the trend in Value Line returns from 1991 to 1998 to argue for a 40% increase in the cost of capital over the period – from 8.5% in 1991 to 11.9% in 1998. LEC earnings, however, were not depressed in 1991. The RBOCs' combined regulatory earnings provided a 10.1% return in 1991[1] – well above that for the Value Line industrials. Gollop improperly ratchets the RBOCs' earnings upward in subsequent years based on behavior of the Value Line return series.[2]

Gollop also errs by converting the changes in the Value Line series into changes in the capital rental price. Gollop follows the Commission's assumption that the capital rental price for 1991 represents a competitive level of earnings and proceeds to adjust the capital rental price in subsequent years based on changes in the Value Line returns. This adjustment is applied only to that portion of the rental price that is estimated to correspond to LEC earnings.

The major difficulty with this procedure is that it improperly mixes rate of return data with data on the capital rental price. It is not proper to add changes in rates of return to the capital rental price, since the two series measure different things. The capital rental price, as used in the FCC's model, refers to the price of one unit of physical capital, while rates of return are measured with respect to financial capital. Physical capital, which is intended to measure the "real" capital stock via a perpetual inventory model, differs substantially from financial capital measured in terms of average net book investment. Because the FCC's series on physical capital has grown by far more than has the RBOCs' average net investment, rate of return changes get "magnified" when added to the capital rental price. That is, the amount of revenue associated with a given basis point change in the capital rental price is substantially more than that associated with the same basis point change in rate of return. As a result, the increased revenue associated with a one basis point increase in the capital rental price causes the rate of return to increase by far more than one basis point, particularly in recent years of the study.[3]

The way to avoid this distortion is to apply changes in the cost of capital to the RBOCs' aggregate rate of return rather than to the capital rental price. Property income

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[1] Calculated from ARMIS 43-01 data.

[2] Another problem with the VL series is that it does not represent public utilities like the LECs that rely heavily on debt financing. As a result, the VL series does not adequately reflect the downward trend in interest costs experienced by the LECs.

[3] The same criticism applies to the capital cost index in the FCC's 1999 TFP Study, but not to the capital cost estimates in the Imputed X Study. Suggested modifications to the FCC's capital cost index are described below.

is then adjusted to produce whatever rate of return is associated with the cost of capital, as AT&T did in its analysis (See Appendix A of AT&T comments, p. 7).[4]

Gollop's procedure of applying the return adjustment only to that portion of the capital rental price corresponding to LEC earnings does not correct the problem. As shown on his Chart D9, the earnings component of the capital rental price is estimated to be 6.25% in 1991. Basis point changes in the Value Line return are then added to this figure causing it to grow to 9.65% in 1998 – an increase of 54% over its 1991 value. The effect of these calculations is thus to convert a 40% increase in the Value Line rate of return (from 8.5% in 1991 to 11.9% in 1998) into a 54% increase in the earnings component of the capital rental price. This inflated earnings ratio is then applied to the capital stock quantity, which, as noted above, has increased by far more than the RBOCs' net investment. This latter calculation further inflates the growth in required earnings, as shown in column P of Gollop's Chart D9.

The result of this extensive data manipulation becomes apparent when one compares the adjusted property income series shown in Gollop's Chart D9 with the unadjusted property income shown in the FCC's Table B-7. As shown in Table 1, Gollop's adjustments lead to the astonishing result that property income has to increase by nearly $5.4 billion in 1998 -- from the unadjusted total of $33.8 billion in the FCC study (column D) to Gollop's adjusted total of $39.2 billion (column E) -- just to cover the RBOCs' cost of capital. The implausibility of this result is underscored by calculating the rates of return that would result from this adjustment. The $5.4 billion increase in 1998 revenue increases the RBOCs' aggregate return on investment from 15.4% to 19.0%, as shown in columns C and H of Table 1. The end result is that, over the entire period, the RBOCs' implicit cost of capital increases by far more than the 40% increase in Value Line rates of return – nearly doubling from an initial rate of return of 10.14% in 1991 to the 19.0% level in 1998.

This 19.0% return on investment implies a return on equity of around 28%.[5] Gollop provides no evidence in support of LEC capital costs rising to such lofty heights. No such evidence exits. Even USTA's other consultant, James H. Vander Weide (USTA Attachment 5), estimates that the trend in the "market competitive cost of capital" has been relatively flat, going from 13.5% in 1991 to 13.78% in 1998.[6]

The impact of Gollop's capital cost methodology on the X-factor can be measured by changing the capital rental price in the FCC staff's model from its adjusted 1998 value of .162175 to the .248821 value used by Gollop. This has the effect of reducing the X-factor for the 1991-98 period from 6.33% to 3.19% and more than accounts for the

[4] A similar approach is used in the FCC staff's Imputed X Study.

[5] The 28% figure is a rough approximation based on a 45%-55% debt-equity mix and a 7.26% interest rate on debt.

[6] Vander Weide's analysis is analyzed elsewhere in AT&T's reply comments.

difference between Gollop's results and those of the FCC. (The net effect of the other changes made by Gollop is a slight increase in the X-factor.)

Gollop makes two other criticisms of the staff study that are likewise without merit.

- First, he faults the FCC for making an adjustment for income tax changes associated with adjustments to LEC earnings. Gollop asserts that the "reassignment of some fraction of dollar earnings from the 'normal' (opportunity cost) to 'excess' categories will have absolutely no impact on the Internal Revenue Service's view of the LECs' income tax liability" (p.16). This statement totally misses the point. The issue here is not the LECs' actual income tax liability, but what their income taxes would be if their earnings were equal to the cost of capital. Income taxes are an integral component of annualized capital-related costs, which consist of depreciation, interest expense, return on equity, and income taxes associated with that return. Any adjustment that alters the return on equity should thus be accompanied by an adjustment to income taxes.[7]

- Gollop claims that the staff's treatment of the LECs' capital cost is inconsistent with the BLS index of input prices. He alleges that using an *external* rate of return for the LECs' capital cost requires a similar approach for the BLS index (pp. 16-17). This assertion is puzzling. Since the BLS index represents the entire U.S. nonfarm business sector, it is not clear what such an *external* rate of return would consist of. The BLS index implicitly includes an economy-wide capital cost – which is consistent with using a capital cost for the LECs based on economy-wide returns. There is no apparent inconsistency or asymmetric treatment here.

Measurement of local output

The other significant modification made by Gollop to the FCC study is to replace DEMs (dial equipment minutes) with access lines as a measure of local output. Gollop contends that if the Commission is intent on using a single variable to measure local output, it should use access lines rather than local DEMs, since more than 80% of local revenue is generated from lines (pp. 20-21).

Gollop's proposal might be reasonable if the X-factor was being used to regulate charges for local service. However, as Gollop himself emphasizes, "The choice of an appropriate output measure must follow from the very purpose of the X-factor as a public policy tool" (p. 20). The purpose of the FCC's X-factor is to regulate the prices of interstate access – not local service prices. Unlike local services, interstate access prices are highly usage sensitive. As long as the X-factor is determined on the basis of total

[7] The FCC may have created some confusion here by applying the income tax adjustment to total operating expense rather than to property income. Since property income by definition includes income taxes, the tax adjustment should be applied to property income. This does not appear to have any effect on estimated X-factors, however.

company data, rather than interstate-only data, use of local DEMs is clearly appropriate. Growth in usage on the network is a major source of productivity growth and contributes to lower per minute costs for all services that use the network, including switched access.

Gollop also contends that the erratic movement in DEMs, as reflected in the growth rates for 1990 and 1997, introduces a substantial bias in the X-factor (p. 21). This is a non-issue. While this may result in year-to-year fluctuations in X, such fluctuations should not be of any concern, since it is the trend over multi-year periods that matters.

Measurement of local output using DEMs is not the ideal solution, however. As AT&T and others have urged repeatedly, the Commission should rely on interstate data to prescribe the X-factor and thereby avoid the problems inherent in measuring local output as well as inputs.

Other issues

Other issues raised by Gollop are generally of little consequence, and are addressed only briefly here.

Labor expense: Gollop claims that the FCC's labor expense adjustment is flawed because it effectively "disallows" severance payments. Gollop says that, because these are legitimate costs that are required by market forces, they should be allocated to labor expense for other years or treated as a capital expense (pp. 18-19).

Once again, Gollop's critique misses the point. The question is not whether these expenses represent legitimate costs, but whether unusually high expenses in a single year have a distorting effect on the trend in labor costs. If expenses were unusually high in either the first year or last year of the period being studied, the trend for that period will be biased and some kind of adjustment is clearly appropriate.

As a practical matter, however, most of the adjustments made by the FCC were for years in between 1990 and 1998, as shown on the FCC's Table B-5, and therefore have little effect on the trend from 1990 to 1998. According to AT&T's estimate, the FCC's downward adjustment of $350 million for 1998 has the effect of raising the average X-factor for 1991-98 by only .066 percentage points.

Price of labor: Gollop also notes some anomalies in the labor price series contained in the 1999 Staff study. But this turns out to be a non-issue. As AT&T's analysis shows, variations in either input prices or input quantities have no effect on the X-factor.[8] Moreover, year-to-year fluctuations in the data are of little concern. As shown in Gollop's Table 5 (p. 27), the overall increase in the labor price from 1990 to 1998 (which determines the average X-factor for 1991-98) in the 1999 Staff Model is very similar to that in both USTA's 9/99 filing and the labor price series for the U.S. nonfarm business sector.

[8] AT&T Comments, Appendix A.

U.S. productivity data: Gollop points out that data on U.S. multifactor productivity will be revised sometime next spring, based on recent revisions in the government's GDP accounts (p. 32-33). On the basis of recent revisions in labor productivity growth rates, Gollop anticipates that growth rates for multifactor productivity will be revised upward by about 0.5 percentage points per year. According to Gollop, incorporating these revisions into the Commission's TFP model will decrease both the TFP differential and the measured X-factor.

If Gollop is correct, a better remedy would be to adopt AT&T's suggestion that the GDP price index be used in place of the U.S. input price and productivity indexes as a measure of inflation. The GDP-PI series used in AT&T's analysis already reflects the latest revisions to the national income and product accounts. Moreover, as explained in AT&T's comments (Appendix A, pp. 5-6), that series provides a more appropriate measure of inflation than does the FCC's use of U.S. input prices minus U.S. productivity growth.[9]

Revised AT&T results

Also included here is an updated version of the charts included in Appendix A of AT&T's comments, which incorporate the following revisions:

- Data on RBOC interstate earnings and average net investment for 1997 and 1998, shown in Tables A-1a and A-2a, have been updated to reflect current ARMIS data from the FCC's web site. Revisions made by Gollop, primarily to exclude SNET from the RBOC data, have also been incorporated into these calculations.

- Where the FCC staff's cost of capital index is used, changes in the cost of capital (as measured by Moody's Baa corporate bond rate) are applied to the RBOCs' aggregate rate of return rather than to the capital rental price, with an 11.25% cost of capital assumed for 1990 and 1991. With that adjustment, the cost of capital declines to 8.67% in 1998, just as it does in the FCC's Imputed X Study.[10] Property income is then adjusted to produce whatever rate of return is associated with the cost of capital, as is done for AT&T's capital cost index. No adjustments are made for the years before 1990.

- The tax adjustment shown in Table A-2a (which incorporates AT&T's capital cost index approach) has also been revised to correct an error in the formula used to calculate this adjustment. The original calculation applied the 39% marginal tax rate to after-tax earnings rather than to before-tax earnings. The revised tax adjustment is

[9] *See* "Comprehensive Revision of the National Income and Product Accounts," U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, November 1999, pp. 2-7.

[10] AT&T estimates that the capital cost index used in the FCC's 1999 TFP Study produces a rate of return of only 6.5% in 1998. The modifications presented here thus make the capital cost index more consistent with the capital cost assumption used in the Imputed X Study.

calculated by multiplying the earnings adjustment, which refers to after-tax earnings, by the factor [.39/(1-.39)]. The same adjustment is also reflected in the tables that rely upon the FCC's capital cost adjustment.

Where applicable, these new values and adjustments are used in Table A-3a to recompute X-factors using total-company data, as in the staff's Table B-12, with the minor correction described in Appendix A of AT&T's comments. These changes result in slightly higher average X-factors than reported by either the FCC staff or by AT&T in its Appendix A.

Next, these same adjustments are used to recalculate interstate-only X-factors under AT&T's "direct calculation" method, but using the revised FCC cost of capital index. Annual X-factors are shown in Table A-4a. Table A-5a then presents estimated aggregate interstate X-factors using the Commission's "rolling average" methodology. The adjustments described above increase the 1986-95 X-factors by about 1.0 percentage points, and increase the 1986-98 X-factors by about 0.7 percentage points.

Similar interstate X-factor calculations based on AT&T's capital cost index are presented in Table A-6a, and rolling averages based on this approach are shown in Table A-7a. The net effect of these revisions is to raise the median X-factor for 1986-95 by about .2 percentage points and the median X-factor for 1986-98 by about .5 percentage points.

The net result of these changes is that the calculated historical X-factors for 1986-95 (based on the rolling average methodology) are all now in the range of 11.1 to 11.8 percent, and the calculated historical X-factors for 1986-98 are now in the range of 10.2 to 10.7 percent.

Next, Table A-8a presents revised calculations of AT&T's earlier "Performance-Based Model," based on the assumption that inputs grow at the same rates for interstate access as for the LECs' other regulated telephone services. The interstate TFP growth rates generated by this model are then reported for various periods in Table A-9a, along with total-company TFP growth rates from Table A-3a. These revised calculations show that the TFP growth rates reported in Table A-9 of AT&T's comments are understated, and therefore that the consumer product dividend (CPD) implied by those growth rates is even higher than AT&T estimated in Appendix C of its comments.

Finally, the adjustments described above have a slight impact on the adjustment to the CPD that AT&T adopted to avoid any risk of double-counting the effects of the (partial) elimination of sharing during 1996-1998. When the realized X-factors for those years are reduced by 1.5 percent (the CPD as calculated based on the entire data series), the rolling average of X-factors calculated for the 1986-1998 period declines from the approximately 10.40 percent reported in Table A-7a to 9.93 percent, and from the approximately 10.23 percent reported in Table A-5a to 9.76 percent. Thus, it would appear that that the appropriate adjustment to the CPD is about 0.5 percent rather than 0.4 percent.

For further explanation of results and methodology, see AT&T's comments, Appendix A and Appendix C.

Table A-1a. LEC Revenue ($) by Type of Service[1] - 1985-1998

Year	Local Service Revenue	Intrastate Toll and Intrastate Access Service Revenue	Interstate Service Revenue (A)	Total Revenue (B)	Adjusted Total Factor Payments (C)	Adjusted Interstate Service Revenue (A*C/B)	Growth Rate (%)
					Adjusted Interstate Service Revenue based on FCC adjustments		
1985	$26,960,554,164	$13,047,095,682	$14,366,305,727	$54,373,955,573	$54,373,955,573	$14,366,305,727	
1986	$28,626,174,049	$13,538,946,795	$15,459,541,700	$57,624,662,544	$57,624,662,544	$15,459,541,700	7.33408
1987	$29,150,842,991	$14,166,723,124	$15,360,313,555	$58,677,879,670	$58,677,879,670	$15,360,313,555	-0.64393
1988	$29,226,988,000	$14,994,975,000	$15,806,448,000	$60,028,411,000	$60,028,411,000	$15,806,448,000	2.86308
1989	$29,973,157,000	$14,868,219,000	$15,745,189,000	$60,586,565,000	$60,586,565,000	$15,745,189,000	-0.38831
1990	$30,699,085,000	$15,014,729,000	$15,483,956,000	$61,197,770,000	$62,753,392,152	$15,877,551,795	0.83714
1991	$32,059,008,000	$14,522,276,000	$15,461,344,000	$62,042,628,000	$63,226,128,240	$15,756,278,385	-0.76674
1992	$33,359,990,000	$14,225,181,000	$15,767,707,000	$63,352,878,000	$61,181,485,720	$15,227,275,715	-3.41506
1993	$34,598,957,000	$14,496,831,000	$16,341,156,000	$65,436,944,000	$62,624,857,991	$15,638,911,467	2.66739
1994	$35,758,637,000	$14,355,983,000	$17,100,570,000	$67,215,190,000	$63,803,171,511	$16,232,500,431	3.72533
1995	$37,684,860,000	$13,123,225,000	$17,632,821,000	$68,440,906,000	$65,001,447,981	$16,746,693,812	3.11854
1996	$40,523,387,000	$12,987,476,000	$18,411,197,000	$71,922,060,000	$66,131,406,167	$16,928,858,084	1.08189
1997	$42,460,592,000	$12,308,613,000	$18,882,869,000	$73,652,074,000	$66,612,633,949	$17,078,102,113	0.87773
1998	$44,993,354,000	$11,978,176,000	$19,898,362,000	$76,869,892,000	$66,832,310,446	$17,300,056,914	1.29127

[1]This excludes miscellaneous services

Source: Federal Communications Commission, *Statistics of Communication Common Carriers* [various years]

Table A-2a. LEC Revenue ($) by Type of Service[1] - 1985-1998

Year	Local Service Revenue	Intrastate Toll and Intrastate Access Service Revenue	Interstate Service Revenue (A)	Total Revenue
1985	$26,960,554,164	$13,047,095,682	$14,366,305,727	$54,373,955,573
1986	$28,626,174,049	$13,538,946,795	$15,459,541,700	$57,624,662,544
1987	$29,150,842,991	$14,166,723,124	$15,360,313,555	$58,677,879,670
1988	$29,226,988,000	$14,994,975,000	$15,806,448,000	$60,028,411,000
1989	$29,973,157,000	$14,868,219,000	$15,745,189,000	$60,586,565,000
1990	$30,699,085,000	$15,014,729,000	$15,483,956,000	$61,197,770,000
1991	$32,059,008,000	$14,522,276,000	$15,461,344,000	$62,042,628,000
1992	$33,359,990,000	$14,225,181,000	$15,767,707,000	$63,352,878,000
1993	$34,598,957,000	$14,496,831,000	$16,341,156,000	$65,436,944,000
1994	$35,758,637,000	$14,355,983,000	$17,100,570,000	$67,215,190,000
1995	$37,684,860,000	$13,123,225,000	$17,632,821,000	$68,440,906,000
1996	$40,523,387,000	$12,987,476,000	$18,411,197,000	$71,922,060,000
1997	$42,460,592,000	$12,308,613,000	$18,882,869,000	$73,652,074,000
1998	$44,993,354,000	$11,978,176,000	$19,898,362,000	$76,869,892,000

[1]This excludes miscellaneous services

Adjusted Interstate Service Revenue based on AT&T's capital cost index

Interstate Earnings (B)	Interstate ANI (C)	Interstate ROR (B/C)	Competitive ROR (D)	Competitive Earnings (E=C*D)	Earnings Adjustment (F=E-B)	Tax Adjustment (G=0.64*F)	Adjusted Interstate Revenue (A-F-G)	Growth Rate (%)
							$14,366,305,727	
							$15,459,541,700	7.33408
							$15,360,313,555	-0.64393
							$15,806,448,000	2.86308
							$15,745,189,000	-0.38831
$3,252,800	$25,752,912	12.63%	11.25%	$2,897,203	-$355,597	-$227,348	$14,901,010,958	-5.51058
$3,065,010	$25,191,906	12.17%	11.25%	$2,834,089	-$230,921	-$147,637	$15,082,786,665	1.21251
$3,290,715	$24,875,599	13.23%	10.88%	$2,705,399	-$585,316	-$374,216	$14,808,175,190	-1.83747
$3,467,862	$24,759,133	14.01%	10.50%	$2,600,063	-$867,799	-$554,819	$14,918,537,841	0.74252
$3,446,525	$24,779,745	13.91%	10.13%	$2,509,480	-$937,045	-$599,090	$15,564,434,938	4.23839
$3,506,389	$25,461,013	13.77%	9.75%	$2,483,176	-$1,023,213	-$654,181	$15,955,427,369	2.48105
$3,756,542	$26,132,272	14.38%	9.38%	$2,450,834	-$1,305,708	-$834,791	$16,270,697,312	1.95667
$3,779,276	$25,827,956	14.63%	9.00%	$2,325,623	-$1,453,653	-$929,379	$16,499,837,413	1.39847
$3,990,567	$25,911,261	15.40%	8.63%	$2,236,142	-$1,754,425	-$1,121,674	$17,022,262,632	3.11715

Source: *ARMIS 43-01*

Tax factor: 0.63934

Table A-3a. Summary of the Components of the LECs' Price Cap X-Factor (excluding the Consumer Productivity Dividend) - 1985-1998
Based on Revised FCC Cost of Capital Index

Year	U.S. Nonfarm Business Sector TFP Growth Rate (%) A	LECs' Output Growth Rate (%) B	LECs' Input Growth Rate (%) C	LECs' TFP Growth Rate (%) D=B-C	TFP Differential (%) E=D-A	U.S. Nonfarm Business Sector Input Price Growth Rate (%) F	LECs' Input Price Growth Rate (%) G	Input Price Differential (%) H=F-G	X-factor (%) I=E+H	Previous X-factor[1] (%) J
1986	1.10166	3.20079	0.23097	2.96981	1.86815	2.80830	5.19735	-2.38905	-0.52090	-0.5
1987	-0.39920	3.76640	0.54947	3.21692	3.61613	2.53178	0.70253	1.82925	5.44538	5
1988	0.29955	6.51199	4.13623	2.37576	2.07621	3.72958	-1.40072	5.13030	7.20651	5
1989	0.19920	4.38736	2.63658	1.75078	1.55158	3.03629	-2.41383	5.45011	7.00169	7.9
1990	-0.69895	4.76136	-0.62394	5.38530	6.08425	3.30913	4.31281	-1.00369	5.08057	8.8
1991	-1.41274	2.61222	1.97867	0.63355	2.04628	2.05824	-1.39313	3.45137	5.49765	5.8
1992	1.61294	3.51156	-0.77999	4.29155	2.67861	2.88104	-2.61511	5.49614	8.17476	3.4
1993	0.09995	5.83136	0.79511	5.03625	4.93630	3.71664	1.49236	2.22428	7.16058	4.7
1994	0.39880	5.41556	2.91809	2.49747	2.09867	3.50341	-1.19592	4.69933	6.79800	5.4
1995	0.29806	5.98474	0.82671	5.15803	4.85997	1.96268	1.12891	0.83377	5.69374	6.8
1996	1.47713	8.22067	-3.41354	11.63421	10.15708	1.38258	5.65246	-4.26988	5.88720	
1997	0.39024	8.81648	4.07661	4.73987	4.34963	1.89887	-3.43866	5.33753	9.68715	
1998	0.59259	6.15546	0.01784	6.13762	5.54502	0.71810	0.24889	0.46921	6.01424	
				avg[2](86-98)	3.98984			2.09682	6.08666	
				var[3](86-98)	5.38031			9.67041	5.13108	
				avg(91-98)	4.58395			2.28022	6.86417	
				var(91-98)	6.06067			9.39899	1.83666	
				avg(86-95)	3.18162			2.57218	5.75380	5.23
				var(86-95)	2.28288			6.97695	5.25875	5.93
				avg(91-95)	3.32397			3.34098	6.66495	5.22
				var(91-95)	1.70185			2.80703	0.96974	1.29

[1] X-factor reported in the 1997 Price Cap Review Order

[2] avg denotes the arithmetic mean of the series

[3] var denotes the variance of the series.

Source: Bureau of Labor Statistics' Multifactor Productivity Table 2: Private Nonfarm Business: Productivity and Related Indexes (annual and quarterly tables), Table B-4, Table B-11, and Table B-13.

Table A-4a. Direct Calculation of the LECs' Price Cap X-Factor (excluding the Consumer Productivity Dividend) - 1985-1998
Based on Revised FCC Cost of Capital Index

Year	U.S. Nonfarm Business Sector TFP Growth Rate (%) A	U.S. Nonfarm Business Sector Input Price Growth Rate (%) B	LECs' Output Growth Rate (%) C	LECs' Adjusted Revenue Growth Rate (%) D	Total Company X-factor (%) E=C-D-A+B	LECs' Interstate Output Growth Rate (%) F	LECs' Adjusted Interstate Revenue Growth Rate (%) G	Interstate X-factor (%) H=F-G-A+B	GDPPI Growth (new series) I	Interstate X-factor (%) based on new GDPPI J=F-G+I	Interstate X-factor with CPD removed for 1996-98 K=H-1.5
1986	1.10166	2.80830	3.20079	5.80654	-0.89912	5.14068	7.334081	-0.48677	2.2	0.00660	-0.48677
1987	-0.39920	2.53178	3.76640	1.81122	4.88616	7.78433	-0.643926	11.35924	2.9	11.32826	11.35924
1988	0.29955	3.72958	6.51199	2.27551	7.66650	12.18682	2.863082	12.75377	3.4	12.72374	12.75377
1989	0.19920	3.03629	4.38736	0.92552	6.29892	6.04719	-0.38831	9.27259	3.9	10.33550	9.27259
1990	-0.69895	3.30913	4.76136	3.51395	5.25549	11.49069	0.837142	14.66163	3.9	14.55355	14.66163
1991	-1.41274	2.05824	2.61222	0.75050	5.33269	9.83068	-0.766736	14.06839	3.4	13.99741	14.06839
1992	1.61294	2.88104	3.51156	-3.28730	8.06697	5.95758	-3.415064	10.64074	2.2	11.57265	10.64074
1993	0.09995	3.71664	5.83136	2.33177	7.11628	11.26657	2.667386	12.21588	2.7	11.29918	12.21588
1994	0.39880	3.50341	5.41556	1.86406	6.65611	8.70504	3.72533	8.08432	2.1	7.07971	8.08432
1995	0.29806	1.96268	5.98474	1.86066	5.78869	9.58520	3.118542	8.13128	2.1	8.56666	8.13128
1996	1.47713	1.38258	8.22067	1.72342	6.40270	9.62733	1.081889	8.45089	1.8	10.34544	6.95089
1997	0.39024	1.89887	8.81648	0.72505	9.60006	7.77268	0.877732	8.40357	1.7	8.59494	6.90357
1998	0.59259	0.71810	6.15546	0.32924	5.95173	9.04564	1.291273	7.87987	1.2	8.95437	6.37987
				avg[2](86-98)	6.00948			9.64888		9.95062	9.30272
				var[3](86-98)	5.52476			13.73368		12.59819	15.10516
				avg(91-98)	6.86440			9.73437		10.05130	9.17187
				var(91-98)	1.69828			4.73915		4.23609	6.94228
				avg(86-95)	5.61687			10.07011		10.14633	10.07011
				var(86-95)	5.72303			17.06482		16.04072	17.06482
				avg(91-95)	6.59215			10.62812		10.50312	10.62812
				var(91-95)	0.93713			5.41234		5.89145	5.41234

Table A-5a. Average Interstate X-Factors

Based on Direct Calculation and Revised FCC Cost of Capital Index

(From Table A-4)

	Interstate X-factor (%)	Interstate X-factor (%) based on GDPPI
1986 to 1995	10.070	10.146
1987 to 1995	11.243	11.273
1988 to 1995	11.229	11.266
1989 to 1995	11.011	11.058
1990 to 1995	11.300	11.178
1991 to 1995	10.628	10.503
Mean:	10.913	10.904
Median:	**11.120**	**11.118**
1986 to 1998	9.649	9.951
1987 to 1998	10.494	10.779
1988 to 1998	10.415	10.729
1989 to 1998	10.181	10.530
1990 to 1998	10.282	10.552
1991 to 1998	9.734	10.051
Mean:	10.126	10.432
Median:	**10.231**	**10.541**

Table A-6a. Direct Calculation of the LECs' Price Cap X-Factor (excluding the Consumer Productivity Dividend) - 1985-1998
Based on AT&T Cost of Capital Index

Year	U.S. Nonfarm Business Sector TFP Growth Rate (%) A	U.S. Nonfarm Business Sector Input Price Growth Rate (%) B	LECs' Output Growth Rate (%) C	LECs' Adjusted Revenue Growth Rate (%) D	Total Company X factor (%) E=C-D-A+B	LECs' Interstate Output Growth Rate (%) F	LECs' Adjusted Interstate Revenue Growth Rate (%) G	Interstate X-factor (%) H=F-G-A+B	GDPPI Growth (new series) I	Interstate X-factor (%) based on GDPPI J=F-G+I	Interstate X-factor with CPD removed for 1996-98 K=H-1.5
1986	1.10166	2.80830	3.20079	5.80654	-0.89912	5.14068	7.334081	-0.48677	2.2	0.00660	-0.48677
1987	-0.39920	2.53178	3.76640	1.81122	4.88616	7.78433	-0.64393	11.35924	2.9	11.32826	11.35924
1988	0.29955	3.72958	6.51199	2.27551	7.66650	12.18682	2.863082	12.75377	3.4	12.72374	12.75377
1989	0.19920	3.03629	4.38736	0.92552	6.29892	6.04719	-0.38831	9.27259	3.9	10.33550	9.27259
1990	-0.69895	3.30913	4.76136	3.51395	5.25549	11.49069	-5.51058	21.00935	3.9	20.90127	21.00935
1991	-1.41274	2.05824	2.61222	0.75050	5.33269	9.83068	1.212508	12.08914	3.4	12.01817	12.08914
1992	1.61294	2.88104	3.51156	-2.10522	6.88488	5.95758	-1.83747	9.06315	2.2	9.99505	9.06315
1993	0.09995	3.71664	5.83136	4.01887	5.42918	11.26657	0.742518	14.14074	2.7	13.22405	14.14074
1994	0.39880	3.50341	5.41556	-0.86102	9.38120	8.70504	4.238391	7.57126	2.1	6.56665	7.57126
1995	0.29806	1.96268	5.98474	1.96378	5.68558	9.58520	2.481055	8.76876	2.1	9.20415	8.76876
1996	1.47713	1.38258	8.22067	1.18184	6.94428	9.62733	1.956673	7.57611	1.8	9.47066	6.07611
1997	0.39024	1.89887	8.81648	0.30089	10.02421	7.77268	1.398475	7.88283	1.7	8.07420	6.38283
1998	0.59259	0.71810	6.15546	0.95756	5.32341	9.04564	3.117153	6.05399	1.2	7.12849	4.55399
				avg (86-98)	6.01641			9.77340		10.07514	9.42724
				var (86-98)	6.37577			22.78475		20.54240	24.98583
				avg(91-98)	6.87568			9.14325		9.46018	8.58075
				var(91-98)	3.06184			6.23239		4.59900	8.97855
				avg(86-95)	5.59215			10.55412		10.63034	10.55412
				var(86-95)	6.36814			26.78701		25.09167	26.78701
				avg(91-95)	6.54271			10.32661		10.20161	10.32661
				var(91-95)	2.32257			5.85386		5.33711	5.85386

Table A-7a. Average Interstate X-Factors

Based on Direct Calculation and AT&T Cost of Capital Index

(From Table A-6)

	Interstate X-factor (%)	Interstate X-factor (%) based on GDPPI
1986 to 1995	10.554	10.630
1987 to 1995	11.781	11.811
1988 to 1995	11.834	11.871
1989 to 1995	11.702	11.749
1990 to 1995	12.107	11.985
1991 to 1995	10.327	10.202
Mean:	11.384	11.375
Median:	**11.742**	**11.780**
1986 to 1998	9.773	10.075
1987 to 1998	10.628	10.914
1988 to 1998	10.562	10.877
1989 to 1998	10.343	10.692
1990 to 1998	10.462	10.731
1991 to 1998	9.143	9.460
Mean:	10.152	10.458
Median:	**10.402**	**10.712**

Table A-8a. Summary of the Components of the LECs' Price Cap Interstate X-Factor - 1985-1998
Based on Revised FCC Cost of Capital Index

Year	U.S. Nonfarm Business Sector TFP Growth Rate (%) A	LECs' Interstate Output Growth Rate (%) B	LECs' Input Growth Rate (%) C	LECs' TFP Growth Rate (%) D=B-C	TFP Differential (%) E=D-A	U.S. Nonfarm Business Sector Input Price Growth Rate (%) F	LECs' Input Price Growth Rate (%) G	Input Price Differential (%) H=F-G	X-factor (%) I=E+H
1986	1.10166	5.14068	0.23097	4.90971	3.80804	2.80830	5.19735	-2.38905	1.41899
1987	-0.39920	7.78433	0.54947	7.23486	7.63406	2.53178	0.70253	1.82925	9.46331
1988	0.29955	12.18682	4.13623	8.05059	7.75104	3.72958	-1.40072	5.13030	12.88134
1989	0.19920	6.04719	2.63658	3.41062	3.21141	3.03629	-2.41383	5.45011	8.66153
1990	-0.69895	11.49069	-0.62394	12.11463	12.81358	3.30913	4.31281	-1.00369	11.80990
1991	-1.41274	9.83068	1.97867	7.85200	9.26474	2.05824	-1.39313	3.45137	12.71611
1992	1.61294	5.95758	-0.77999	6.73757	5.12463	2.88104	-2.61511	5.49614	10.62077
1993	0.09995	11.26657	0.79511	10.47146	10.37151	3.71664	1.49236	2.22428	12.59579
1994	0.39880	8.70504	2.91809	5.78695	5.38815	3.50341	-1.19592	4.69933	10.08748
1995	0.29806	9.58520	0.82671	8.75850	8.46043	1.96268	1.12891	0.83377	9.29420
1996	1.47713	9.62733	-3.41354	13.04088	11.56374	1.38258	5.65246	-4.26988	7.29386
1997	0.39024	7.77268	4.07661	3.69607	3.30582	1.89887	-3.43866	5.33753	8.64335
1998	0.59259	9.04564	0.01784	9.02779	8.43520	0.71810	0.24889	0.46921	8.90441

Average X-factors:		
	1986 to 1995	9.95494
	1987 to 1995	10.90338
	1988 to 1995	11.08339
	1989 to 1995	10.82654
	1990 to 1995	11.18738
	1991 to 1995	11.06287
	Mean:	10.83642
	Median:	10.98313
	1986 to 1998	9.56854
	1987 to 1998	10.24767
	1988 to 1998	10.31898
	1989 to 1998	10.06274
	1990 to 1998	10.21843
	1991 to 1998	10.01950
	Mean:	10.07264
	Median:	10.14059

Table A-9a. Results for Specified Periods

Total company results(from Table A-7):

	TFP growth	TFP differential	X-factor
1986-90	3.14	3.04	4.84
1991-95	3.52	3.32	6.66
1996-98	7.50	6.68	7.20

Interstate-only results (from Table A-8):

	TFP growth	TFP differential	X-factor
1986-90	7.14	7.04	8.85
1991-95	7.92	7.72	11.06
1996-98	8.59	7.77	8.28

Reply Appendix B
RESPONSE TO USTA'S EXPERT ANALYSES
William H. Lehr

In its comments in this docket, AT&T argues in favor of setting an historical X-factor in the range of 9.5 to 10.1 percent, with a CPD of 1.1 percent, for a total adjustment of 10.6 to 11.2 percent per year. In contrast, the United States Telecommunications Association (USTA) submitted comments arguing that even the 6.5 percent adjustment included in the 1997 price-cap order is too high and should be lowered. The purpose of this analysis is to respond to comments by USTA affiants Frank Gollop, William Taylor, and James Vander Weide that argue against revising the X-factor upwards as suggested by the FCC and as recommended by AT&T. Specifically, in the following I will explain why:

1. Revising the X-factor upwards is consistent with the goals of price cap regulation and will not harm the Local Exchange Carriers' (LECs') incentives to invest in becoming more efficient, contrary to the arguments by USTA's affiants Gollop, Taylor and Vander Weide.

2. Access charges remain substantially above economic costs and will remain so even if an X-factor in the highest ranges under consideration in this proceeding is adopted. Usage-related interstate access charges are in excess of $0.01 per minute, while reasonable estimates of the incremental cost associated with providing interstate access are less than $0.004 per minute.[1]

3. The LECs continue to earn substantial excess profits, contrary to what Dr. Taylor would suggest by his comparison of accounting returns for the LECs and the Value Line industrials. These excess profits exceed many billions of dollars per year. For example, in New York, Bell Atlantic's excess profits are in excess of $1.3 billion per year.[2] And in California, Florida, Georgia, Massachusetts, Michigan, Minnesota, New Hampshire, and Virginia, the excess profits of the Bell Operating Companies (BOCs) exceed $5.4 billion

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[1] In its access charge reform decision, the FCC declined to set access charges at a level corresponding to economic costs immediately, adopting instead a transitional approach that will move access to costs over a longer period (see *Second Report and Order,* In the Matter of Access Charge Reform, Before the Federal Communications Commission, CC Docket No. 96-262, May 21, 1997 -- hereafter, referred to as the "FCC Access Charge Order").

[2] See *Affidavit of R. Glenn Hubbard and William H. Lehr on Behalf of AT&T Communications Of New York, Inc.,* Petition of New York Telephone Company for Approval of Its Statement of Generally Available Terms and Conditions Pursuant to Section 252 of the Telecommunications Act of 1996 and Draft Filing of Petition for InterLATA Entry Pursuant to Section 271 of the Telecommunications Act of 1996, Before the State of New York Public Services Commission, Case No. 97-C-0271, October 4, 1999

per year.[3] The comparison by Dr. Taylor of LEC and Value Line industrials' accounting returns during the period from 1990-1998 is meaningless and should be disregarded as I explain below.

4. It is appropriate that the FCC adjust the X-factor for interstate access charges to reflect the more rapid pace of unit cost reductions for the facilities used to provide interstate services. The FCC should not be swayed by USTA's affiants' theoretical arguments as to why such an attempt is theoretically unsound.

5. The FCC's decision to revise its estimate of local output from calls to Dial Equipment Minutes (DEM) is appropriate, and certainly better than Dr. Gollop's proposal to use access lines.

6. Dr. Vander Weide's estimation of the trend in the weighted average cost of capital (WACC) for the LECs is substantially biased upwards and should be disregarded.

7. The FCC should consider either retaining an estimate of the Consumer Productivity Dividend (CPD) or of incorporating the adjustment it implies directly into its estimate of a forward-looking X-factor, contrary to Dr. Taylor's contention.

In what follows, I address each of the points summarized above.

1. Increasing the X-factor is consistent with Price Cap goals

Drs. Gollop, Taylor and Vander Weide are incorrect in arguing that revising the X-factor is inconsistent with the goals of price cap regulation and will harm LEC incentives to invest in enhancing their efficiency. Revising the X-factor upwards as recommended by AT&T does not reduce price cap regulation to "cost of service" regulation as USTA's advocates claim.

Price caps are attractive relative to traditional cost-of-service or rate of return (ROR) regulation because (1) they offer improved incentives for firms to invest in productivity enhancements; and, (2) they are less costly to implement for regulatory authorities. Efficiency incentives are improved under price caps because the firms can expect to retain a larger share of the benefits from any cost-saving investments. Under ideal ROR regulation, prices are set on the basis of annual rate hearings that balance

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[3] These are the eight states in which MediaOne operates and for which I also have prepared estimates of BOC excess profits. See *Declaration of R. Glenn Hubbard and William H. Lehr on behalf of AT&T Communications*, In the Matter of Applications for Consent to Transfer the Control of Licenses MediaOne Group Inc. to AT&T Corp., Before the Federal Communications Commission, CS Docket No. 99-251, December 8, 1999.

revenues and costs. Since lower (or higher) costs result in lower (or higher) prices, the full benefit (or pain) from cost savings (or increases) is passed through to consumers. The expectation that future prices will be adjusted *ex post* to reflect realized cost savings reduces the benefits that the firm would otherwise expect to realize from investing in efficiency enhancements. In addition, the annual rate hearings are quite costly for all parties involved.

In contrast, under a pure price cap regime, the regulator sets retail prices according to a formula which will make future price adjustments to some degree independent of the firm's actual realized costs. This decoupling of output price regulation from the operating decisions of the firm gives rise to the improved incentives and mitigates the so-called "ratchet effect" that otherwise bedevils efforts to induce regulated firms to invest in cost minimization. In addition, administering price caps is supposed to be substantially less expensive than administering ROR regulation (*e.g.*, because annual rate hearings are eliminated as prices are adjusted according to a simple formula).

Ideally, the regulator initializes the price cap by setting prices equal to the best estimate of the firm's current (forward-looking) economic costs. If price caps are set above this level then public welfare will suffer. Consumers will be harmed because prices will be too high and the firm will earn excess monopoly profits. If price caps are set below economic costs then the firm will not be able to recover its costs, and if this is not corrected, the firm eventually will be driven out of business and consumer welfare again will suffer.

While this latter eventuality may appear more severe, its likelihood of occurring is so low as to make this not much of a concern in practice. If price caps were ever set so low as to threaten the ability of the LECs to recover their economic costs, the reaction from the LECs and the financial community (as reflected in their share price) would be immediate and impossible to ignore. In contrast, our long experience with the monopoly over local telephone service demonstrates that the danger of price caps being set too high is far more likely and to be expected. Indeed, when the FCC established price caps for access charges in 1991, there was no attempt to set access charges equal to economic costs. Even when the FCC revised access charges in 1997, it declined to adjust access charges down to equal economic costs.[4]

Because of exogenous forces, the firm's costs are likely to change over time. This means that price caps must be adjusted to reflect changes that are beyond the firm's control (*e.g.*, shifts in the prices of factor inputs such as labor or capital or productivity gains from technological innovation). The price cap should increase to compensate the firm for growth in the overall level of output prices in the economy (usually measured by an index such as the GNP-PI) offset by an X-factor that corrects for (1) faster expected productivity growth by the regulated firm than the rest of the economy, and (2) slower growth in input prices faced by the regulated firm than in the overall economy. As long

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[4] See *Second Report and Order,* In the Matter of Access Charge Reform, note 1, *supra*.

as these adjustment mechanisms are exogenous, the firm's investment incentives are not distorted.

Pure price caps are not feasible in practice because no formula is perfect. Costs may increase in a way not anticipated necessitating an upward adjustment in the price cap to allow the firm a fair opportunity to recover its costs. Alternatively, unit costs may decline much more rapidly than anticipated resulting in a price cap that is above the price that an unregulated monopolist would charge. In this situation, the price caps would no longer be binding and the firm would be able to earn monopoly profits. Therefore, it is necessary periodically to revise the price cap to reflect improved estimates of the firm's costs. However, it is important that the regulated firm not expect this to happen too frequently or to be implemented so as to expropriate from the firm *ex post* any realized cost savings resulting from its investments due to its improved cost-saving incentives under the price caps.

Drs. Gollop, Taylor, and Vander Weide would have us believe that the current debate is about *ex post* expropriation of LEC cost-savings, and therefore in violation of the goals of the price cap formula. This is clearly not the case. Instead, the FCC is endeavoring to correct a past error in how the price cap was specified. The current proceeding is a result of a D.C. Circuit Court Order that responded in part to complaints from the LECs that price caps were too low and that the X-factor was too high. The LECs would be quite happy if the FCC continuously revised the X-factor so long as they kept making it smaller.

The proposed revisions to the X-factor neither eliminate the regulatory cost savings nor the pro-efficiency incentives anticipated from price caps. The revisions do not require a return to the burdensome annual ROR hearings which are a critical component of cost-of-service regulation. Similarly, adjusting the X-factor upward to more accurately reflect differential unit cost growth rates represents a correction of past errors and does not reflect *ex post* expropriation. Correcting past errors does not affect future decisions, first, because the operating decisions associated with past revenues have already been made, and second, because the LEC should expect errors to be corrected. Certainly, if it were found *ex post* that the price cap actually had been set below economic costs the LEC would be very happy to have that error corrected and its faith in the FCC's ability to commit to a regulatory policy would be enhanced. Therefore, the USTA affiants are incorrect in asserting that an upward revision in the X-factor will eliminate the pro-efficiency incentives anticipated by the change to price cap.

Moreover, even if one were to accept the contrary claim (which I do not), the LECs would retain powerful incentives to invest in productivity enhancements and cost reduction. First, the price caps only affect a portion of the LECs' revenues. Second, because of the growth of the Internet and the many opportunities for growth and new markets that it offers and because of the potential for increased competition in all telecommunications services, the LECs' have strong incentives to invest in cost minimization. The LEC's are quite vocal in asserting the same in their filings seeking permission to offer in-state interLATA service under Section 271 of the Telecommunications Act of 1996 or on behalf of their request for merger approval

(*e.g.*, Bell Atlantic/Nynex, SBC/Ameritech, etc.).

Finally, with the shift in regulatory paradigm from direct oversight to increased reliance on market forces anticipated by the Telecommunications Act of 1996 and the promotion of local competition, the social costs of pricing access substantially above cost are increased. The pro-competitive provisions of the Act are only now beginning to yield some results. Local competition is far from assured and the LECs retain substantial monopoly power over essential local access facilities. The excessive access charges distort investment and pricing decisions all along the telecommunications value chain and help fund the LECs' war chest for engaging in anticompetitive behavior intended to raise rivals' costs. The added threat to prospects for more competitive telecommunications services today and in the future increases the social costs from retaining excessive access charges and makes it all the more expensive for society if it fails to correct errors in the X-factor.

2. Access charges remain above economic costs

Current usage-sensitive interstate access charges exceed $0.01 per minute. In contrast, reasonable estimates of the incremental cost of providing interstate access are less than $0.004 per minute.[5] Even the LECs' own witnesses in this and other proceedings do not argue that access charges are currently at cost. An X-factor of 15 percent would take over five years to reduce current access charges to below $0.004 per minute, which is still above economic cost![6]

Hopefully, progress toward effective local exchange and exchange access competition will be more rapid. If (but only if) that occurs, we can expect the price cap

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[5] In the FCC's first Interconnection Order, the FCC specified that default proxy rates for local termination should be in the range of $0.002 to $0.004 per minute (see Section 51.707 of the *First Report and Order*, In the Matter of Implementation of Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98 (FCC August 8, 1996). The FCC reasoned that the relevant costs should include the TELRIC of local switch usage, some transport to account for the possibility that traffic is exchanged at a tandem and needs to be carried to the terminating end office, and a reasonable allocation of common costs. While these specific pricing requirements were suspended by the Supreme Court when it remanded the FCC's pricing recommendations in its recent decision, these levels are in the range of estimates from such cost models as the one prepared by HAI Inc. and the methodology for establishing the economic costs remains sound and in force. Moreover, many of the reciprocal compensation agreements negotiated by LECs recently call for payments in the range of $0.01-$0.02 per minute, suggesting that $0.04 is likely to be an excessive estimate of the usage-sensitive cost of terminating or originating interstate calls.

[6] That is, assuming that the X-factor is the only reason access prices are falling, reducing the current access charge that is in excess of $0.01 per minute to below $0.004 per minute would take 5.6 years (or, $0.01(1-.15)^{5.6} = 0.004$).

regime to be rendered moot as market forces replace the need for regulatory controls to assure that prices are driven towards costs. Unless and until that happens, however, it will be extremely important for the Commission to be vigilant in its regulation of the LECs' access charges.

3. *LECs earn substantial excess profits*

Conservative estimates of LEC excess profits exceed many billions of dollars per year. Earlier I cited examples of estimates I prepared in the context of evaluating the public welfare benefits associated with introducing effective competition in Bell Atlantic's territory in New York and in the territories served by the BOCs where MediaOne operates. These estimates are conservative because they consider only revenue earned on switched access lines and ignore any of the spillover benefits that accrue to the BOCs operations in other markets. The overall estimate of $5.4 billion per year in excess profits cited for the eight MediaOne states rounds down the excess margins on the average switched access line to $10.00 per month and then scales this by the total number of lines in the state.

The estimate provided above is a bottom-up estimate based on the revenues and economic costs faced by the BOCs. In contrast, Dr. Taylor offers a chart (at p. 22) comparing the accounting earnings of the LECs and the Value Line industrials during the period from 1990-1998, claiming that the LECs' earnings growth was lower than the Value Line industrials on average. Given Dr. Taylor's comments (at p. 12) on the problems with using accounting earnings to infer anything about economic profits, it is hard to take this chart seriously. As Dr. Taylor points out, excess accounting earnings do not tell us about economic profits. The analysis presented here demonstrates that the LECs are currently earning monopoly profits and, in light of decreases in access charges and other prices in recent years, it is unlikely that these excess profits were substantially less in the past. In contrast, the Value Line industrials represent a large sample of industries that are broadly presumed to be quite competitive -- certainly much more so than the market for local access services during the period from 1990 to 1998.

Although I have not attempted to verify Dr. Taylor's chart, he seeks to compare the regulated accounting earnings of the LECs with the accounting earnings of a quite different sample of firms that use quite different accounting practices and face substantially different economic environments (different production functions, different risk profiles, different labor markets, etc.). This is simply not a meaningful comparison and tells us nothing about whether the LECs did or did not earn excess profits in the past.

4. X-factors ought to reflect more rapid interstate per unit cost reductions

The USTA affiants fault the FCC for recommending that the X-factor ought to be adjusted on the basis of estimates of the changes in unit costs for interstate services. Because the price cap is intended to control the price for interstate access charges, this

approach is appropriate and, indeed, necessary.

While I agree that common costs can introduce some complexity into cost and revenue allocations between interstate and intrastate services, I do not think these problems are as substantial as the USTA affiants allege. First, as Mr. Friedlander has shown, it is mathematically possible to calculate the changes in the LECs' interstate productivity without separately computing changes in input prices for interstate and intrastate services. Second, in all events, abandoning the attempt to reflect more carefully changes in interstate unit costs because of the difficulties of allocating accounting costs is throwing the baby out with the bath water. Applying economic theory in practice requires judgement and often necessitates using imperfect data proxies. For example, estimates of the cost of capital based on market data for the BOCs results in an overstatement of capital costs and consequent understatement of productivity growth for local telephone access and service. This is because the BOCs are also engaged in other businesses such as offering cellular and advanced business data services that are typically regarded as being substantially more competitive and risky. Because data for comparable local-only telephone companies is not available, economists work with what is available.

The hypothetical examples presented by Dr. Taylor of how misallocation of accounting costs/revenues can result in sub-optimal incentives for the LEC are not relevant. For example, he argues (at p. 20) that attempts to allocate usage to interstate and intrastate jurisdictions may create perverse incentives that could hinder the deployment of new productivity-enhancing technologies such as ATM switches. We have already noted that the LEC's investment incentives are influenced by far more than simply how the X factor is set for access charges. However, this example hides a further fallacy. If switching productivity is increasing (*e.g.*, because ATM switches are more productive than older digital switches as suggested by Dr. Taylor) and switching represents a larger share of the total costs for interstate access services than for intrastate services, then the per unit costs for interstate services are likely to fall more rapidly.

If it were true that interstate service costs were falling less rapidly than local costs (which would conflict with arguments the LECs have made elsewhere regarding the economic costs of providing local service), then I would expect the USTA affiants to provide such estimates rather than cooking up irrelevant examples.

5. Measuring local output in terms of DEMs is appropriate

USTA affiants oppose the FCC's decision to revise the way in which it measures local output based on Dial Equipment Minutes (DEMs) instead of local calls. Dr. Gollop even goes so far as to argue in favor of using the number of access lines as the appropriate metric because the revenue associated with flat rate charges comprises a large share of the LECs total local service revenue.

The X-factor ought to be based on the best estimate of local output possible, i.e., DEMs instead of calls. Revising the X-factor to reflect this decision is fully appropriate. The reason the LECs oppose this revision is because DEMs have grown faster than calls

which, in turn, have grown faster than access lines. The reason for this faster growth appears to be due primarily to the growth of dial-up Internet usage which results in calls which have a longer call holding time and which has helped propel the demand for second lines. Whether these calls are to access the Internet or to call someone's grandmother is irrelevant from the perspective of switch utilization. The increased minutes represent higher utilization of switching facilities which translates into increased output from existing plant. This higher output is rightfully measured as increased productivity.

Certainly Dr. Gollop's argument that we should use total access lines to measure local output makes no sense at all. Interstate access charges are assessed on a per minute basis so the natural metric by which to measure access output is on the basis of per minute costs or output. DEMs provide a much better measure of switch utilization than do the number of access lines.

6. *USTA's estimates of LEC capital costs are excessive*

Dr. Gollop and Dr. Vander Weide present mutually incompatible estimates of the change in capital costs faced by the LECs during the 1990s. Dr. Gollop's estimates are substantially higher and are based on accounting data that has been artfully manipulated to result in implausibly low estimates for the X-factor. AT&T's expert, Dr. Friedman, provides ample explanation as to why Dr. Gollop's approach is incorrect.

The methods employed by Dr. Vander Weide are closer to what I consider sound economic practice. Nevertheless, there are several reasons why I believe Dr. Vander Weide's estimates are biased upwards.

First, Dr. Vander Weide uses the returns earned by the S&P index as a proxy for the return on equity (ROE) for the LECs. Because this includes firms facing very different business environments and with very different capital structures (*e.g.*, in general, LECs are more capital-intensive than the average firm included in the S&P index), this is not an appropriate representative sample. Dr. Vander Weide said he repeated his estimates using data for the BOCs, but claimed without explanation that he felt this understated the appropriate cost of equity, even though he claimed (at note 7, page 8) to estimate a cost of equity of 13.22 percent for November 1999. Dr. Vander Weide does not provide sufficient information to verify what he did to arrive at his estimates beyond noting that he used an "annual DCF" model. Using a more appropriate 3-stage DCF model, Drs. Cornell and Hirshleifer estimated the cost of equity for the BOCs to be 9.28 percent[7] -- suggesting that Dr. Vander Weide's ROE estimate is much too high.

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[7] See page 13 in *Affidavit of Bradford Cornell and John I. Hirshleifer on behalf of AT&T*, in the Matter of Prescribing the Authorized Unitary Rate of Return for Interstate Services of Local

Second, Dr. Vander Weide constructs his weighted average cost of capital (WACC) estimates by using the market value of equity to weight his upwardly-biased estimates of the ROE. From 1991 until September 1999, the market share of equity declined from 31% to 17% according to Vander Weide's Table 6. Because the ROE is higher than the cost of debt and because the market value of equity has increased substantially during the bull market of the 1990s (resulting in an increase in the equity share of the capital structure), this approach allows Vander Weide to conclude that the WACC has remained flat rather than declined as the FCC staff concluded.

However, Vander Weide's choice of weights for the WACC is biased upwards. The goal of his exercise is to estimate the appropriate forward-looking cost of capital at each point in time. Although finance theory tells us that we should prefer market data to accounting data, the capital structure that should be used is the optimal forward-looking capital structure. Dr. Vander Weide's approach would have us believe that the optimal future capital structure for the LECs is to employ only 17 percent debt financing. This seems implausible for a capital-intensive industry that involves substantial investment in long-lived assets (*e.g.*, local access infrastructure). I think there is little doubt that Dr. Vander Weide's approach is designed to take advantage of current market anomalies to develop excessive cost of capital estimates.

7. *Retention of the CPD is fully warranted*

Dr. Taylor argues (at pp. 27-29) that because we have had price cap regulation since 1991, it no longer makes sense to retain a positive adjustment for the Consumer Productivity Dividend (CPD). I disagree. The CPD is needed because estimates of the X-factor based on historical productivity performance of the LECs is biased downwards because of (1) inferior investment incentives under previous regulatory regimes, and (2) the inefficiencies associated with operation as a regulated monopolist.

The goal of this proceeding is to develop the best estimates possible of the forward-looking X-factors that will reflect future relative productivity growth and input price changes. We rely on historical data of actual performance because we have to. However, it is reasonable to adjust this upwards to reflect the additional productivity gains that can be expected as the LECs continue their transition from a regime of direct regulatory oversight to one that relies on market competition to discipline behavior and encourage cost minimization.

Dr. Taylor overstates the case when he argues that we have had 10 years of experience, as if this has been continuous. It neglects to mention the profound changes inaugurated by passage of the Telecommunications Act of 1996. Moreover, the CPD was originally justified on the basis of the expected additional benefits from moving from

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Exchange Carriers, Before the Federal Communications Commission, CC Docket No. 98-166, March 1999.

rate-of-return regulation to the price cap system with sharing. Now, however, the Commission has eliminated the sharing requirement, creating significant additional incentives to productivity. Because it is reasonable to anticipate that future productivity growth will be even faster than in the past, a positive CPD is warranted.

In sum, consumers and competition would benefit if the FCC were to review the USTA proposals critically and not be swayed from adjusting access pricing to be more in line with economic costs.

Attachment #1A[8]
Table C: Excess ILEC Profits in MediaOne States

State	ILECs	Total Revenue ($millions)[9]	Switched Access Lines (000s)[10]	Revenue (per line per month)	Economic costs (per line per month)[11]	Excess Profit (per line per month)[12]
MA	Bell Atlantic	$ 2,378.3	4,485.0	$ 44.19	$ 17.71	$ 13.24
NH	Bell Atlantic	$ 437.8	781.4	$ 46.69	$ 24.93	$ 10.88
FL	BellSouth	$ 2,979.9	6,444.4	$ 38.53	$ 17.29	$ 10.62
	United	$ 994.6	2,006.8	$ 41.30	$ 22.37	$ 9.46
GA	BellSouth	$ 2,381.5	4,085.4	$ 48.58	$ 21.76	$ 13.41
CA	SBC	$ 7,609.0	17,915.6	$ 35.39	$ 14.99	$ 10.20
	GTE	$ 2,664.3	4,554.5	$ 48.75	$ 14.26	$ 17.24
MN	U S WEST	$ 1,176.6	2,291.6	$ 42.79	$ 21.61	$ 10.59
VA	Bell Atlantic	$ 1,656.3	3,600.3	$ 38.34	$ 19.93	$ 9.20
MI	Ameritech	$ 2,885.3	5,309.7	$ 45.28	$ 18.79	$ 13.25
	GTE	$ 418.5	702.5	$ 49.64	$ 33.18	$ 8.23
Average excess profit per line						$ 11.59
Total SW access lines			52,177.2			
Total Excess Profits per Year[13]						$6,261,264

[8] This table is Table C from *Declaration of R. Glenn Hubbard and William H. Lehr on behalf of AT&T Communications*, In the Matter of Applications for Consent to Transfer the Control of Licenses MediaOne Group Inc. to AT&T Corp., Before the Federal Communications Commission, CS Docket No. 99-251, December 8, 1999.

[9] See Attachment #1B.

[10] Source: FCC ARMIS Operating Data Report 43-08, 1998, Table III, Access Lines in Service by Customer, Total Switched Access Lines, Column (dj).

[11] Source: (HAI 5.0 estimates state-wide average economic cost - $1.72 for billing and number portability)*1.3 to account for retail-level costs and other network-related costs not included in HAI estimates.

[12] After-tax excess profit per line = [(Revenue per line per month)-(Economic Cost per line per month)]*0.5

[13] This estimate assumes that the excess profit per line per month is $10 instead of $11.59 which is the access line weighted average excess profits actually realized by the ILECs.

Attachment #1B[14]
Table D : Total Revenue for Bell Operating Companies and GTE in States where MediaOne Operates[15]

State	ILECs	Basic Service Revenue	Other LX Revenue	End User Revenue	Switched Access Revenue	State Access Revenue	L D Message Revenue	Total Revenue ($millions)
MA	Bell Atlantic	$ 1,103.2	$ 262.0	$ 267.2	$ 394.1	$ 56.7	$ 295.1	$ 2,378.3
NH	Bell Atlantic	$ 183.2	$ 35.2	$ 46.9	$ 93.7	$ 16.6	$ 62.2	$ 437.8
FL	BellSouth	$ 1,191.9	$ 671.6	$ 388.4	$ 430.1	$ 246.0	$ 51.9	$ 2,979.9
	United	$ 342.1	$ 164.3	$ 109.8	$ 162.2	$ 197.3	$ 18.9	$ 994.6
GA	BellSouth	$ 1,219.3	$ 500.3	$ 253.7	$ 311.4	$ 80.8	$ 16.0	$ 2,381.5
CA	SBC	$ 3,323.0	$ 903.7	$ 923.2	$ 567.9	$ 762.7	$ 1,128.5	$ 7,609.0
	GTE	$ 1,124.3	$ 293.4	$ 215.2	$ 317.2	$ 428.9	$ 285.3	$ 2,664.3
MN	U S WEST	$ 590.1	$ 170.9	$ 126.8	$ 121.5	$ 129.7	$ 37.6	$ 1,176.6
VA	Bell Atlantic	$ 840.0	$ 254.2	$ 204.1	$ 149.1	$ 155.3	$ 53.6	$ 1,656.3
MI	Ameritech	$ 1,032.4	$ 511.3	$ 328.1	$ 167.0	$ 192.5	$ 654.0	$ 2,885.3
	GTE	$ 135.2	$ 46.3	$ 35.0	$ 54.3	$ 107.4	$ 40.3	$ 418.5

[14] This table is Table D from *Declaration of R. Glenn Hubbard and William H. Lehr on behalf of AT&T Communications*, In the Matter of Applications for Consent to Transfer the Control of Licenses MediaOne Group Inc. to AT&T Corp., Before the Federal Communications Commission, CS Docket No. 99-251, December 8, 1999.

[15] Source: FCC ARMIS Joint Cost Report 43-03, 1998, Column (b) Total. Line (row) numbers: Basic Area Revenues--5001, Other Local Exchange--5060, End User--5081, Switched Access--5082(separate component of), State Access--5082(separate components of), and LD Message--5100.

Attachment #2: Curriculum Vitae
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Biographical Description

Dr. William Lehr is an economist and industry consultant. He is a research associate in the Center for Technology, Policy and Industrial Development at the Massachusetts Institute of Technology and executive director of the MIT Internet & Telecoms Convergence Consortium (MIT ITCC). He is also an associate research scholar on the faculty of Columbia University's Graduate School of Business, and a research associate at the Columbia Institute of Tele-Information. His fields of specialization and research include industrial organization, political economy, and regulation, especially as these apply to information technology industries. He teaches courses in microeconomics and competitive strategy, including courses on the media, telecommunications, and Internet economics. He has published articles on such topics as the effects of industry structure on the quality of telecommunications infrastructure, the economics of standardization, and Internet pricing. He is currently engaged in research on the effects of computer investment on productivity and organizational structure and on Internet industry structure and pricing mechanisms. This latter work is being undertaken in conjunction with the MIT ITCC, which is an academic/industry consortium devoted to research on issues related to the convergence of Internet and telecommunications infrastructure.

In addition to his academic research, Dr. Lehr provides litigation, economic, and business strategy consulting services for firms in the information technology industries. Dr. Lehr has advised information technology companies on strategic marketing, pricing, financial planning, and competitive strategy. Dr. Lehr has prepared expert witness testimony for both private litigation and for regulatory proceedings before the FCC and numerous state commissions.

Dr. Lehr holds a PhD in Economics from Stanford (1992), an MBA from the Wharton Graduate School (1985), and MSE (1984), BS (1979) and BA (1979) degrees from the University of Pennsylvania.

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Curriculum Vitae

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Ph.D., Economics, Stanford University, 1992.
M.B.A., with distinction, The Wharton School, University of Pennsylvania, 1984.
M.S.E., Chemical Engineering, University of Pennsylvania, 1984.
B.S., Chemical Engineering, *cum laude*, University of Pennsylvania, 1979.
B.A., European History, *magna cum laude*, University of Pennsylvania, 1979.

Academic Honors: Graduate Student Research Award, Telecommunications Policy Research Conference, 1991; Lynde and Harry Bradley Foundation Fellowship, 1990; Stanford Fellowship, 1987

PROFESSIONAL EXPERIENCE

MIT Internet Telecoms Convergence Consortium, Center for Technology, Policy and Industrial Development, Massachusetts Institute of Technology (Cambridge, MA), Research Associate, January 1997-present, Executive Director, August 1999-present.

Graduate School of Business, Columbia University (New York, NY), Associate Research Scholar of Finance and Economics, 1997-present; Assistant Professor of Finance and Economics, July 1991 to December 1996.

RAND Corporation (Santa Monica, CA), Graduate Student Intern, Summer 1990.

Economic Analysis Group, Ltd. (Washington, DC), Senior Consultant, 1985-1987.

M.C.I. Telecommunications (Washington, DC), Manager of Financial Analysis, 1985; Senior Financial Analyst, 1984.

Office of Management and Budget, National Security Division (Washington, DC), Graduate Student Intern, Summer 1983.

Putnam, Hayes and Bartlett (Cambridge, MA), Research Associate 1980-1982.

TEACHING EXPERIENCE

Internet Pricing and Quality of Service, 1999
Internet Commerce, 1999
Internet Economics 101, 1998
Internet Telephony Tutorial, 1998
Internet Commerce Video Course, 1998 & 1999

Economics of Telecommunications Pricing, 1996, 1997
Economics and Strategy in Media Industries, 1993-1995
Economics of Strategic Management, 1993
Managerial Economics, 1991-1995
Theory of the Firm (teaching assistant for Paul Milgrom), 1989

PAPERS and PUBLICATIONS

"Provisioning for Bursty Internet Traffic: Implications for Industry Structure," with Dave Clark, paper presented to Workshop on Internet Service Quality Economics, Massachusetts Institute of Technology, December 2-3, 1999, Cambridge, MA

"Availability of Broadband Internet Access: Empirical Evidence," with Sharon Gillett, paper presented to the Twenty-Seventh Annual Telecommunications Policy Research Conference, September 25-27, 1999, Alexandria, VA

"Telecommunications, the Internet, and the Cost of Capital," with R. Glenn Hubbard, paper presented to the Twenty-Seventh Annual Telecommunications Policy Research Conference, September 25-27, 1999, Alexandria, VA

"Telecommunication Regulation in the United States and Europe: The Case for Centralized Authority," with Thomas Kiessling," in *Competition, Regulation and Convergence: Trends in Telecommunications Policy Research,* S. E. Gillett and I. Vogelsang (Eds.), Lawrence Erlbaum Associates, Mahwah, NJ, 1999.

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"Next Generation Bandwidth Markets," with Lee McKnight, Communications & Strategies, Number 32, 4th Quarter 1998, 91-106.

"Forces for Integration and Disintegration in the Internet," with Petros Kavassalis, Communications and Strategies, Number 30, 2nd Quarter 1998, 135-154.

"Computer Use and Productivity Growth in Federal Government Agencies, 1987-92", with Frank Lichtenberg, Journal of Industrial Economics, Volume XLVI, Number 2, June 1998, 257-279.

"Understanding Vertical Integration in the Internet," mimeo, paper presented to Euro CPR '98 Conference, Venice, April 1998.

"Improving Local Exchange Competition: Regulatory Crossroads," with R. Glenn Hubbard, mimeo, Columbia University, February 1998.

"Information Technology and Its Impact on Productivity: Firm-level Evidence from

Government and Private Data Sources, 1977-1993," with Frank Lichtenberg, Canadian Journal of Economics, volume 32, No. 2, April 1999, pages 335-362.

"The Political Economy of Congestion Charges and Settlements in Packet Networks," with Martin Weiss, Telecommunications Policy, 20(3), April 1996, pages 219-31.

"Compatibility Standards and Industry Competition: Two Case Studies", Economics of Innovation and New Technology, 4(2), 1996, pages 97-112.

"Compatibility Standards and Interoperability: Lessons from the Internet", in Standards Policy for Information Infrastructure, edited by B. Kahin and J. Abbate, Harvard Information Infrastructure Project, Cambridge MA: MIT Press, 1995.

Quality and Reliability of Telecommunication Infrastructure (editor), Hillsdale, NJ: Lawrence Erlbaum Associates, 1995.

"The Quality of Complex Systems and Industry Structure", with Nicholas Economides, in Quality and Reliability of Telecommunication Infrastructure, edited by William Lehr, Hillsdale, NJ: Lawrence Erlbaum Associates, 1995.

"Repeated Contract Negotiations with Private Information: Comment," Japan and the World Economy, 7(4), November 1995, pages 473-74.

"Quality Choices in a Network of Networks", in *Private Networks and Public Objectives*, edited by E. Noam and A. NíShúilleabháin, North Holland: New York, 1996.

"ISDN in the U.S.A.: Is it Arriving at Last?", in *ISDN: An International Comparison of Trends in the USA, Japan, Singapore and Europe*, Final Report to the ISDN Commission of North Rhine-Westphalia, May 1996.

"Compatibility Standards and the Internet", working paper, September 1992.

"Standardization: Understanding the Process", Journal of the American Society for Information Science, vol 43, no 8 (September 1992) 550-555.

"Voluntary Standard Setting, Institutions and the Allocation of Technical Capabilities", working paper, July 1992.

"ISDN and the Small User: Regulatory Policy Issues", with Roger Noll, in Integrated Broadband Networks: the Public Policy Issues, edited by Martin Elton, North-Holland, New York, 1991, 147-178.

"Incremental Costs and the Efficient Pricing of Local Exchange Services: A Synopsis of the Incremental Cost Conference", Center for Economic Policy

Research Working Paper #175, Stanford University, January 1990.

"Vertical Integration in the Cable Television Industry: the Issue of Content/Carrier Separation", WD-5100-MF, RAND Corporation, Santa Monica, CA, August 1990.

"ISDN: an Economists' Primer to a New Telecommunications Technology", working paper, February 1989.

"Economics of Anticipatory Standard Setting", working draft, presented at the European Association of Research in Industrial Economics (E.A.R.I.E.) Conference, Chania, Crete, September 1994.

"Political Economics of Voluntary Standard Setting", working draft, January 1992.

Reply Appendix C
COMMENTERS

Commenter	Abbreviated as
Ad Hoc Telecommunications Users Committee	Ad Hoc
Bell Atlantic telephone companies	Bell Atlantic
BellSouth Corporation and BellSouth Telecommunications, Inc	BellSouth
Cincinnati Bell Telephone Companies	CBT
Citizens Utilities Company	Citizens
General Services Administration	GSA
GTE Service Corporation	GTE
Independent Telephone and Telecommunications Alliance	ITTA
Iowa Telecommunications Services, Inc	Iowa
MCI Telecommunications Corporation	MCI
Missouri Public Service Commission	MPSC
SBC Communications, Inc	SBC
Sprint Corporation	Sprint
U S West Communications, Inc	US WEST
United States Telecom Association	USTA

CERTIFICATE OF SERVICE

I hereby certify that on this 24th day of January, 2000, I caused true and correct copies of the foregoing Reply Comments of AT&T Corp. to be served on all parties by mailing, postage prepaid to their addresses listed on the attached service list.

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