

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of

Price Cap Performance Review
for Local Exchange Carriers

Access Charge Reform

Further Notice of Proposed Rulemaking

CC Docket No. 94-1

CC Docket No. 96-262

Statement of

PATRICIA D. KRAVTIN

on behalf of the

Ad Hoc Telecommunications Users Committee

January 24, 2000

STATEMENT OF PATRICIA D. KRAVTIN

Introduction

1. My name is Patricia D. Kravtin; my business address is One Washington Mall, Boston, Massachusetts 02108. I am a Senior Vice President at Economics and Technology, Inc. ("ETI"), a research and consulting firm specializing in telecommunications economics, regulation and public policy. Along with Dr. Lee L. Selwyn, President of ETI, I participated in the preparation of the Initial Comments of the Ad Hoc Telecommunications Users Committee ("Ad Hoc" or "Committee") that were filed in this matter on January 7, 2000. A statement of my qualifications is annexed hereto as Attachment 1 and is made a part hereof.

2. I have been an active participant in each of the Commission's price cap review proceedings and in the further notices of proposed rulemakings associated therewith, including the most recent "Refresh the Record" proceeding upon which many of the changes reflected in the 1999 Staff Study were based. In addition, I have participated extensively in state price cap and other incentive regulation proceedings.

3. Counsel for Ad Hoc has asked that I review the submission entitled "Economic Assessment of the 1999 X-Factor Model Proposed by the FCC Staff" prepared by Frank M. Gollop that was filed as Attachment 2 to the Comments of the United States Telecom

Association ("USTA") and that I respond to his various claims and contentions regarding the "1999 Staff TFP Study" methodology for purposes of establishing the X-factor. I was also asked to respond to the specific adjustments made by Dr. Gollop to the 1997 Staff TFP Study. My comments also address the Affidavit submitted by James H. Vander Weide as Attachment 5 to USTA's Comments specifically concerning the Staff's proposed methodology for measuring the cost of capital.

4. Dr. Gollop identifies what he claims to be several major errors in the 1999 Staff TFP Study that "violate both basic economic principles and well-accepted productivity accounting rules," the most significant of which relates to the Staff's use of the Moody's Baa rate in the cost of capital calculation.¹ As discussed in these comments, with the exception of a number of non-methodological data-related issues, Dr. Gollop's criticisms and the corrections he proposes be made to the 1997 TFP Study are without merit and conspire to produce a lower X-factor result more favorable to his client. So too, evidence presented by Dr. Vander Weide in opposition to the Staff's cost of capital adjustment is similarly unconvincing.

1. Gollop Comments, Attachment 2 to USTA Comments, at 1.

Arguments advanced by Messrs. Gollop and Vander Weide in opposition to Staff's use of the Moody's Baa rate in making a cost of capital adjustment are unpersuasive and largely based upon evidence that is irrelevant to the price cap LECs' regulated operations.

5. Dr. Gollop asserts that Staff's proposed use of the Moody Baa series as the measure of LEC opportunity costs in its adjustment to the LEC cost of capital in the TFP study is not justified. In its place, Dr. Gollop proposes that the Commission rely upon the rate of return series reported by Value Line for a sample of 875 large industrials.² Aside from the point that the Value Line series incorporates both debt and equity returns, Dr. Gollop provides no specific justification for the use of this particular series, say from any other cost of capital series, including, but certainly not limited to, the Competitive Cost of Capital series developed by his fellow USTA expert, Dr. Vander Weide.³ As discussed below, Dr. Gollop's use of the Value Line series is consistent with neither past practice nor economic principles applicable to the price cap LECs.

6. Estimating the cost of equity is a very controversial issue in utility ratemaking and one that entails a substantial amount of judgment since actual investor requirements are not

2. *Id.* at 7.

3. Sensitivity analyses reveal Dr. Gollop's series yields a lower X-factor result than use of Dr. Vande Weide's series, suggesting a results-oriented rationale may underly Dr. Gollop's choice.

directly observable. This process is described succinctly in the Commission's Notice Initiating a Prescription Proceeding and Notice of Proposed Rulemaking ("1998 Represcription Notice"):

Because ILECs do not issue stock or borrow money solely to support interstate service, investor expectations that would affect the cost of equity for interstate services cannot be measured directly. For this reason, we must select a group of companies facing risks similar to those encountered by the rate-of-return ILECs in providing interstate service for which we can estimate the cost of equity. Risk is the uncertainty associated with the ability of an investment to generate the return expected by investors. As was done in the 1990 proceeding, once the surrogates are selected, their firm-specific data are applied to the cost-of-equity methodologies selected herein, and average or median returns for the surrogate group are calculated in order to determine a zone of reasonableness for cost of equity.⁴

7. In his comments, Dr. Gollop presents no evidence to demonstrate that the 875 large industrials represented in the Value Line series that he proposes be relied upon in the determination of a competitive cost of capital for price cap LECs indeed represent an appropriate set of companies to be used as the surrogate or proxy group. There is a long history of cost of capital calculations for price cap LECs both by this Commission and by state regulatory authorities. Significantly, the industrials represented in the Value Line series have generally not been found to be acceptable as proxy companies for the ILECs, and no

4. Commission's Notice Initiating a Prescription Proceeding and Notice of Proposed Rulemaking, CC Docket No. 98-166, released October 5, 1998, at para. 18.

compelling rationale has been advanced by Dr. Gollop in this proceeding that would support that notion now in the context of the X-factor calculation.

8. Since divestiture, the Commission has historically relied upon the RBOCs as the appropriate surrogate group for providers of regulated interstate access services.⁵ Even then, the Commission has concluded that "the RBOCs are riskier as a whole than their regulated telephone operations," such that "the cost-of-equity estimate for an RBOC as a whole may overstate the cost of equity for interstate access alone."⁶ In its 1998 Represcription Notice, the Commission tentatively concluded that "the RBOCs, more than any other group of companies, once again constitute the best surrogate for carriers subject to rate of return regulation."⁷ Similarly, state utilities commissions, like this Commission, have historically relied upon the RBOCs rather than upon a group of general industrials as the benchmark group in cost of capital analyses.⁸

5. *Id.* at para. 19.

6. *Id.* at para. 19.

7. *Id.* at para. 19.

8. See e.g., Utah Public Service Commission, Docket No. 92-049-05, Re: U S WEST Communications Inc., April 15, 1993, 142 PUR4th at 47, also New York Public Service Commission, Case No. 95-C-0657, Opinion No. 97-2, *Re: AT&T Communications of New York, Inc.*; Case No. 94-C-0095, Opinion No. 97-2, *Re: Universal Service and the Regulatory Framework for the Transition to Competition in the Local Exchange Market*; Case No. 91-C- (continued...)

9. While the Commission has not issued a final decision in the 1998 rescription proceeding, the point of this discussion is that Dr. Gollop presents no evidence to demonstrate that the industrials represented in the Value Line series reflect risk attributes comparable to those inherent in the price cap LECs' *regulated* telephone operations. Absent such evidence, there is no basis upon which to conclude that the use of the Value Line rate of return series (a series that specifically *excludes* utilities) – and more specifically, the year-to-year changes embodied in that series for purposes of determining the change in the competitive cost of capital applicable to the price cap LECs – is appropriate.

10. The sole justification Dr. Gollop provides concerning the use of the Value Line series is that the series incorporates both debt and equity returns to capital.⁹ That the series encompasses a measure of equity does not, however, in and of itself make that measure appropriate (or as discussed below, necessarily superior to the Moody's) for this purpose if the underlying risk of the component companies included in that series is not comparable to that of the price cap ILECs. This point also applies to Dr. Vander Weide's estimate of a

8. (...continued)
1174, Opinion No. 97-2, *Re: Comparably Efficient Interconnection Arrangements for Residential and Business Links*; April 1, 1997, 177 PUR4th at 127-128.

9. Gollop at 7.

competitive cost of capital based upon the cost of equity and average capital structure of the S&P Industrials.¹⁰

11. In order to justify his reliance upon the Value Line series, Dr. Gollop appears, rather incredibly, to have sidestepped the question of comparable risk altogether. Dr. Gollop focuses myopically upon the standard of "the return an investor can expect in the next best use of its funds" without any meaningful consideration of the question of risk, or as defined above, "the uncertainty associated with the ability of an investment to generate the return expected by investors." Dr. Gollop's attempt to analogize the LECs' (or their investors') opportunity cost of capital to that of "a young, highly educated and motivated woman in the early phase of her earnings cycle in a lucrative job" (who would not reference the opportunity cost of her employment to a bond rate) as opposed to an "eighty-year old individual with sparse funds" (who would reference his opportunity cost to a bond rate), while amusing, conforms neither to financial theory or reality.

12. In accordance with financial theory and years of application in utility ratemaking, the appropriate opportunity cost of capital for a firm will be commensurate with the returns to

10. See Vander Weide Affidavit at 14.

investment of comparable risk. As unequivocally described by the Utah Public Service

Commission:

Equity cost must be estimated indirectly by considering the relationship between risk and return. This is done by using proxy companies...The obvious point is that to be relevant, a proxy company must be comparable in risk...Therefore the key to this approach is the measurement of risk comparability, which, unless done properly, will not yield proxy companies that are in fact comparable.

Significantly, the Utah Commission used this finding as the basis upon which to reject ILEC testimony that principally relied upon industrials – as does Dr. Gollop here – as proxy companies for the ILEC’s regulated operations.

13. In reality, the LECs, with their stable source of revenues flowing from regulated operations, may indeed be a better fit to the profile of the octogenarian (and accordingly, to an opportunity cost linked to bonds) notwithstanding Dr. Gollop’s assertions to the contrary. Dr. Gollop, in likening the LECs to the youthful woman vis-a-vis the elderly man, and similarly, Dr. Vander Weide in determination of his competitive cost of capital index as well, ignore the very important distinction between the risk level of industrials, or even the RBOCs as a whole (including deregulated competitive activities), and the risk level associated with the price cap LECs’ regulated operations.

14. Interestingly, the original TFP study commissioned by USTA relied upon the very Moody's bond indices that USTA's experts now attack.¹¹ The study's author, Dr. Laurits Christensen, supported use of the Moody's bond yield in his TFP analysis, describing it "as a good proxy to the LEC cost of capital for purposes of measuring LEC TFP growth," notwithstanding the fact that "it does not incorporate an equity component."¹² According to Dr. Christensen, the original study "used the Moody's Bond Yield because (1) it is publicly available; (2) it is updated annually; and (3) our TFP results were not very sensitive to this choice."¹³ This reasoning on the part of USTA witness Christensen is very similar to that applied in the 1999 Staff Study.

15. USTA's subsequently filed TFP study, the so-called "simplified study," did provide an alternative to the Moody's bond yield series as proxy for the LEC cost of capital, namely the "cost of capital implicit in the U.S. National Income and Product Accounts" for the U.S. economy as a whole.¹⁴ Aside from the obvious problem with this approach, namely the fact that this measure highly inappropriately assumed a level of risk for regulated telephone assets

11. See Price Cap Fourth Further Notice, 10 FCC Rcd at 13665.

12. "Total Factor Productivity Methods for Local Exchange Carrier Price Cap Plans," Laurits R. Christensen et al, Attachment A to USTA Comments, January 16, 1996.

13. *Id.* at 9.

14. *Id.* at 10.

similar to those in the U.S. economy as a whole, the various National Income and Product Accounts data used by Dr. Christensen to calculate this U.S. cost of capital are not all currently produced by the U.S. Bureau of Economic Analysis and consequently, this option is no longer practically available.¹⁵

16. Another option considered by the Commission at the time the USTA model was under consideration was the use of the Commission's authorized rate of return as the LEC cost of capital. One problem with this approach, as discussed by Dr. Christensen, is that the infrequency with which the Commission's rate of return prescription proceedings are held will produce "large stepwise changes in the authorized rate of return" that "in turn would increase the volatility of the implicit rental prices."¹⁶ That empirical phenomenon (i.e., use of a data series with infrequent year-to-year changes) is not *per se* a compelling reason to discard reliance upon a number produced by a process specifically designed to determine the LEC's true opportunity cost of capital. The real problem related to this phenomenon, however, and one that has been raised to the fore in the 1999 Staff Study, is that the authorized 11.25% rate of return has stayed fixed despite notable declines in interest rates and the returns on other

15. See, Bureau of Economic Analysis, *National Income and Product Accounts ("NIPA")*, Including 11th Comprehensive Revision of the Accounts, October 28, 1999. In particular, The BEA discontinued the reporting of the constant cost of net capital stock, an NIPA used in Christensen's calculation of cost of capital.

16. Christensen et al at 11-12.

alternative financial instruments since the Commission's last rate of return decision that would have supported decreases in the authorized rate of return over the post-price cap period.

17. In this context, AT&T's alternative method, which trends the authorized rate of return downward over this period from the 11.25% last authorized to a level of 8.63%, the rate of return determined by AT&T experts as the competitive rate of return for the LECs, is a reasonable solution. The problem with AT&T's method, as with any of the approaches now under consideration that include a measure of equity cost, is that some might argue that it fails to comply with the Commission's requirement that the calculation of the X-factor be "reasonably simple and based on accessible and verifiable data."¹⁷

18. In his affidavit, Dr. Vander Weide seeks to downplay the significance of declining debt costs vis-a-vis increasing equity costs and an increasing share of equity over the post-price cap period. This is understandable in light of the implications for the X-factor calculation, but not valid in the context of the competitive cost of capital applicable to the price cap LECs' regulated telephone operations.

17. See, Federal Communications Commission, In the Matter of Price Cap Performance Review for Local Exchange Carriers, Fourth Further Notice of Proposed Rulemaking ("Fourth Further Notice"), CC Docket No. 94-1 (released September 27, 1995) at para. 16.

19. It should not be surprising to anyone in light of the run-up in stock prices over the last several years that the percent equity measured strictly on the basis of stock market valuations has risen dramatically over this period. However, the percent of equity appropriate for use in the context of a company's regulated operations has historically (and appropriately so) been determined by this Commission¹⁸ and typically by state commissions as well on a book basis – not on a market valuation basis. Even Dr. Vander Weide admits that "[r]egulators have sometimes defined the weighted average cost of capital using the book value percentages of debt and equity in the regulated firm's capital structure," and specifically acknowledges that this "Commission's 11.25 percent authorized rate of return was based upon an embedded cost of debt and a book value capital structure."¹⁹

20. Dr. Vander Weide makes every effort to both deemphasize this point (by relegating references to this Commission's reliance on book value capital structure to footnotes) and to discredit this approach by asserting its inconsistency with economic theory and its inapplicability to estimating the competitive market cost of capital for purposes of the Commission's productivity studies. Dr. Vander Weide is wrong on all counts.

18. See 47 C.F.R. §65.304.

19. Vander Weide Affidavit at 6,7 (footnotes 4 and 6).

21. While it is true, indeed by definition, that "price cap companies are no longer rate of return regulated,"²⁰ it is indisputable that critical linkages to rate of return guarantees remain intact for the price cap LECs.²¹ As a result, and unless and until price cap LECs are willing to give up all remaining vestiges of rate of return guarantees including but not limited to the low end adjustment and the ability to make a takings claim, the price cap LECs will remain far less risky than their non-regulated peers, and book values will remain highly relevant in evaluating LEC capital structure.

22. Moreover, that "the Commission is attempting to estimate productivity in a competitive marketplace" does not in any way preclude the Commission's reliance on book values. While "the Commission is attempting to estimate productivity in a competitive marketplace," it is doing so for a specific group of regulated companies that possess a risk profile inherently different from those of firms actually operating under true competitive market conditions. Messrs. Gollop and Vander Weide, by seeking to rely upon changes in cost of capital applicable to firms with greater risk profiles, would incorrectly assume away these

20. Vander Weide Affidavit at 6.

21. Federal Communications Commission, *In the Matter of 1998 Biennial Regulatory Review - Review of Depreciation Requirements for Incumbent Local Exchange Carriers, Notice of Proposed Rulemaking* ("FCC Depreciation Notice"), CC Docket No. 98-137 (released October 14, 1998), at para. 6.

fundamental differences, and in doing so, apply changes in cost of capital that are not applicable to the price cap LECs.

23. It is important to emphasize that the methodology employed in the Staff Study is to apply the changes in the selected cost of capital series to the benchmark 1991 rate of return value for the price cap LECs. The Staff Study does not rely upon the selected cost of capital series as a measure of the overall or combined cost of capital. Accordingly, the notion advanced by Messrs. Gollop and Vander Weide that the Moody's series cannot *a priori* be relied upon because it specifically excludes equity does not hold. The Staff study relies upon the Moody series only as to the magnitude of change in the index. It is that change that is applied to the 1991 competitive cost of capital benchmark for the price caps LECs. The Moody's series is not used to replace the Commission's competitive cost of capital benchmark of 11.25% set in 1991.

24. In fact, there is underlying theoretical foundation for Staff's use of the Moody's series. Under the risk premium methodology for calculating the cost of equity, the cost of equity is determined by adding a specified increment to the cost of debt, where that increment is measured either as the historical spread between bond and equity or as linear function of

market risk (i.e., the "beta").²² Significantly, under either method for measuring the risk premium, since the risk premium is a fixed additive over the study period, the change in cost of capital over the study period will be determined by the change in debt. Thus, Staff's methodology which relies strictly upon the cost of debt for measuring change in the competitive cost of capital implicitly relies upon, or is totally consistent with, the well-established risk premium approach to calculating the cost of equity.

25. Staff fully acknowledged in its study that the Moody's index it relied upon was just one of many indices that could be used. As noted in Ad Hoc's initial comments, the Moody's series used by Staff does possess a number of positive attributes in contrast to the rate of return numbers presented by Messrs. Gollop and Vander Weide.²³ In particular, neither the Value Line 875 Industrial Rate of Return series used by Mr. Gollop, nor the Competitive Cost of Capital estimate derived by Dr. Vander Weide based upon the cost of equity and average capital structure of the S&P Industrials, satisfy the Commission's requirement that the calculation of the X-factor be "reasonably simple and based on accessible

22. 1999 Represcription Notice at paras. 30-31. The beta is an estimate of the difference in risk of the stock for which the cost of equity estimate is being made and the overall risk of stock market investments. *Id.* at 32.

23. See Ad Hoc Comments at 35.

and verifiable data."²⁴ Both are based upon proprietary calculations that cannot be independently validated.

Dr. Gollop's criticism of Staff's application of the Moody's Baa adjustment to the entire rental price of capital is unfounded and is based upon a misrepresentation of the underlying nature of the cost of capital calculation in the Staff Study.

26. Apart from the selection of the Moody's Baa series as the basis upon which to apply changes to the 1991 benchmark competitive cost of capital in the Staff Study, Dr. Gollop makes a collateral attack on Staff's cost of capital adjustment by arguing that Staff had incorrectly applied the Baa adjustment to the entire rental price as opposed to just the opportunity cost component.²⁵ Dr. Gollop purports to correct for this error by applying the cost of capital adjustment to approximately 30% of the measured LEC property income, based upon his admittedly preliminary analysis that depreciation, amortization, and income taxes account for roughly 70% of LEC property income, whereas earnings and other miscellaneous capital expenses account for the remaining 30%.²⁶

24. *See*, Fourth Further Notice, at para. 16. Efforts to validate the Value Line series relied on by Dr. Gollop were not possible through a rudimentary web search. Nor was validation of underlying data used to calculate the Value Line series results possible based on information provided in privately purchased copies of this data.

25. Gollop Comments at 9.

26. *Id.* at 11-12.

27. Sensitivity analyses reveal that this second part of Dr. Gollop's "correction" to Staff's cost of capital methodology contributes more significantly to the substantially lower X-factor result obtained by Dr. Gollop than the selection of an alternative cost of capital series. Accordingly, it is worthy of significant scrutiny. As I explain further below, while Dr. Gollop's representation of the theory underlying the implicit rental price of capital *a la* Jorgenson and Griliches is correct, he misapplies that theory to the Staff model.

28. In both the original and simplified TFP studies submitted by USTA, an implicit rental price formula derived from neoclassical capital theory was applied to develop the cost of capital used as the weight for the capital input.²⁷ Following the neoclassical approach, an implicit rental price formula was developed by the authors of USTA's studies to model the annual flow of real capital services provided by the various classes of LEC assets.²⁸ This formula was shown to be a function of an externally-determined rate of return, the depreciation rate, taxes, and the economic reevaluation of plant as reflected by the relevant asset price deflators.²⁹

27. See Fourth Report and Order, § 70.

28. See "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation," Laurits R. Christensen, *et al*, May 3, 1994, at 7-8.

29. *Id.*

29. The Commission, however, did not adopt the USTA implicit rental price formula approach in developing the X-factor. Instead, the 1997 Staff Study upon which the Commission relied in setting the 1997 X-factor was based upon AT&T's so-called "residual earnings method," also referred to as an "internal rate of return" approach. Under this approach, the cost of capital is determined residually by developing a measure of "property income" defined as LEC revenues less the costs of labor and materials. In other words, the cost of capital is equal to the amount by which total revenues exceed total costs. The Commission found this method to be superior to the USTA approach, because it measured the "actual flow of funds to capital."³⁰ As noted by the Commission in its *Fourth Report and Order* adopting this approach, its decision meant it no longer needed to determine either a rate of return or make findings regarding the treatment of depreciation or taxes in the implicit rental price.³¹

30. In its 1999 Study, Staff determined (and appropriately so) that the residual approach adopted by the Commission and embodied in the 1997 Study needed modification to account for the existence of excess earnings by the LECs – earnings that would not have been permitted under the discipline of a competitive market. Staff's adjustment altered the cost of

30. *Id.* at §72.

31. *Id.* at § 76.

capital results in the TFP study for years other than the benchmark year of 1991 (the year in which the Commission affirmatively established the competitive cost of capital to be 11.25%). However, Staff's adjustment did not alter the fundamental approach upon which the cost of capital calculation was determined. For the benchmark year, the calculation of the cost of capital as being equal to the amount by which total revenues exceeded total costs was kept intact. The cost of capital for other years was set in relation to this benchmark year. The Staff adjustment did not involve an application of the USTA construct, whereby the cost of capital is determined on the basis of an implicit rental price formula designed to approximate the user cost of capital for specific classes of capital assets on a bottoms-up basis. Accordingly, Dr. Gollop's logic that Staff's adjustment must be applied only to that portion of property income that corresponds to what he defines to be the opportunity cost of capital pursuant to the neoclassical approach³² does not necessarily hold. In performing his adjustment, Dr. Gollop would appear to be mixing theoretical apples and oranges in order to create a strawman argument whose only solution is to keep with the status quo of the 1997 Study.

31. Perhaps as a subtle admission of this point, Dr. Gollop acknowledges that the basis upon which his proposed correction is made to the Staff Study cannot be formally relied

32. See Gollop Comments, USTA Attachment 2, at 10.

upon, i.e., that "any formal analysis of the staff's proposal will require a far more detailed analysis of LEC capital accounts" than he provides.³³ He further states that "any meaningful 'adjustment' will require considerable data effort, well beyond the requirements of the staff's 1997 model."³⁴

32. Dr. Gollop creates yet another strawman argument in claiming Staff's "backward" adjustments to the period 1985-1990 (when the LECs were under rate-of-return) did not make sense, claiming that regulators during that period were by definition setting rates that generated no excess profits.³⁵ The backward adjustments are neither perplexing as Dr. Gollop feigns, nor as they significant in an analysis of the post-price cap period. First, prior to 1990, the LECs did not face competitive market conditions. Accordingly, while the LECs were rate of return-regulated, their earnings were not subject to the discipline of a competitive market. As acknowledged in the SPR study commissioned by the price cap LECs (and cited in the Commission's Notice), rate of return regulation, since it operated under regulatory lag and other imperfections, still provided measurable opportunities for the LECs to reap the

33. Gollop Comments, USTA Attachment 2, at 12.

34. *Id.*

35. Gollop Comments, USTA Attachment 2, at 13.

benefits of excess profits.³⁶ Thus, there was nothing inappropriate about Staff's adjustment to LEC rental prices to reflect competitive market conditions in those years where LECs operated under rate of return regulation, but were not subject to true competitive market conditions. The distinction, beginning in 1991, was that not only was competition just beginning to emerge, the Commission was about to embark on a significant new form of regulation for the LECs. At that time, the Commission made an explicit finding about the reasonableness of going-in rates under price cap regulation.³⁷ Finally, the question of these backward adjustments does not even come into play in a X-factor measured over the post-price cap period, as Ad Hoc recommends.

Dr. Gollop's criticism of Staff's adjustment to labor expense is misguided and inconsistent with the rationale he uses to support his own recommended labor expense adjustment.

33. Dr. Gollop strongly disagrees with Staff's adjustment to the price of labor,³⁸

36. Strategic Policy Research, *Regulatory Reform for the Information Age, Providing the Vision*, January 11, 1994, APP SPR to Southwestern Bell Comments, CC Docket 94-1, at 17, 22-23.

37. *Policy and Rules Concerning Rates for Dominant Carriers*, Second Report and Order, CC Docket No. 87-313, 5 FCC Rcd 6786 (Sept. 19, 1990), at § 230.

38. Specifically, Staff corrected the unusually high levels of employment benefits recorded for the years 1991-1998, by bringing them into line with the historical trend. According to (continued...)

claiming that employee severance payouts are simply a market-driven cost of business and therefore should be left in the labor compensation series.³⁹ However, Dr. Gollop is entirely silent on the second, at least equally important, justification for the Staff adjustment, which is to correct for one-time changes in accounting rules.

34. The construction of the TFP series demands the most accurate possible representation of *economic* cost trends, rather than changes in *accounting* costs. Within the years encompassed by Staff's labor expense adjustment, ILECs' regulatory accounting for labor expense was strongly impacted by accounting changes made to reflect changes in Generally Accepted Accounting Principles (GAAP), including the adoption of SFAS-106 and SFAS-112. SFAS-106 required Other Post-Retirement Benefits (OPEBs) amounts to be accrued as deferred compensation, and the Common Carrier Bureau authorized carriers to do this effective January 1, 1993.⁴⁰ Similarly, SFAS-112 directed that companies' Transitional

38. (...continued)

Staff, benefit levels during these years was abnormally high because of one-time charges reflecting items including accounting rule changes and payouts of employee severance packages ("buyouts"), at a time when the ILECs were making substantial reductions to their staffing levels. Staff's correction was to remove all recorded benefits in excess of the historical average level of benefits, which Staff determined to be 20% of salaries plus wages. Further Notice, Appendix B, at page 50. Based upon sensitivity runs I have performed, this adjustment's overall impact is to increase the calculated historical X-factor in the order of magnitude of only 0.05%.

39. USTA Comments, Attachment 2, at 18-20.

40. 6 FCC Rcd at 7560 (SFAS-106 Order).

Benefit Obligations (TBOs) caused by the change in OPEB treatment should be booked also, and the Bureau required carriers to implement this accounting change by January 1, 1994.⁴¹ The increase in ILECs' booked benefit levels due to these directives affects accounting costs only, not economic costs, and therefore should not be taken into account in the labor input data series for the calculation of historical TFP.

35. The Commission has already reached this conclusion, in the context of determining whether such changes qualify for exogenous cost treatment under the price cap rules. As stated in the *LEC Price Caps Review Order*, “[w]e have concluded here that OPEB cost changes are noneconomic cost changes, and thus, should not be reflected in carriers' PCIs prospectively.”⁴²

36. Staff's labor expense adjustment is entirely consistent with the Commission's prior determination. Indeed, it is ironic that Dr. Gollop opposes the Staff adjustment, when he has seen fit to make his own adjustment to the labor expense data to make it more representative of actual cost changes. In a prior filing, Dr. Gollop adjusted the 1996 labor compensation value incorporated in the 1999 Staff TFP Study in order to correct for the impact of ARMIS

41. LEC Price Caps Review Order, 10 FCC Rcd 8961, at 9083.

42. LEC Price Caps Review Order, 10 FCC Rcd 8961, at 9096.

reporting changes affecting that datapoint.⁴³ For the reasons identified above, It is clear that Dr. Gollop's criticism of the Staff adjustment is misplaced, and the Commission should adopt Staff's labor expense adjustment in its calculation of the X-factor.

Dr. Gollop agrees that a change to the local output series is appropriate due to increased Internet use; however, his proposal to use access lines in lieu of DEMs, does not adequately capture the growth in local revenues associated with that use.

37. In a significant admission, given USTA's staunch opposition in the past to any change in the measure of local output in the Commission's TFP study,⁴⁴ Dr. Gollop agrees that a change to the local output series is appropriate due to increased Internet use.⁴⁵ However, Dr. Gollop disagrees with Staff's proposed use of dial equipment minutes (DEMs) and argues that access lines be used instead.⁴⁶ As I discuss below, while the use of access

43. Docket 94-1, Comments of USTA, October 26, 1998, Attachment D, at page 5. As stated therein, "Second, ARMIS reporting changes for 1996 labor compensation make it necessary to form an estimate of 1996 RBOC compensation for employee (Chart D6) that maintains consistency with compensation data for earlier and later years."

44. See Frank Gollop, "Current Issues in Modeling the Commission's X-Factor: A Rebuttal of IXC Arguments," April 9, 1999, at 8-10, submitted with Ex Parte Letter from Linda L. Kent, Associate General Counsel, USTA, to Magalie Roman Salas, Secretary, FCC, dated April 14, 1999.

45. Gollop Comment, USTA Attachment 2, at 4.

46. *Id.* at 23.

lines as the measure of local output is an improvement over the use of calls, the use of DEMs more accurately captures the total impact of the increased Internet usage on LEC output than any one single measure. Indeed, the very reasoning advanced by Dr. Gollop in support of using access lines as the single measure in my opinion actually supports the use of DEMs.

38. Dr. Gollop first argues that "output in the X-factor calculation must be defined as closely as possible to the unit measure on which market price is based."⁴⁷ However, in support of this argument he cites, and is in apparent agreement with, a statement made previously by MCI that "since local revenue is a combination of per line and per minute charges for local service, and of charges for CLASS services, the more accurate estimator of demand for local services would be based upon some weighted average of all of these types of outputs."⁴⁸ I agree with both MCI and Dr. Gollop on this point. Clearly, the "first best" solution would be to calculate an index that reflected all three of these components of local service.

47. *Id.* at 20.

48. Gollop Comments at 21, citing MCI Reply Comment dated November 9, 1998, CC Docket 94-1, p. 26.

39. However, as Dr. Gollop goes on to state, "[t]he Commission, however, long ago decided it would adopt a single measure of local output for the sake of simplicity."⁴⁹ Notwithstanding the theoretical foundation for a measure of output that reflects each component of local service, the Commission's decision to adopt a single measure of local output has merit given the inherent complexity involved with accurately deriving an aggregate measure of local service output, given the number of different local service offerings and the distinctions that exist in their provision by price cap LECs. Moreover, the time frame of this proceeding places severe constraints on the development of a credible local service output index, and indeed, there is no such index in the record before the Commission to even consider at this time. Accordingly, the question becomes that of determining what constitutes the most meaningful "second best" solution, i.e., which of the various single quantity measures in the record best reflects the trend in overall local service output.

40. Citing to his analysis that some 67% of intrastate revenues is flat rate or line volume related, Dr. Gollop argues that access lines represent the "only economically meaningful choice," if as Dr. Gollop notes, "the Commission is intent on changing the measure of local output but wants a single quantity measure."⁵⁰ In further support of his

49. *Id.*

50. *Id.*

conclusion to use access lines as the single metric, Dr. Gollop presents an analysis of the growth rates of calls, DEMs, and access lines from which he concludes the "access line growth in likely a reasonable proxy" for the weighted average of growth rates for calls, DEMs, and lines.

41. Significantly, his analysis completely omits consideration of the growth rate of the other component of local output growth identified in the cited passage from MCI quoted above, namely charges for CLASS services. These services, include vertical services, such as call waiting, call forwarding, and Caller ID, that are sold as ancillary services to the line. Dr. Gollop's omission is significant in that LEC sales of these services have been experiencing substantial growth over the price cap period, and these are services for which revenues far exceed their cost. Indeed, profit margins on vertical services may be as high as 70 to 90 percent.⁵¹ Other high margin services, inherently linked to the sale of lines, both subject to separate charges, that also need to be accounted for in local output include listing-related services, such as charges for non-published listings and additional listings. The failure of a local output index to properly reflect this important sources of local service charges and revenues will definitely result in an understatement of local output.

51. Lawyer, Gail. "Saved By the Bells (and Whistles): Enhanced Services Expand from Profit Centers to Churn Control Tools," X-Change Magazine, Posted December 15, 1998. Online; www.x-changemag.com/articles/8c2feat2.html accessed October 4, 1999.

42. There is ample evidence showing the demand for vertical (and listing) services in both the residential and business markets is growing substantially, while the incremental cost of delivering these services to the customer remain insignificant. For example, GTE credited vertical services for contributing \$109 million to its third quarter 1998 revenue growth.⁵² From 1996 to 1998, Bell Atlantic's vertical service revenues increased by 34%⁵³ and SBC's vertical services revenues increased by 44%.⁵⁴ The success that RBOCs are having in the vertical service market is outpacing all other measures of RBOC growth. As an example, during the same time period, both Bell Atlantic and SBC had a 9.5% growth in access lines. In the various applications by local exchange carriers to merger, the merging companies forecast substantial growth in revenues from the sale of discretionary services. The penetration rate for call waiting, for example, is approaching 50%, and penetration rates for the vertical services have also been growing.⁵⁵

52. GTE News Release, "GTE reports 11% Consolidated Operating growth and Double-Digit Core EPS Growth in Third Quarter," October 19, 1998.

53. Bell Atlantic Investor's Reference Guide, mid-year 1999, updated August 10, 1999, at 17 and 24. Online; www.bell-atl.com/invest/news/publications.html accessed October 4, 1999.

54. SBC Communications Inc. Statistical Profile. Online; www.info.sbc.com/StatProfile/.html accessed October 4, 1999.

55. See, e.g., data provided for Bell Atlantic-Massachusetts, in Quantity-Demand data reported in Feasibility Analysis of the Attorney General's Proposed Rate Center Consolidation Plans, DTE 98-38, Record Request RR-TC-3, Attachment A, dated March 4, 1999.

43. As discussed in Ad Hoc's comments, the increasing trend in the sales of highly profitable additional and ancillary vertical services can be directly attributed to the increased usage being carried over the LECs' network.⁵⁶ This trend is not captured in the historical series of access lines alone. The higher growth rate in DEMs in more recent years more closely tracks the increased Internet usage and the corresponding growth in the sale of ancillary local services. Accordingly, in the context of a single measure of local service output, DEMs is the most appropriate measure. Using either calls or even lines, unadjusted for the increased sale of ancillary vertical services that is being stimulated by the greater usage of the network, will introduce a significant downward bias in the local service output measure.

Some of the data-related corrections made by Dr. Gollop relating to the Staff 1999 TFP Study appear reasonable; however, a number of data-related corrections proposed by Dr. Gollop are not able to be publicly validated and therefore should not be accepted.

44. Dr. Gollop makes a number of data-related corrections to the 1999 Staff TFP Study. One of the most significant data-related corrections made concerns the question of which Bureau of Labor Statistic ("BLS") U.S. nonfarm business input price index should be

56. See Ad Hoc Comments at 9-10.

used. The Staff 1999 TFP Study cites a revised input price index, which Dr. Gollop was unable to verify.⁵⁷ I similarly was unable to verify the series identified in the Staff Study after contacting the BLS office responsible for reporting the input price series.⁵⁸ I also was not able to validate the precise numbers used by Gollop⁵⁹ for the years, 1988, 1990, 1991 and 1996. I believe it is appropriate to rely on the most currently available reported series, which happens to be an updated version of the series identified by Dr. Gollop. In the workpapers attached to my Statement, I have incorporated the use of this publicly available input price index⁶⁰ in the replication of the 1999 Staff Study submitted by Ad Hoc in its Comments.⁶¹

45. The majority of the remaining data corrections are associated with the exclusion of Southern New England Telephone ("SNET") from total RBOC data sourced to the 1998

57. Gollop Comments, USTA Comments, Attachment 2, at 23-24.

58. In a January 18, 2000 conversation with a staff member of the BLS Office of Productivity and Technology, the source of the series identified in the Staff Study was unverifiable.

59. Gollop Comments, USTA Comments, Attachment 2, Appendix B, at B-1, Column B.

60. The Nonfarm Business Input Price Index, Bureau of Labor Statistics, Office of Productivity and Technology, February 11, 1999.

61. The replication analysis performed by Ad Hoc in connection with the filing of initial comments already reflected a number of small data-related corrections to the Staff Study. These corrections were identified in Attachment 2 to the Ad Hoc Comments. The corrections discussed in this Statement reflect additional corrections.

Statistics of Communications Common Carriers ("SOCC") and The FCC's Automatic Reporting Management Information System ("ARMIS"). The Staff 1999 TFP Study reports Total RBOC data, reflecting the merger of SNET and SBC in 1998. Since the data for years 1985-1997, does not include SNET, it is reasonable to normalize the data to ensure better comparability by either excluding SNET from 1998 data, or by including SNET in the data for the earlier years. The latter would entail a significant data collection effort not permitted in the time frame of this proceeding. Attachment 2 to my Statement identifies the data corrections relating to the exclusion of SNET from the 1998 data. With minor differences, the corrections shown in Attachment 2 match those reflected in Dr. Gollop's analysis.⁶²

46. In addition to the SNET correction, I also accepted a data correction which revised the 1997 special access lines to reflect an ARMIS revision to US WEST data.

47. However, Dr. Gollop proposes several additional data corrections that I cannot independently validate from public sources. USTA claims that the 1996 labor compensation, which exhibits a large increase in that year, is in obvious error.⁶³ USTA provides an estimate for labor compensation of \$16,597,889,075. That figure, however, is not reflected in

62. The minor differences may be a result of my relying on current ARMIS data values, which are continuously being updated.

63. Gollop Comments, USTA Comments, Attachment 2, at 25.

current ARMIS data. Current ARMIS data shows a revised figure of \$18,479,991, up from 18,457,448,000.⁶⁴ The data value for 1998 Intrastate DEMs is not currently available, and both USTA and the Staff have provided an estimate for 1998 Intrastate DEMs⁶⁵. Absent the release of a publicly available update, I have no basis upon which to accept Dr. Gollop's figure in lieu of Staff's which was based upon simple exponential extrapolations⁶⁶. I was also unable to verify USTA's data values for 1997 and 1998 switched access lines and 1997 total operating expenses with available ARMIS data, and thus did not incorporate those data changes in my replication of the 1999 Staff Study.

48. With the aforementioned changes, the X-factor results I obtained in my replication of the 1999 Staff Study actually increased from 6.28% on a total company basis as reported in Ad Hoc's Comments to 6.76%.⁶⁷

64. See ARMIS Report 43-02, Table I1a.

65. Gollop Comments, USTA Comments, Attachment 2, at 25.

66. Further Notice, Appendix B, at 36.

67. The derivation of this revised total company X-Factor is provided in the Workpapers attached to Statement.

Attachment 1

Statement of Qualifications

Statement of Qualifications

PATRICIA D. KRAVTIN

Patricia D. Kravtin is Senior Vice President at ETI. Ms. Kravtin did graduate study in the Ph.D. program in Economics at the Massachusetts Institute of Technology, where she was a National Science Foundation Fellow. Her fields of study have included Industrial Organization, Government Regulation of Industry, and Urban and Regional Economics. While at M.I.T., Ms. Kravtin performed research for the Sloan School of Management and the Joint Center for Urban Studies of M.I.T. and Harvard. Her own empirical work has centered on multiproduct industries and has included econometric estimation of multiproduct cost functions and measurement of product-specific economies of scale and economies of joint production.

While in Washington, D.C., Ms. Kravtin gained valuable insight into the regulatory process performing research and policy analysis at the United States Department of Commerce, the Securities and Exchange Commission, and the Private Radio Bureau of the Federal Communications Commission.

Since joining ETI in 1982, Ms. Kravtin has been actively involved in state regulatory proceedings throughout the country and has frequently testified as an expert witness before regulatory commissions. Ms. Kravtin has testified before the Arizona Corporation Commission, Arkansas Public Service Commission, California Public Utilities Commission, Connecticut Department of Public Utility Control, Delaware Public Service Commission, Florida Public Service Commission, Georgia Public Service Commission, Illinois Commerce Commission, Kansas Corporation Commission, Kentucky Public Service Commission, Louisiana Public Service Commission, Maine Public Utilities Commission, Minnesota Public Utilities Commission, the Mississippi Public Service Commission, New Hampshire Public Utility Commission, New Jersey Board of Regulatory Commissioners, New York Public Service Commission, Puerto Rico Telecommunications Regulatory Board, Rhode Island Public Utilities Commission, South Carolina Public Service Commission, and the Tennessee Public Service Commission.

Ms. Kravtin has also on numerous occasions submitted written testimony and other filings before the Federal Communications Commission, and international agencies including the Canadian Radio-television and Telecommunications Commission, and the Guam Public Utilities Commission. Ms. Kravtin has testified as an expert witness in anti-trust litigation before the United States District Court for the Eastern District of Tennessee at Greeneville, and has served as an expert in a number of anti-trust cases involving monopolization by the local telephone company. Ms. Kravtin has served as advisor to a number of state regulatory commissions, including most recently, the Public Service Commission of the District of Columbia.

Ms. Kravtin has also testified before a number of state legislative committees including the Ohio General Assembly Senate Select Committee on Telecommunications Infrastructure and Technology and the New Jersey Senate Transportation and Public Utility Committee.

Ms. Kravtin has conducted major studies in the areas of rate regulation, total factor productivity, cost of service, incentive regulation, network modernization, plant utilization,

stranded investment, merger synergies, intercompany cost and benchmark price comparisons, embedded versus forward-looking investment, econometric demand and cost models, statistical market research, and cost allocation for ETI clients.

Ms. Kravtin has actively participated in a number of proceedings relating to the implementation of local competition in the telecommunications industry pursuant to federal and state legislation, covering such topics as universal service, access charges, cost of basic service, interconnection, unbundling of network elements, pole attachment rates, and tariff development for new entrants. Ms. Kravtin has also participated in a number of proceedings related to electric utility restructuring, with emphasis on issues concerning the potential cross-subsidization of competitive ventures, including entry into telephony and cable, by monopoly ratepayers.

Ms. Kravtin has also been actively involved in the cable TV industry for more than a decade, researching changing market and technological trends and monitoring the integration of the cable and telecommunications industries. Ms. Kravtin has gained extensive cable television rate regulation expertise in connection with the implementation of the Cable Act of 1992 and the Telecommunications Act of 1996, by the Federal Communications Commission and local franchise authorities. As part of that work, she participated in significant economic studies on cable television rate regulation related to implementation of the Cable Act of 1992.

Ms. Kravtin has developed particular expertise regarding the potential entry into video and multi-media information service markets by local telephone companies and other new entrants. In the early to mid-1990's, Ms. Kravtin submitted numerous filings before the FCC and state commissions concerning the economics of video dial tone investment and VDT-related tariffs proposed by New Jersey Bell, Pacific Bell, Ameritech, Southern New England Telephone, US West, GTE, Bell Atlantic, BellSouth, NYNEX, Puerto Rico Telephone Company and Carolina Telephone in over 25 Section 214 Application proceedings. More recently, Ms. Kravtin has participated in studies evaluating telephone company deployment of xDSL technology in competition with the deployment of cable modems and other broadband alternatives.

Ms. Kravtin has authored and co-authored numerous papers and reports pertaining to these issues. These include the following:

“Building a Broadband America: The Competitive Keys to the Future of the Internet,” prepared for The Competitive Broadband Coalition, May 1999.

“Broken Promises: A Review of Bell Atlantic-Pennsylvania’s Performance Under Chapter 30,” prepared for AT&T and MCI Telecommunications, June 1998.

“Analysis of Opportunities for Cross Subsidies Between GTA and GTA Cellular,” prepared for Guam Cellular and Paging, submitted to the Guam Public Utilities Commission, July 11, 1997.

“Reply to Incumbent LEC Claims to Special Revenue Recovery Mechanisms,” submitted in the Matter of Access Charge Reform in CC Docket 96-262, February 14, 1997.

“Assessing Incumbent LEC Claims to Special Revenue Recovery Mechanisms: Revenue opportunities, market assessments, and further empirical analysis of the ‘Gap’ between embedded and forward-looking costs,” submitted in CC Docket 96-262, January 29, 1997.

“Analysis of Incumbent LEC Embedded Investment: An Empirical Perspective on the ‘Gap’ between Historical Costs and Forward-looking TSLRIC,” Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, submitted in FCC CC Docket 96-98, May 30, 1996.

“Reply to X-Factor Proposals for the FCC Long-Term LEC Price Cap Plan,” prepared for the Ad Hoc Telecommunications User Committee, submitted in FCC CC Docket 94-1, March 1, 1996.

“Establishing the X-Factor for the FCC Long-Term LEC Price Cap Plan,” prepared for the Ad Hoc Telecommunications User Committee, submitted in FCC CC Docket 94-1, December 1995.

“The Economic Viability of Stentor’s ‘Beacon Initiative,’ Exploring the extent of its financial dependency upon revenues from services in the Utility Segment,” prepared for Unitel, submitted as evidence before the Canadian Radio-television and Telecommunications Commission, March 1995.

“Fostering a Competitive Local Exchange Market in New Jersey: Blueprint for Development of a Fair Playing Field,” prepared for the New Jersey Cable Television Association, January 1995.

“The Enduring Local Bottleneck: Monopoly Power and the Local Exchange Carriers,” February 1994.

“A Note on Facilitating Local Exchange Competition,” prepared for E.P.G., November 1991.

“Testing for Effective Competition in the Local Exchange,” prepared for the E.P.G., October 1991.

“A Public Good/Private Good Framework for Identifying POTS Objectives for the Public Switched Network” prepared for the National Regulatory Research Institute, October 1991.

“Report on the Status of Telecommunications Regulation, Legislation, and modernization in the states of Arkansas, Kansas, Missouri, Nebraska, Oklahoma and Texas,” prepared for the Mid-America Cable-TV Association, December 13, 1990.

“The U S Telecommunications Infrastructure and Economic Development,” presented at the 18th Annual Telecommunications Policy Research Conference, Airlie, Virginia, October 1990.

“An Analysis of Outside Plant Provisioning and Utilization Practices of US West Communications in the State of Washington,” prepared for the Washington Utilities and Transportation Commission, March 1990.

“Sustainability of Competition in Light of New Technologies,” presented at the Twentieth Annual Williamsburg Conference of the Institute of Public Utilities, Williamsburg, Virginia, December 1988.

“Telecommunications Modernization: Who Pays?,” prepared for the National Regulatory Research Institute, September 1988.

“Industry Structure and Competition in Telecommunications Markets: An Empirical Analysis,” presented at the Seventh International Conference of the International Telecommunications Society at MIT, July 1988.

“Market Structure and Competition in the Michigan Telecommunications Industry,” prepared for the Michigan Divestiture Research Fund Board, April 1988.

“Impact of Interstate Switched Access Charges on Information Service Providers - Analysis of Initial Comments,” submitted in FCC CC Docket No. 87-215, October 26, 1987.

“An Economic Analysis of the Impact of Interstate Switched Access Charge Treatment on Information Service Providers,” submitted in FCC CC Docket No. 87-215, September 24, 1987.

“Regulation and Technological Change: Assessment of the Nature and Extent of Competition From A Natural Industry Structure Perspective and Implications for Regulatory Policy Options,” prepared for the State of New York in collaboration with the City of New York, February 1987.

“BOC Market Power and MFJ Restrictions: A Critical Analysis of the ‘Competitive Market’ Assumption,” submitted to the Department of Justice, July 1986.

“Long-Run Regulation of AT&T: A Key Element of a Competitive Telecommunications Policy,” *Telematics*, August 1984.

“Economic and Policy Considerations Supporting Continued Regulation of AT&T,” submitted in FCC CC Docket No. 83-1147, June 1984.

Ms. Kravtin attended George Washington University on an Honor Scholarship where she received a B.A. with Distinction in Economics. She was elected to Phi Beta Kappa and Omicron Delta Epsilon in recognition of high scholastic achievement in the field of Economics. Ms. Kravtin is a member of the American Economic Association.

Attachment 2

Data Corrections Relating to the Exclusion of SNET from 1998 Data

Attachment 2

Data Corrections Relating to the Exclusion of SNET from 1998 Data

Table	Data Item	Original Data Value	Corrected Data Value
4	1998 Switched Access Lines	138,527,924	136,216,910
4	1998 Special Access Lines	31,643,642	31,620,187
5	1998 Local Revenues	45,643,024,000	44,993,354,000
5	1998 Intrastate Toll and Access Revenues	12,236,469,000	11,978,176,000
6	1998 End User Revenues	7,928,205,000	7,807,872,000
6	1998 Interstate Switched Access Revenues	7,447,289,000	7,275,241,000
6	1998 Special Access Revenues	4,894,584,000	4,815,249,000
10	1998 Labor Compensation	18,470,692,000	18,128,861,000
10	1998 Number of Employees	345,317	338,404
10	1998 ARMIS Benefits	4,263,993	4,173,480
10	1998 Depreciation and Amortization	17,646,242,000	17,306,863,000
11	1998 Total Operating Expenses	61,962,261,000	60,836,253,000
11	1998 Original Property Income w/ Depreciation	33,830,949,286	22,340,502,000

Workpaper 1

Impact of Additional Data Corrections on X-Factor Results

Workpaper 1: Base Case

Table 1			
Summary Table of Total Company Calculated X-Factors Corrections and Use of Original Input Price Index			
	Total Factor Productivity Differential	Input Price Differential	Total Company X-Factor
Year	A = Table 2	B = Table 2	C = A+B
1985			
1986	5.6	5.5	11.1
1987	3.6	1.7	5.3
1988	0.5	3.0	3.5
1989	0.6	2.6	3.2
1990	5.4	-0.8	4.7
1991	1.4	2.0	3.4
1992	4.2	4.5	8.7
1993	4.1	2.8	6.9
1994	2.3	1.3	3.7
1995	5.4	1.8	7.2
1996	12.0	-2.9	9.2
1997	3.9	2.6	6.5
1998	6.4	2.1	8.5
Avg. (91 - 98)	4.98085	1.77586	6.75671

Source: See Table 2.

Workpaper 1: Base Case

Table 2									
Summary of the LECS' Price Cap X-Factor									
	U.S. Nonfarm Business Sector TFP Growth Rate	LECs' Output Growth Rate	LECs' Input Growth Rate	LECs' TFP Growth Rate	LECs' TFP Differential	U.S. Nonfarm Business Sector Input Price Growth Rate	LECs' Input Price Growth Rate	Input Price Differential	X-Factor
Year	A	B = Table 3	C = Table 7	D = +B-C	E = +D-A	F	G = Table 8	H = +F-G	I = +E+H
1985									
1986	1.10166	3.20079	-3.47804	6.67883	5.57716	2.32711	-3.15211	5.47922	11.05638
1987	-0.39920	3.76640	0.58715	3.17925	3.57845	3.45067	1.76258	1.68809	5.26654
1988	0.29955	6.51199	5.73034	0.78165	0.48210	5.12933	2.14707	2.98226	3.46436
1989	0.19920	4.38736	3.61526	0.77210	0.57290	2.41505	-0.22463	2.63967	3.21257
1990	-0.69895	4.76136	0.01899	4.74237	5.44133	3.09688	3.88344	-0.78656	4.65477
1991	-1.41274	2.61222	2.60077	0.01144	1.42418	1.87505	-0.13437	2.00943	3.43361
1992	1.61294	3.51156	-2.30555	5.81711	4.20417	3.14907	-1.36727	4.51633	8.72051
1993	0.09995	5.83136	1.61153	4.21982	4.11987	2.17615	-0.64768	2.82383	6.94370
1994	0.39880	5.41556	2.67569	2.73987	2.34107	3.55636	2.22171	1.33465	3.67572
1995	0.29806	5.98474	0.29912	5.68562	5.38756	2.60965	0.84015	1.76951	7.15706
1996	1.47713	8.22067	-5.29773	13.51840	12.04127	2.81198	5.68956	-2.87758	9.16369
1997	0.39024	8.81946	4.51998	4.29948	3.90923	2.29895	-0.26199	2.56094	6.47017
1998	0.59259	5.55848	-1.45353	7.01201	6.41942	2.69200	0.62220	2.06980	8.48922
Avg. (91 - 98)					4.98085			1.77586	6.75671

Sources: U.S. Nonfarm Business Sector TFP Growth Rate and U.S. Nonfarm Business Sector Input Price Growth Rate, Bureau of Labor Statistics' (BLS) 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. 1998 LEC Input Price Growth estimated, based upon 1993-1997 average growth.

Workpaper 1: Base Case

Table 3											
Total LEC Output Index											
Year	Revenue Shares			Quantities			Output Indices				Growth Rate %
	Local	Intrastate Toll	Interstate	Local DEMs	Intrastate DEMs	Interstate Quantity Index	Laspeyres Output Index	Paasche Output Index	Fisher Relative Output Index	Total Company Output Index	
	A= Table 5	B = Table 5	C = Table 5	D	E	F=Table 4	G	H	I	J	
1985	0.49584	0.23995	0.26421	1,380,145,900	164,191,177,000	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	0.49677	0.23495	0.26828	1,396,014,000	173,173,536,000	1.05275	1.03277	1.03229	1.03253	1.03253	3.20079
1987	0.49679	0.24143	0.26177	1,404,776,000	183,597,411,000	1.13797	1.03898	1.03779	1.03838	1.07216	3.76640
1988	0.48689	0.24980	0.26332	1,469,781,200	191,904,837,000	1.28546	1.06784	1.06673	1.06729	1.14430	6.51199
1989	0.49472	0.24540	0.25988	1,496,826,800	207,298,177,000	1.36560	1.04541	1.04429	1.04485	1.19562	4.38736
1990	0.50164	0.24535	0.25302	1,514,588,700	217,913,904,000	1.53188	1.05008	1.04745	1.04877	1.25393	4.76136
1991	0.51673	0.23407	0.24921	1,512,946,987	219,713,721,000	1.69013	1.02762	1.02531	1.02647	1.28711	2.61222
1992	0.52657	0.22454	0.24889	1,558,762,543	224,278,538,000	1.79388	1.03581	1.03567	1.03574	1.33311	3.51156
1993	0.52874	0.22154	0.24972	1,640,600,472	227,540,869,000	2.00781	1.06059	1.05950	1.06005	1.41316	5.83136
1994	0.53200	0.21358	0.25442	1,719,329,169	235,362,364,000	2.19043	1.05570	1.05560	1.05565	1.49180	5.41556
1995	0.55062	0.19175	0.25764	1,802,545,593	246,926,539,000	2.41077	1.06184	1.06151	1.06167	1.58381	5.98474
1996	0.56343	0.18058	0.25599	1,955,027,929	263,719,641,000	2.65441	1.08566	1.08571	1.08568	1.71951	8.22067
1997	0.57650	0.16712	0.25638	2,179,309,093	273,526,580,000	2.86929	1.09208	1.09233	1.09220	1.87805	8.81946
1998	0.58532	0.15582	0.25886	2,275,450,746	286,005,820,798	3.14092	1.05733	1.05699	1.05716	1.98540	5.55848

Notes:
Laspeyres Output Index (Column G) calculation: $A(\text{previous}) * D(\text{current}) / D(\text{previous}) + B(\text{previous}) * E(\text{current}) / E(\text{previous}) + C(\text{previous}) * F(\text{current}) / F(\text{previous})$
Paasche Output Index (Column H) calculation: $1 / (A(\text{current}) * D(\text{previous}) / D(\text{current}) + B(\text{current}) * E(\text{previous}) / E(\text{current}) + C(\text{current}) * F(\text{previous}) / F(\text{current}))$
Fisher Relative Output Index (Column I) calculation: Square root of $(H * G)$
Total Company Output Index (Column J) calculation: $J(\text{previous}) * I(\text{current})$
Sources: Local DEMs, FCC Monitoring Report, Table 8.15; Intrastate DEMs, FCC Monitoring Report, Table 8.16.

Workpaper 1: Base Case

Table 4

Interstate Output Index

Year	Revenue Shares			Quantities			Output Indices			Interstate Output Quantity Index	Growth Rate %
	End User	Interstate Switched Access	Special Access	Switched Access Lines	Switched Access Minutes	Special Access Lines	Laspeyres Output Index	Paasche Output Index	Fisher Relative Output Index		
	A =Table 6	B =Table 6	C =Table 6	D	E	F	G	H	I		
1985	0.10437	0.75915	0.13648	92,671,959	156,853,820,000	1,230,590	1.000000	1.000000	1.000000	1.000000	
1986	0.15527	0.67817	0.16655	95,333,884	157,302,701,000	1,664,101	1.053249	1.052253	1.052751	1.052751	5.14068
1987	0.20121	0.62577	0.17302	98,228,585	173,154,171,000	1,764,445	1.083098	1.078813	1.080953	1.137975	7.78433
1988	0.22802	0.61130	0.16067	98,270,787	187,663,836,000	2,701,817	1.144443	1.114960	1.129605	1.285462	12.18682
1989	0.27937	0.57748	0.14315	101,190,050	210,406,134,000	2,448,090	1.065766	1.058920	1.062338	1.365595	6.04719
1990	0.30219	0.55514	0.14267	103,857,988	231,960,296,000	3,518,005	1.129086	1.114500	1.121769	1.531882	11.49069
1991	0.31227	0.55067	0.13705	107,383,807	246,710,182,000	5,151,699	1.111811	1.094856	1.103301	1.690127	9.83068
1992	0.31477	0.54865	0.13658	108,938,065	262,187,655,000	6,033,139	1.062516	1.060258	1.061386	1.793878	5.95758
1993	0.32091	0.55070	0.12839	112,196,681	278,173,161,000	10,153,615	1.136148	1.102619	1.119258	2.007812	11.26657
1994	0.32687	0.54348	0.12965	115,264,861	298,342,017,323	13,824,365	1.095119	1.086800	1.090952	2.190425	8.70504
1995	0.32725	0.52929	0.14346	119,887,506	334,981,582,000	16,107,677	1.101268	1.099925	1.100596	2.410774	9.58520
1996	0.32214	0.51108	0.16678	125,333,996	363,445,050,000	20,775,150	1.101412	1.100708	1.101060	2.654407	9.62733
1997	0.33194	0.46411	0.20394	131,665,390	387,587,696,669	24,479,958	1.079964	1.081942	1.080953	2.869289	7.78431
1998	0.39239	0.36562	0.24199	136,216,910	407,903,661,000	31,620,187	1.095287	1.094051	1.094669	3.140922	9.04522

Notes:

Laspeyres Output Index (Column G) calculation: $A(\text{previous}) * D(\text{current}) / D(\text{previous}) + B(\text{previous}) * E(\text{current}) / E(\text{previous}) + C(\text{previous}) * F(\text{current}) / F(\text{previous})$

Paasche Output Index (Column H) calculation: $1 / (A(\text{current}) * D(\text{previous}) / D(\text{current}) + B(\text{current}) * E(\text{previous}) / E(\text{current}) + C(\text{current}) * F(\text{previous}) / F(\text{current}))$

Fisher Relative Output Index (Column I) calculation: Square root of (H*G)

Total Company Output Index (Column J) calculation: $J(\text{previous}) * I(\text{current})$

Sources: Switched access lines (excluding mobile) and special access lines from SOCC, Table 2.10; Switched access minutes from SOCC, Table 2.20 (Common Line).

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Table 5				
LEC Revenue by Type of Service (Excluding Miscellaneous Services)				
Year	Local Service	Intrastate Toll and Intrastate Access	Interstate	Total
	A	B	C = Table 6	D = A+B+C
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

Source: SOCC, Table 2.9: Local Service Revenues (Account 520); Intrastate Toll and Intrastate Access Revenues (Accounts 5084 and 525).

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Table 6				
LEC Interstate Revenues				
Year	End User	Interstate Switched	Special Access	Total Interstate
	A	B	C	D = A+B+C
1985	\$1,499,413,893	\$10,906,203,190	\$1,960,688,644	\$14,366,305,727
1986	\$2,400,475,814	\$10,484,265,170	\$2,574,800,716	\$15,459,541,700
1987	\$3,090,639,929	\$9,611,996,187	\$2,657,677,439	\$15,360,313,555
1988	\$3,604,221,000	\$9,662,529,000	\$2,539,698,000	\$15,806,448,000
1989	\$4,398,692,000	\$9,092,575,000	\$2,253,922,000	\$15,745,189,000
1990	\$4,679,142,000	\$8,595,750,000	\$2,209,064,000	\$15,483,956,000
1991	\$4,828,177,000	\$8,514,130,000	\$2,119,037,000	\$15,461,344,000
1992	\$4,963,262,000	\$8,650,880,000	\$2,153,565,000	\$15,767,707,000
1993	\$5,244,094,000	\$8,999,065,000	\$2,097,997,000	\$16,341,156,000
1994	\$5,589,662,000	\$9,293,783,000	\$2,217,125,000	\$17,100,570,000
1995	\$5,770,285,000	\$9,332,869,000	\$2,529,667,000	\$17,632,821,000
1996	\$5,930,960,000	\$9,409,639,000	\$3,070,598,000	\$18,411,197,000
1997	\$6,268,026,000	\$8,763,815,000	\$3,851,028,000	\$18,882,869,000
1998	\$7,807,872,000	\$7,275,241,000	\$4,815,249,000	\$19,898,362,000

Source: SOCC, Table 2.9: End User Revenues (Account 5081); Interstate Switched Access (Account 5082); Special Access Revenues (Account 5083).

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Table 7											
Total LEC Input Quantity Index											
Year	Input Shares			Quantities			Input Quantity Indices				Growth Rate %
	Labor	Materials	Capital	Labor Quantity	Material Quantity Index	Capital Quantity Index	Laspeyres Input Quantity Index	Paasche Input Quantity Index	Fisher Ideal Input Quantity Index	Fisher Ideal Chained Input Quantity Index	
	A = Table 9	B = Table 9	C = Table 9	D = Table 10	E = Table 10	F = Table 12	G	H	I	J	
1985	0.31969	0.25576	0.42455	504,113	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	0.33511	0.23922	0.42567	482,698	0.85179	1.04599	0.96804	0.96360	0.96582	0.96582	-3.47804
1987	0.33052	0.23256	0.43691	477,714	0.83421	1.08111	1.00590	1.00588	1.00589	0.97150	0.58715
1988	0.30773	0.26773	0.42453	466,827	1.00332	1.12865	1.05882	1.05913	1.05898	1.02880	5.73034
1989	0.29341	0.29499	0.41160	461,149	1.11057	1.15949	1.03648	1.03715	1.03681	1.06668	3.61526
1990	0.29395	0.29488	0.41117	443,105	1.10737	1.19603	1.00064	0.99974	1.00019	1.06688	0.01899
1991	0.26968	0.32913	0.40119	414,457	1.23419	1.22895	1.02608	1.02662	1.02635	1.09499	2.60077
1992	0.27367	0.31776	0.40857	411,167	1.12198	1.25950	0.97791	0.97651	0.97721	1.07003	-2.30555
1993	0.27256	0.33712	0.39032	395,639	1.18270	1.28943	1.01657	1.01592	1.01625	1.08742	1.61153
1994	0.23729	0.36725	0.39546	367,196	1.31710	1.31542	1.02658	1.02765	1.02712	1.11690	2.67569
1995	0.23073	0.37954	0.38973	346,843	1.34400	1.34520	1.00330	1.00269	1.00300	1.12025	0.29912
1996	0.27440	0.33001	0.39559	338,040	1.13303	1.39401	0.94871	0.94810	0.94840	1.06245	-5.29773
1997	0.25627	0.35561	0.38812	338,177	1.24404	1.44123	1.04584	1.04663	1.04624	1.11157	4.51998
1998	0.27105	0.33996	0.38899	338,404	1.15116	1.48745	0.98607	0.98507	0.98557	1.09553	-1.45353

Notes:
Laspeyres Input Quantity Index (Column G) calculation: $A(\text{previous}) * D(\text{current}) / D(\text{previous}) + B(\text{previous}) * E(\text{current}) / E(\text{previous}) + C(\text{previous}) * F(\text{current}) / F(\text{previous})$
Paasche Input Quantity Index (Column H) calculation: $1 / (A(\text{current}) * D(\text{previous}) / D(\text{current}) + B(\text{current}) * E(\text{previous}) / E(\text{current}) + C(\text{current}) * F(\text{previous}) / F(\text{current}))$
Fisher Ideal Input Quantity Index (Column I) calculation: Square root of (H*G)
Fisher Ideal Chained Input Quantity Index (Column J) calculation: $J(\text{previous}) * I(\text{current})$
Growth Rate (Column K) calculation: $LN(I(\text{current})/I(\text{previous}))$

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Table 8

Total LEC Input Price Index

Year	Input Shares			Input Quantities			Input Price Indices				Growth Rate %	
	Labor	Material	Capital	Labor Price Index	Materials Price Index	Capital Price Index	Laspeyres Input Price Index	Paasche Input Price Index	Fisher Ideal Input Price Index	Fisher Ideal Chained Input Price Index		
	A = Table 9	B = Table 9	C = Table 9	D = Table 10	E = Table 11	F = Table 13	G	H	I	J		K
1985	0.31969	0.25576	0.42455	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	0.33511	0.23922	0.42567	1.02819	1.03135	0.89271	0.97148	0.96647	0.96897	0.96897	0.96897	-3.15211
1987	0.33052	0.23256	0.43691	1.05447	1.05353	0.90146	1.01788	1.01768	1.01778	0.98620	0.98620	1.76258
1988	0.30773	0.26773	0.42453	1.08234	1.08639	0.91297	1.02157	1.02184	1.02170	1.00760	1.00760	2.14707
1989	0.29341	0.29499	0.41160	1.08797	1.12623	0.88304	0.99750	0.99801	0.99776	1.00534	1.00534	-0.22463
1990	0.29395	0.29488	0.41117	1.17754	1.17203	0.89133	1.04001	1.03918	1.03960	1.04515	1.04515	3.88344
1991	0.26968	0.32913	0.40119	1.18570	1.20494	0.86555	0.99842	0.99889	0.99866	1.04375	1.04375	-0.13437
1992	0.27367	0.31776	0.40857	1.17037	1.23480	0.82779	0.98717	0.98567	0.98642	1.02958	1.02958	-1.36727
1993	0.27256	0.33712	0.39032	1.22361	1.25535	0.77944	0.99388	0.99321	0.99354	1.02293	1.02293	-0.64768
1994	0.23729	0.36725	0.39546	1.20706	1.29144	0.81121	1.02192	1.02302	1.02247	1.04591	1.04591	2.22171
1995	0.23073	0.37954	0.38973	1.25564	1.32167	0.79187	1.00872	1.00816	1.00844	1.05473	1.05473	0.84015
1996	0.27440	0.33001	0.39559	1.53019	1.36140	0.78497	1.05846	1.05863	1.05855	1.11648	1.11648	5.68956
1997	0.25627	0.35561	0.38812	1.49199	1.39550	0.77622	0.99701	0.99776	0.99738	1.11356	1.11356	-0.26199
1998	0.27105	0.33996	0.38899	1.56500	1.43074	0.74675	1.00678	1.00570	1.00624	1.12051	1.12051	0.62220

Notes:

Laspeyres Input Price Index (Column G) calculation: $A(\text{previous}) * D(\text{current}) / D(\text{previous}) + B(\text{previous}) * E(\text{current}) / E(\text{previous}) + C(\text{previous}) * F(\text{current}) / F(\text{previous})$

Paasche Input Price Index (Column H) calculation: $1 / (A(\text{current}) * D(\text{previous}) / D(\text{current}) + B(\text{current}) * E(\text{previous}) / E(\text{current}) + C(\text{current}) * F(\text{previous}) / F(\text{current}))$

Fisher Ideal Input Price Index (Column I) calculation: Square root of $(H * G)$

Fisher Ideal Chained Input Price Index (Column J) calculation: $J(\text{previous}) * I(\text{current})$

Growth Rate (Column K) calculation: $LN(I(\text{current})/I(\text{previous}))$

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Table 9

Factor Shares of Total Payments

Year	Adjusted Labor Compensation	Adjusted Material Payment	New Property Income w/ Depreciation	Total Factor Payment	Labor Compensation Share	Material Payment Share	Property Income w/ Depreciation Share
	A = Table 11	B = Table 11	C	D = A+B+C	E = A/D	F = B/D	G = C/D
1985	16,991,572,326	13,593,421,399	22,565,162,887	53,150,156,613	0.31969	0.25576	0.42455
1986	16,728,435,454	11,941,762,479	21,249,282,358	49,919,480,291	0.33511	0.23922	0.42567
1987	16,978,905,847	11,946,837,981	22,444,356,821	51,370,100,649	0.33052	0.23256	0.43691
1988	17,030,359,791	14,816,785,832	23,494,269,571	55,341,415,194	0.30773	0.26773	0.42453
1989	16,910,850,694	17,002,050,701	23,723,261,704	57,636,163,099	0.29341	0.29499	0.41160
1990	17,586,868,921	17,642,463,859	24,600,191,719	59,829,524,499	0.29395	0.29488	0.41117
1991	16,563,755,600	20,215,059,800	24,641,357,000	61,420,172,400	0.26968	0.32913	0.40119
1992	16,219,861,400	18,832,545,315	24,215,058,885	59,267,465,601	0.27367	0.31776	0.40857
1993	16,317,325,400	20,182,266,668	23,367,601,637	59,867,193,705	0.27256	0.33712	0.39032
1994	14,939,421,600	23,121,830,040	24,897,946,640	62,959,198,280	0.23729	0.36725	0.39546
1995	14,679,257,600	24,146,320,315	24,794,383,988	63,619,961,904	0.23073	0.37954	0.38973
1996	17,434,857,200	20,967,954,435	25,134,534,757	63,537,346,392	0.27440	0.33001	0.39559
1997	17,006,551,600	23,598,931,333	25,756,101,085	66,361,584,018	0.25627	0.35561	0.38812
1998	17,850,653,600	22,388,606,387	25,617,623,505	65,856,883,493	0.27105	0.33996	0.38899

Notes:

New Property w/ Depreciation (Column C) calculation: previous year Capital Stock Quantity (Table 12) multiplied by the current year Imputed Competitive Cost of Capital (Table 13), multiplied by 1000.

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Table 10

Price of Labor

Year	Labor Compensation	Number Of Employees	ARMIS Salaries and Wages (000)	ARMIS Benefits (000)	ARMIS Benefits/ Salaries+ Benefits E = D/(C+D)	Excess Benefits	Adjusted Labor Compensation	Labor Price	Labor Price Index	Labor Price Change
	A	B	C	D		F	G = A-F	H = G/B	I	J
1985	16,991,572,326	504,113				0	16,991,572,326	33,706	1.00000	
1986	16,728,435,454	482,698				0	16,728,435,454	34,656	1.02819	2.78018
1987	16,978,905,847	477,714				0	16,978,905,847	35,542	1.05447	2.52407
1988	17,030,359,791	466,827	15,033,849	3,636,033	0.19475	0	17,030,359,791	36,481	1.08234	2.60794
1989	16,910,850,694	461,149	14,977,589	3,669,768	0.19680	0	16,910,850,694	36,671	1.08797	0.51954
1990	17,586,868,921	443,105	15,230,268	3,768,099	0.19834	0	17,586,868,921	39,690	1.17754	7.91115
1991	17,186,211,200	414,457	15,038,534	4,537,703	0.23180	622,455,600	16,563,755,600	39,965	1.18570	0.69019
1992	17,160,988,000	411,167	14,976,159	4,920,448	0.24730	941,126,600	16,219,861,400	39,448	1.17037	-1.30106
1993	17,956,438,000	395,639	15,479,969	5,918,883	0.27660	1,639,112,600	16,317,325,400	41,243	1.22361	4.44882
1994	17,154,284,000	367,196	15,085,400	6,539,928	0.30242	2,214,862,400	14,939,421,600	40,685	1.20706	-1.36176
1995	16,203,522,000	346,843	15,088,974	5,677,574	0.27340	1,524,264,400	14,679,257,600	42,322	1.25564	3.94555
1996	18,479,991,000	338,040	15,337,179	5,140,712	0.25104	1,045,133,800	17,434,857,200	51,576	1.53019	19.77440
1997	17,451,673,000	338,177	15,358,125	4,395,933	0.22253	445,121,400	17,006,551,600	50,289	1.49199	-2.52780
1998	18,128,861,000	338,404	15,302,883	4,173,480	0.21428	278,207,400	17,850,653,600	52,750	1.56500	4.77704

Notes:

Excess Benefits (Column F) calculation: ((C+D)*E-.2)*1000. Benefits are equal to approximately 20% of the sum of salaries and wages plus benefits. See, *Price Cap and Access Reform Further Notice of Proposed Rulemaking*, at 50.

Sources: Labor Compensation, SOCC, Table 2.9 (Account 860); Number of Employees, SOCC, Table 2.9 (Account 830); ARMIS Salary and Wages and ARMIS Benefits, ARMIS Report 43-02 (Account 720).

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Table 11

Materials Input Quantity

Year	Material Price Index (1985=1.00)	Adjusted Operating Expense	Depreciation & Amortization Expense	Adjusted Labor Compensation	Material Expense	Material Quantity	Material Quantity Index (1985 = 1.0)
	A	B	C	D = Table 10	E = B - C - D	F = E / A	G
1985	1.00000	40,609,704,381	10,024,710,656	16,991,572,326	13,593,421,399	13,593,421,399	1.00000
1986	1.03135	40,262,199,181	11,592,001,248	16,728,435,454	11,941,762,479	11,578,768,099	0.85179
1987	1.05353	42,242,743,388	13,316,999,560	16,978,905,847	11,946,837,981	11,339,817,548	0.83421
1988	1.08639	45,494,082,623	13,646,937,000	17,030,359,791	14,816,785,832	13,638,551,378	1.00332
1989	1.12623	47,773,002,395	13,860,101,000	16,910,850,694	17,002,050,701	15,096,428,528	1.11057
1990	1.17203	49,160,847,780	13,931,515,000	17,586,868,921	17,642,463,859	15,052,911,495	1.10737
1991	1.20494	50,278,593,400	13,499,778,000	16,563,755,600	20,215,059,800	16,776,818,597	1.23419
1992	1.23480	48,875,288,715	13,822,882,000	16,219,861,400	18,832,545,315	15,251,494,424	1.12198
1993	1.25535	49,744,106,068	13,244,514,000	16,317,325,400	20,182,266,668	16,077,003,759	1.18270
1994	1.29144	53,129,309,640	15,068,058,000	14,939,421,600	23,121,830,040	17,903,913,492	1.31710
1995	1.32167	54,381,861,915	15,556,284,000	14,679,257,600	24,146,320,315	18,269,553,153	1.34400
1996	1.36140	54,780,053,635	16,377,242,000	17,434,857,200	20,967,954,435	15,401,758,803	1.13303
1997	1.39550	57,364,314,933	16,758,832,000	17,006,551,600	23,598,931,333	16,910,735,459	1.24404
1998	1.43074	57,546,122,987	17,306,863,000	17,850,653,600	22,388,606,387	15,648,270,397	1.15116

Note:

Adjusted Operating Expenses (Column B) Calculation: Change in Property Income (The difference between the New Property Income, Table 9, and the Original Property Income, Table 12) multiplied by an adjustment factor of .39, minus RBOC Excess Benefits, Table 10, and then added to Total Operating Expenses (reported in The SOCC, Table 2.9, Account 720). The .39 represents .34 Federal and .5 state taxes, See, *Price Cap and Access Reform Further Notice of Proposed Rulemaking*, at 47.

Sources: Material Price Index (Column A) derived from Input/Output Tables compiled by the Bureau of Economic Analysis of the U.S. Department of Commerce; Depreciation and Amortization Expense, SOCC Table 2.8 (Account 6560).

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Table 12							
Capital Quantity and Imputed Cost of Capital							
Year	Benchmark A	Adjusted Capital Additions B = Table 14	BEA Composite Asset Price Index C	Capital Stock Quantity D	Capital Input Quantity E	Original Property Income w/ Depreciation F	Imputed Price of Capital G
1984				103,903,095			
1985	109,602,959	13,321,774	1.00000	109,602,959	1.00000	23,445,593,794	
1986		13,180,340	1.01048	114,643,584	1.04599	26,792,578,943	
1987		12,554,873	1.02734	118,493,306	1.08111	27,701,751,800	
1988		14,284,742	1.03047	123,703,569	1.12865	26,866,209,000	
1989		13,283,569	1.07018	127,083,465	1.15949	25,845,853,000	
1990		14,476,334	1.08973	131,088,425	1.19603	25,584,541,000	
1991		14,527,049	1.10222	134,696,416	1.22895	24,641,357,000	0.18798
1992		14,611,866	1.10830	138,045,138	1.25950	26,477,135,000	
1993		14,860,116	1.11231	141,325,020	1.28943	26,914,823,000	
1994		14,717,999	1.11766	144,174,284	1.31542	26,366,385,000	
1995		15,374,568	1.11481	147,438,176	1.34520	27,166,096,000	
1996		18,026,150	1.11862	152,787,121	1.39401	30,414,808,000	
1997		18,253,199	1.11764	157,962,762	1.44123	30,679,731,000	
1998		18,553,791	1.11769	163,028,757	1.48745	33,340,502,000	
Notes:							
BEA Composite Asset Price Index (Column C): The single composite asset price index that incorporates prices for three Bureau of Economic Analysis National Income and Product Account (NIPA) asset prices, including Communication Equipment (Table 7.8, Line7), Telecommunication Structures (Table 7.7, Line 12), and Producer Durables (Table 7.1, Line 39).							
Capital Stock Quantity (Column D) calculation: prior year Capital Stock (Column D) less depreciation (7.30180%) (Table 14) plus current year Adjusted Capital Additions (Column B) deflated by current year BEA Composite Asset Price (Column C).							
Original Property Income w/ Depreciation: The residual value, Total Factor Payments/Total Revenues - Labor Compensation and Material Payments. Taken Directly from the <i>Price Cap Performance Review Fourth Report and Order</i> , 1997 TFP Model.							
Imputed Price of Capital (Column G) calculation: current year property Income w/Depreciation divided by the prior year Capital Stock Quantity divided by 1000.							
Sources: BEA Composite Asset Price Index, Bureau of Economic Analysis National Income and Product Accounts (Table 7.8, Line 7; Table 7.7, Line 12; Table 7.1, Line 39).							

Workpaper 1: Base Case

Table 13			
Cost of Capital			
Year	Moody's Baa Corporate Bond Rate	Imputed Competitive Cost of Capital	Competitive Cost of Capital Index
	A	B	C
1985	12.72	0.21718	1.00000
1986	10.39	0.19388	0.89271
1987	10.58	0.19578	0.90146
1988	10.83	0.19828	0.91297
1989	10.18	0.19178	0.88304
1990	10.36	0.19358	0.89133
1991	9.80	0.18798	0.86555
1992	8.98	0.17978	0.82779
1993	7.93	0.16928	0.77944
1994	8.62	0.17618	0.81121
1995	8.20	0.17198	0.79187
1996	8.05	0.17048	0.78497
1997	7.86	0.16858	0.77622
1998	7.22	0.16218	0.74675

Notes:

Imputed Competitive Cost of Capital (Column B) calculation: Table 12 provides the 1991 Cost of Capital Index, which is used as a base point. Years 1985 - 1990 are calculated by subtracting the change in The Moody's Baa Corporate Bond Rate from the next year Competitive Cost of Capital. For years 1992 - 1998, the calculation is similar, although the change in the Baa Corporate Bond Rate is added to the previous year Competitive Cost of Capital.

Source: Moody's Baa Corporate Bond Rate from Table B-73 of the *Economic Report of the President- 1999*.

Workpaper 1: Base Case

Table 14

Capital Stock Adjustments and the Average Depreciation Rate

Year	TPIS.BOY	Capital Additions	TPIS.EOY	Retires	Adjustment Factor	Adjusted Capital Additions	Adjusted TPIS.EOY	Depreciation Accruals	Adjusted Depreciation Rate (%)
	A	B	C	D = A+B-C	E	F = B*E	G = A+F-D	H	I
1985	138,879,365	15,001,998	149,061,793	4,819,570	0.888	13,321,774	147,381,569	10,241,376	7.15527
1986	149,061,793	14,842,725	159,010,189	4,894,329	0.888	13,180,340	157,347,804	11,826,961	7.71971
1987	159,010,189	14,138,370	168,505,114	4,643,445	0.888	12,554,873	166,921,617	13,311,655	8.16837
1988	168,505,114	14,284,742	175,860,216	6,929,640	1	14,284,742	175,860,216	13,134,992	7.62852
1989	175,860,216	13,283,569	182,978,381	6,165,404	1	13,283,569	182,978,381	13,420,810	7.48014
1990	182,978,381	14,476,334	187,168,695	10,286,020	1	14,476,334	187,168,695	13,439,933	7.26194
1991	187,168,695	14,527,049	192,034,545	9,661,199	1	14,527,049	192,034,545	13,200,593	6.96228
1992	192,034,545	14,611,866	196,411,915	10,234,496	1	14,611,866	196,411,915	13,337,581	6.86714
1993	196,411,915	14,860,116	203,082,418	8,189,613	1	14,860,116	203,082,418	14,032,782	7.02527
1994	203,082,418	14,717,999	209,325,562	8,474,855	1	14,717,999	209,325,562	14,863,196	7.20801
1995	209,325,562	15,374,568	217,430,207	7,269,923	1	15,374,568	217,430,207	15,358,553	7.19782
1996	217,430,207	18,026,150	227,317,120	8,139,237	1	18,026,150	227,317,120	16,252,281	7.30855
1997	227,317,120	18,253,199	236,896,179	8,674,140	1	18,253,199	236,896,179	16,667,034	7.18077
1998	236,896,179	18,553,791	248,970,288	6,479,682	1	18,553,791	248,970,288	17,154,619	7.06145
Avg. (85-98)									7.30180

Note:
Adjustment Factor (Column E): Capital/expense shift factor, employed in the 1997 Price Cap Review Order.
Adjusted Depreciation Rate (Column I) calculation: $H / ((A+G)/2) * 100$
Source: TPIS, Capital Additions and Retires, ARMIS Report 43-02, Account 2001.