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EX PARTE

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Re: Price Cap Performance Review
for Local Exchange Carriers
CC Docket No. 94-1

Dear Mr. Caton:

We have received an ex parte submission in the above referenced proceeding by Bell Atlantic, dated June 4, 1996, transmitting a "Declaration of Melvyn A. Fuss." The Fuss declaration purports to respond to "new arguments" contained in the Reply Comments herein of AT&T and the Ad Hoc Telecommunications Users Committee, which were filed more than three months earlier, on March 1, 1996. This declaration addresses, among other things, the presentation of AT&T's experts demonstrating that, in computing the X-Factor for the local exchange carriers (LECs), the existence of an input price differential should be recognized and the total factor productivity (TFP) growth rate for the LECs' interstate access services should and can be measured separately.

In view of the contentions in this newly submitted ex parte document, we believe it appropriate to provide the Commission and its Staff the response from Dr. John R. Norsworthy showing the invalidity of the points made in the Fuss declaration. Accordingly, we are enclosing this responsive statement with this letter.

Over

Please include the attached Statement in the record of this proceeding. Pursuant to Section 1.1206 of the Commission's Rules, 47 C.F.R. §1.1206, two copies of this notice and the attachment are submitted for this purpose.

Very truly yours,

Brian Masterson

Attachment

**Supplemental Statement
of Dr. John R. Norsworthy¹**

RESPONSE TO EX PARTE "DECLARATION OF MELVYN A. FUSS"

Subsequent to the filing of Reply Comments in this rulemaking proceeding (CC Docket No. 94-1), Bell Atlantic transmitted a written ex parte presentation, denominated the "Declaration of Melvyn A. Fuss." In this Supplemental Statement, I respond to certain matters discussed by Dr. Fuss concerning the Reply Statement of Drs. Norsworthy and Berndt (Appendix B to AT&T Reply Comments, dated March 1, 1996) and the Statement of Dr. M. Ishaq Nadiri (Appendix C to AT&T Reply Comments, dated March 1, 1996).

1. Response to Fuss' Comments on the Norsworthy-Berndt Reply Statement

In his declaration, Dr. Fuss makes the following points regarding the Reply Statement of Drs. Norsworthy and Bendt: (1) we have improperly complained about Fuss' use of the Moody's bond yield data; (2) our critique of the Fuss time series is contrary to procedures recommended in the Time Series Processor (TSP) manual; (3) our critique of the time series used by Fuss is, in effect, an "attack" on the analysis made by FCC Staff economists, Bush and Uretsky; and (4) we used an algebraically incorrect equation in determining the feasibility of making a separate calculation of the total factor productivity

¹ The author gratefully acknowledges the significant contributions to this Statement provided by Dr. Ernst R. Berndt, Massachusetts Institute of Technology.

(TFP) growth rates for the LECs' interstate access services. As shown below, none of the points raised by Dr. Fuss has any validity.

(a) Use of Moody's bond yield data .

In the Norsworthy-Berndt Reply Statement (p. 20), we pointed out that Fuss claimed to use the Moody's Public Utility Bond rate data, but those data failed to match any of the published Moody's public utility bond series. Now in his declaration, Fuss defends his claim by asserting that he used the same Moody bond yields as did Bush and Uretsky, and that this series had been mislabeled in the Bush-Uretsky study. He states that the series is really the Moody Corporate Aaa bond yields.

We did not purport to review the Bush-Uretsky study in our Reply Statement. Rather, our comments were directed to the Fuss study. In that study, Fuss clearly labeled the series he used as the Moody public utility bond rate. We are gratified that Fuss now has examined the appropriate antecedents of his data and acknowledged the error that we identified. Notably, the other consultants for the LECs, Christensen Associates (Christensen) and National Economic Research Associates (NERA), similarly labeled their series as the Moody public utility bond yield.

(b) Validity of Norsworthy-Berndt time series critique.

Fuss contends that the time series critique in our Reply Statement is incorrect because the cointegration tests are invalid. He cites the Time Series Processor

(TSP) User's Guide as stating that the cointegration tests must be preceded by unit root tests showing that the dependent variable and at least one independent variable are integrated at the first order. This condition may be required *if one seeks to conclude that the model is cointegrated* (Greene, 1993, p. 566-568). However, non-stationarity of the residuals from the model is direct and sufficient evidence *that the model is not cointegrated* (Hamilton, 1994, pp. 598-601). Furthermore, the TSP User's Guide (Hall, 1995, pp. 93-95) introduces the section, to which Fuss refers, with the qualifying term, "Usually" (p. 94, paragraph 2).

To repeat, as we previously demonstrated, the Fuss model's testing for the aberrational character of the post-1984 period is subject to spurious regression because the residuals from his model are nonstationary. The results of his model are therefore invalid. In short, Fuss asserts that we have proceeded incorrectly in testing the hypothesis that the series in his model *are not* cointegrated. But we are testing the hypothesis that the series *are* cointegrated, and that hypothesis is rejected by a wide margin.

Further, the Fuss investigation omitted data points for 1993 and 1994. It is *Fuss'* thesis that the 1984-1989 period is aberrational. If his objective is to demonstrate that the period 1984-1989 is aberrational, then his analysis should address *all* available evidence, and not just the data examined by Bush and Uretsky. This additional investigation is particularly necessary because of *Fuss'* assertion that the presumed aberration ended in 1990.

(c) The Norsworthy-Berndt time series critique as an "attack" on the Bush-Uretsky methodology.

The discussion of the input price differential (IPD) in our Reply Statement was clearly directed at Fuss' hypothesis that the IPD during the post-1984 period is aberrational. As shown above, Fuss' conclusion that the IPD is aberrational is indeed invalid because the residuals from his model are nonstationary. We did not and do not address the Bush-Uretsky methodology, for which the comment period closed months ago. Rather, we did address the Fuss initial declaration and his study, filed as part of the Bell Atlantic Comments. And we concluded, along with Bush and Uretsky, that the IPD is not zero, and that, absent valid evidence to the contrary, the IPD is non-aberrational.

(d) Validity of Norsworthy-Berndt algebraic equation.

The interstate argument set forth in the Norsworthy-Berndt Reply Statement does not depend for its validity on the equation criticized by Fuss. He focuses on the first line of equation (2) (Reply Statement, p. 32). Contrary to the implication of Fuss' criticism, the calculations in the Performance Based Model are correct and follow the prescriptions of the Fisher Ideal Index detailed in Diewert (1993). However, equation (2) in our Reply Statement *does* require adjustment as shown below. Thus, equation (2) p. 32 should read:

$$\Delta TFP_{AS} = \Delta(Y/X) \approx \Delta Y - \Delta X$$
$$(2) \quad \Delta TFP_{AS} = (r w_A \cdot \Delta Y_A + r w_T \cdot \Delta Y_T + r w_L \cdot \Delta Y_L) - (c w_L \cdot \Delta X_L + c w_M \cdot \Delta X_M + c w_K \cdot \Delta X_K)$$

where *AS* denotes *All Services*, and where the growth rates of outputs and inputs, and their corresponding weights, are determined from the Fisher Ideal Indexes of outputs and inputs, as described in the documentation of the Performance Based Model. The argument for an interstate measure of productivity depends on partitioning the last expression of equation (2) on page 32 of our Reply Statement, as shown in equation (3) below.

Consequently, the calculations in the Performance Based Model were performed according to equation (3) as follows:

$$(3) \quad \Delta TFP_{AS} = (rw_A \cdot \Delta Y_A + rw_O \cdot \Delta Y_O) - \Delta X_C = [rw_A \cdot (\Delta Y_A - \Delta X_C) + rw_O \cdot (\Delta Y_O - \Delta X_C)]$$

The intermediate equality (equation (2), first line) should perhaps be represented as " \approx " to be interpreted as "approximately equal to." The partition of the last expression is algebraically valid when the growth rates of inputs are equal for all outputs, which is the assumption shown elsewhere in our Reply Statement to be empirically conservative. The analogous partition of output assigned to various inputs is and has been commonly practiced.

Had Dr. Fuss examined the spreadsheet (submitted with the AT&T supporting data) that calculates the Performance Based Model results, he would have seen that the calculations in that model follow the correct approach. For example, the spreadsheet "TFP.wk4" supplied as part of the AT&T ex parte presentation of March 29,

1996, Table 8, demonstrates that the partition of TFP growth for interstate access services follows the usual pattern. That table is reproduced below:

Table 8. TFP, Input Price Differential and X-Factor in Interstate and All LEC Regulated Services: Rates of Growth, 1985-1994		
	Interstate Access Services	All LEC Regulated Services
Output Growth	7.80%	5.15%
-Input Growth	2.04%	2.04%
=TFP Growth LECs	5.76%	3.12%
Input Prices: GDPPI	3.06%	3.06%
-Input Prices: LECs	0.31%	0.31%
=IPD	2.75%	2.75%
- TFP Gr in NFB	0.18%	0.18%
= X-Factor	8.33%	5.69%
Note: TFP Gr in NFB is Total Factor Productivity Growth in Non-Farm Business Sector		

2. Quality of Data Used in the Fuss Study

Dr. Fuss does not choose to rebut the point that the national input price series used by Dr. Christensen and Christensen Associates (Christensen) in their model is flawed. Moreover, on the basis of evidence that has recently come to light, their national input price series is flawed in such a way as to bias the data in favor of a break in 1983-84,

a crucial part of Fuss' "aberration" thesis. Specifically, the data for 1984 forward are asserted by Christensen to be taken from the Bureau of Labor Statistics, which uses the framework of the National Income and Product Accounts (NIPA) for measurement of prices and quantities of inputs and outputs. The data for 1982 and 1983 come from one Christensen study, and the data for 1947-67 from the *Review of Income and Wealth (RIW)* study by Drs. Christensen and Jorgenson (1969, 1970). Subsequent data to 1981 are asserted to be from an update of the RIW study that was carried out by Christensen and Jorgenson in 1986. The only evidence of that study that can be accessed is a computer printout, which does not explain either the capital input measurement or the output measurement of that study. Both of these methods differed substantially in the RIW study from the NIPA framework. The differences affect the measures of input prices and of TFP, both of which are cited repeatedly in the United States Telephone Association (USTA) and related LEC submissions in CC Docket No. 94-1. USTA's repeated failures to document its methods violate the Commission's requirement that the study results presented must be reproducible from publicly available sources.

Dr. Fuss should assess the effects of the undocumented Christensen data as follows: Add dummy variables reflecting the time periods corresponding to each of the separate sources from which the national economy input price series are taken. Then re-estimate the Fuss model just as he has specified them in all other respects. If his aberration hypothesis still holds up, and the residuals from the model are stationary, then the empirical results support the Fuss aberration hypothesis. Indeed, the data breaks may

partially or totally account for the observed nonstationarity of the residuals of the Fuss model. Structural breaks in the data are commonly cited in the cointegration literature as sources of unit roots (Enders 1995, chapter 4). In any reprise of the study, Fuss should of course extend the data to include the most recent years for which data are available: specifically, 1993 and 1994.

3. Economics and the Input Price Differential

Finally, Dr. Fuss avoids the question as to what should be expected from economic reasoning about the input price differential. *Even if* growth rates of input prices for capital, labor and materials (i.e. all other) inputs were the same in the LEC industry as in the national economy, the mix of inputs is still different. About 50 percent of total input in the LEC industry is capital, whose national level prices have been stable or declining since the 1960's. Labor, whose prices have risen most rapidly, constitutes about two-thirds of the GDP deflator, but only about one-fourth of the cost of the LECs. Moreover, labor's share of total cost has been declining in the case of the LECs since the time of divestiture. Consequently, *it is to be expected* that there would be an input price differential: that the price index for the LECs would rise more slowly than the price index for the national economy. And, not at all surprisingly, that is exactly what has been observed in the data.

4. Summary: Fuss Comments on Input Price Differential

I conclude, therefore, that the Fuss study should be ignored for four reasons. First, it is scientifically unsound, because it is based on a model subject to spurious

regression and hence biased coefficients and standard errors. Second, the crucial input price differential is based on input prices for the national economy that come from multiple sources in different time periods, including a series break between 1983 and 1984, the exact time where Fuss claims to find a significant shift. Therefore, from the perspective of economic statistics, the data set employed by Fuss may beg the question he addresses. Third, the input price series used in the Fuss study is undocumented and hence cannot be evaluated by other parties in the current proceeding, particularly for methodological conformance among the various studies on which the series is based. Fourth, Fuss does not address the fact that the results to be expected from elementary economic reasoning are those which are observed in the data, in contradiction of his economics-free hypothesis.

5. Response to Fuss Comments on Separately Measuring TFP Growth for the LECs' Interstate Services.

There are two levels of discussion of the interstate calculation of TFP: the practical and the academic. As demonstrated in the previously filed Norsworthy Statement and the Norsworthy-Berndt Reply Statement, the objective at a practical level is to construct a reasonable lower bound for TFP growth in the interstate services supplied by the LECs. *This practical objective differs in no way from the objective of the Simplified Christensen Model which relies on jurisdictional separations procedures to allocate between unregulated and regulated services.* The objective from an academic/econometric perspective is to use an estimated multiple output model of production for the LECs and to test for separability of regulated from unregulated output (as in the Simplified Christensen

Model) and for separability of interstate output from other outputs (as in the Performance Based Model). *This academic/econometric objective also differs in no way from that of the Simplified Christensen Model, which distinguishes between unregulated and regulated services.* Both AT&T and USTA have acknowledged the difficulty in estimating stable econometric models of production, and no such estimates have been presented for consideration in this proceeding. Thus, there is no econometric support for either contention: that regulated and unregulated outputs of the LECs are or are not separable, or that interstate and intrastate outputs of the LECs *are or are not* separable.

In the absence of econometric evidence, in formulating the Performance Based model we chose to examine the available quantitative information to assess the properties of a lower bound for interstate TFP growth. Based on the evidence derived from jurisdictional separations data, it was concluded that a reasonable lower bound can be constructed. That lower bound is calculated in the Performance Based Model.

By contrast, there is no empirical evidence whatsoever that is cited by USTA or the LECs that supports the construction of a TFP for regulated services separate from that for unregulated services, despite the fact that unregulated services have grown much more rapidly in recent years.

These broader points should not be neglected, as we focus on some aspects of Fuss' comments on the separate measurement of TFP growth for the LECs' interstate access services.

In his declaration, Fuss questions any estimation of service-specific TFP growth based on the FCC's cost allocation rules. He denies the existence of any service-specific TFP growth for interstate access service (while ignoring the parallel argument embodied in the USTA-Christensen measure of TFP for regulated services). According to his declaration on page 7 in point 13, "service-specific TFP growth is not a meaningful concept."

Dr. Fuss offers no empirical evidence to support his claim that service-specific TFP growth is not meaningful for the multiproduct LECs. He would first need to show that common costs truly exist in the provision of interstate access service and other regulated LEC services. In other terms, he would need to test the jointness of production in an econometric model of production. Standard tests are available to determine the jointness of production both globally and locally. Using econometric estimation procedures and standard tests, we could in principle test the jointness of production at least locally if not globally (if information about stand-alone costs is not available) for LEC services. Neither USTA nor Fuss has carried out such tests. It is not at all clear that, even if such tests were done, their results would be both unambiguous and sufficiently important quantitatively to justify a clear decision for or against cost separability.

Without doing any formal test, however, it is clear on the basis of the general characteristics of telephone services that there is substantial sharing of inputs, particularly capital, between interstate and intrastate services and that therefore common costs exist among the different regulated services provided by the LECs.

There is general agreement that (a) interstate output has grown faster than intrastate output, and that (b) interstate access services are produced primarily by shared capital inputs rather than by more readily separated labor and material inputs. Given these conditions, it would be both unwise and ultimately unworkable to apply the TFP growth for all LEC regulated services to determine the TFP growth for interstate services alone. Such an approach would be manifestly incorrect.

Because the Commission has determined that price cap regulation of the LECs' interstate access services is appropriate, then clearly the task is to estimate TFP for those interstate services. Patently, the TFP growth for all LEC regulated services (both intrastate and interstate) is not a reasonable approximation to TFP growth for interstate services alone. That the precise answer cannot be obtained by a particular method is no argument for the use of an alternative that is known to be wrong, and to be strongly biased downward. To apply price cap regulation to interstate access service (one of many services produced by LECs) some methodology that provides an approximate measure of the TFP growth for the interstate access services must be used. This approximate measurement of

TFP growth can then be used in calculating the X-Factor in the price cap equation for the LECs' interstate access services.

One possible method would be to develop a measure based exclusively on the FCC's presently existing cost allocation rules for separating investment and operating costs between the interstate and state jurisdictions. However, the history of the evolution of jurisdictional separations suggests that there would need to be substantial adjustments. Another, more reliable procedure would be to use the methodology proposed by Dr. Norsworthy and Dr. Berndt.

Because Dr. Fuss criticizes both of the possible methods mentioned above, he should offer an alternative proposal to measure the interstate access service-specific TFP growth. Instead, he suggests that the FCC use total regulated services TFP growth to determine the interstate access service-specific X-Factor in the LEC price cap equation. He advocates this approach without any defense of its appropriateness or recognition of its bias. There is no reason to believe that Dr. Fuss' biased approach will increase the price efficiency of LEC interstate access regulation. Indeed, raising the LECs' price caps -- which would be the inevitable result from using all regulated services TFP -- would surely reduce pricing efficiency. In fact, most of the LECs have recently elected X-Factors significantly higher than those that would result from application of Fuss' approach. Does Dr. Fuss have information concerning the costs of the LECs about which the LECs themselves are ignorant? The evidence from the LECs' own actions discloses that adoption

of the Fuss approach would lead to more inefficient production processes and inefficient pricing rules.

6. Response to Fuss' Critique of Dr. Nadiri's Statement

In section A of his Statement (Appendix C to AT&T's Reply Comments), Dr. Nadiri discusses cost elasticities and their implications for productivity growth in interstate access services. He states on page 9: "The increased efficiency of switched access services can also be inferred from the estimates of cost elasticities for toll and local services reported in the economic literature. Although the toll and local services do not perfectly map to interstate and intrastate services, in general, the interstate services are mostly toll service in nature while the intrastate services are of the local service type."

Three papers are cited in this discussion in the Nadiri Statement: Bernstein (1989); Denny, Fuss and Waverman (1981); and Nadiri and Nandi (1995). Dr. Nadiri states that in each of these three studies, variable cost elasticity for toll service was found to be much lower than that of local service. As he also observes, the last study shows that the toll service cost elasticity is not only lower than that of local service, but that it has declined faster than that of local service, particularly since the beginning of the 1980's. He concludes that these econometric estimates of cost elasticities of toll and local services indirectly imply lower costs and increasing efficiency gains in the provision of interstate access services than those experienced in providing other (predominantly regulated intrastate) services offered by the LECs.

Econometric evidence of (i) the relatively smaller cost elasticity of toll service compared to local service and (ii) the faster rate of decline in cost elasticity of toll service than local service, taken together, suggests an increasing contribution of interstate access services production toward the TFP growth for all the regulated services of the LECs. This finding conforms to Dr. Christensen's argument that the loss of interstate switched access traffic would reduce the LECs' productivity growth for all of their regulated services taken together. This is precisely the basis for the argument on which we proposed use in the X-Factor of a lower bound on interstate TFP growth.

Dr. Fuss' first criticism of the Nadiri Statement is that it confuses levels and growth rates of productivity. This, however, is not a valid comment on the Nadiri Statement, as clearly shown in the above discussion.

Dr. Fuss' second criticism is based on his paper (Denny, Fuss and Waverman, 1981) where it was found that local elasticity declined more rapidly than the toll cost elasticity over the 1952-76 period in Canada. The results of that study contradict the findings of Bernstein (1989) for Canada and of Nadiri and Nandi (1995) for the United States.

First, the 1981 paper that Fuss cites is based on a study of Canadian telecommunication data, whereas the Nadiri and Nandi paper is based on U.S. data. The time periods in the two studies are also significantly different. The Denny, Fuss and

Waverman study was concerned with Bell Canada for the 1952-76 period, whereas the Nadiri and Nandi time series data for the Bell System extended until 1987. Thus, the evidence cited by Fuss is for a different country and for a different time period (well before the AT&T divestiture took place).

Several other studies based on U.S. data also show the same direction regarding the behavior of cost elasticities of local and toll services. Important among them are the studies by Charnes, Cooper and Sueyoshi (1987) and Evans and Heckman (1988). Both studies used data in their estimates derived from the U.S. Bell System. Related evidence is also found in the study by Norsworthy, et al. (1993) of eleven large local exchange carriers. The markup of access rates over their applicable marginal costs was found to be considerably greater than the markups for local and toll services, and these relative markups have increased between 1984 and 1990.

Moreover, the Bernstein (1989) study was based on Canadian data, as was the earlier Denny, Fuss and Waverman study. However, Bernstein found more rapid decline in the cost elasticity of toll service than in local service for the years 1970 to 1978. From an empirical point of view, the more rapid decline in the cost elasticity of toll service compared to that of local service may have come about because the cost of toll services benefited more from technological innovations in the last two decades. Furthermore, toll services produced by the LECs adopted advanced switching more quickly than they might

have done because telecommunications regulation required that long distance customers have equal access to all interexchange carriers (IXCs).

Finally, it should be noted that Dr. Fuss' comments in his declaration regarding cost complementarities are based on a strong (global) form of cost separability. Weaker (local) cost separability conditions can be met that would justify the more valid Performance Based Model approach to the measurement of a lower bound for interstate TFP growth. Although Denny and Fuss (1979) published a paper on the distinction between various forms of separability of cost functions and empirical tests of separability hypotheses in the *American Economic Review*, as observed above, Fuss has not introduced in this proceeding any empirical evidence concerning cost separability in the LEC industry that would support him in this regard.

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