DIRECT TESTIMONY OF DALE E. LEHMAN

ON BEHALF OF

SOUTHWESTERN BELL TELEPHONE COMPANY

DOCKET NUMBER 97-SCCC-149-GIT

Q. PLEASE STATE YOUR NAME, POSITION, AND BUSINESS ADDRESS.

A. My name is Dale E. Lehman, and I am Associate Professor of Economics at Fort Lewis College in Durango, Colorado. My business address is 8960 County Road 250, Durango, CO 81301.

Q. HAVE YOU PREVIOUSLY TESTIFIED IN THIS DOCKET?

A. Yes, I provided testimony on behalf of Southwestern Bell Telephone Company in the earlier phase of this docket. At that time I was Senior Economist at Southwestern Bell Telephone Company. I have since returned to my permanent teaching position at Fort Lewis College. My current curriculum vitae is Attachment 1 to this testimony.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I provide a template for how to choose between the competing "inputs" advocated in this proceeding. These "inputs" vary significantly among those proposed by SWBT, AT&T, BJA/BJA/Staff (I will refer to the Ben Johnson Associates and BJA/Staff positions as "BJA/Staff"), and CURB. My observations are intended to support why SWBT's proposal is consistent with efficient economic choices. In particular, I will show that SWBT's models and inputs are an appropriate basis for deriving forward-looking long-run incremental cost estimates, and that the conceptual basis for many of the other parties' proposed modifications to these models and inputs are not consistent with economic theory and/or sound public policy principle.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. The conceptual approach of SWBT's cost models/inputs has been questioned in terms of:

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- Is a forward-looking long-run standard reflected in the cost studies?
- To what degree should the inputs in a forward-looking study deviate from the actual experience of the company?
- (How) can embedded cost data be used in a forward-looking cost study?

These generic issues form the foundation for the parties' differences regarding fill factors, operating cost factors (including common costs), depreciation, appropriate technological assumptions for estimating non-recurring costs (NRCs), and the extent to which, and manner in which, the cost studies should account for anticipated demand growth. These areas encompass the most significant differences in cost inputs recommended by the parties to this proceeding. Much of the dispute traces back to the underlying answers to the questions above, played out through these specific cost inputs. I will arrange my testimony in terms of these specific input areas, referring to the numbered issues matrix. I also address a couple of related pricing issues at the end of my testimony.

I will demonstrate that SWBT's studies make appropriate use of historic data in a forward-looking study. The embedded network and embedded costs form the starting point for SWBT's cost analyses. Technological conditions are modified to reflect currently available most efficient technological choices. Cost factors are based upon historical relationships, but reflect forward-looking investment cost levels (derived from these modified technological assumptions). Speculations about future costs are kept to a minimum. I will explain how this is appropriate from the point of view of economic theory, sound public policy, and the Telecommunications Act of 1996. Finally, I will show that most of the other parties' recommended changes to SWBT's cost inputs reflect an inappropriate speculative cost standard and/or an incorrect view of the (ir)relevance of embedded cost data in a forward-looking cost study.

Fill Factors and Other Loop Issues

Q. HOW DOES SWBT APPROACH FILL FACTORS AND WHAT IS THE NATURE OF THE DISPUTE ABOUT APPROPRIATE FILL FACTORS?

A. SWBT uses actual fill factors experienced in its existing network as representative of the fill factors relevant to future conditions. The other parties suggest that this "snapshot" of current fill factors is inappropriate for any of the following reasons:

- Demand growth will lead to increased fill over time.
- Current fill is inefficiently low (not most efficient deployment of technology).
- "long-run" cost conditions require that fill be minimal.

The other parties recommend significantly higher fill factors, resulting is substantially lower UNE cost estimates. No single issue is as quantitatively important as this one.

Q. IS IT APPROPRIATE TO USE CURRENT FILL AS REPRESENTATIVE OF FORWARD-LOOKING FILL? (AE0001)

A. Yes. Current fill is a snapshot in time of an ongoing dynamic process through which fill is determined. While fill appears as an input in cost models, it is really the output of a complicated process involving the need to place facilities in advance of uncertain demand and extensive customer mobility. The result of these factors is that facilities at any point in time will be excessive relative to the current demand, and in theory, this process tends to be stable over time. In other words, as some unused facilities become used through demand growth, other facilities become "unused" as a result of changing consumer demands and locations. I have prepared a stylized analysis, Attachment 2, which illustrates this dynamic process.

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR ANALYSIS IN ATTACHMENT 2.

A. I provide a highly simplified simulation in which facilities must be placed in advance of demand, there is demand growth (including second line demand growth), and customer migration which leads to "stranding" of some facilities. The model is not intended to mirror actual parameters, but it illustrates three points which are relevant to the current proceeding. First, in a dynamic environment, actual fill is quite stable over time. Thus, proposals which deviate significantly from current fill levels should be cautiously examined. Second, actual network fill will be substantially lower than subdivision specific or engineered fill. Third, fill is not itself an input: it is the output of a dynamic process. The last point means that any recommended increases in SWBT's fill factors should be supported by an analysis of the underlying dynamic process which would lead to significantly higher fill levels.

Q. BJA/STAFF SUGGESTS THAT A LONG-RUN COST STUDY REQUIRES THAT FILL BE LARGE (I.E., THAT UNUSED FACILITIES BE MINIMAL). DO YOU AGREE? (AE0004)

A. No, the BJA/Staff position reflects a fundamental misunderstanding of the meaning of the "long-run." As stated, the BJA/Staff position is that "A long-run cost study should optimize the amount of plant investment to match the volume of output." However, this is not an accurate statement of long-run conditions. In economic theory, the long-run represents a period of time sufficiently long that all inputs can be varied. In itself, this says nothing about the ability to "match" investment to demand. The BJA/Staff position confuses the definition of the "long-run" with an inappropriate use of a static cost standard applied to a dynamic cost process.

Q. PLEASE EXPLAIN THIS POINT.

A. A good analogy is to think about a retail store's level of inventories. A proper long-run cost study would permit a retail firm to alter the size of its store and warehouse. This is quite different from assuming that inventories will be kept to a minimum (the equivalent to the BJA/Staff position of matching investment

to the level of output, allowing only for day-to-day fluctuations in demand). For example, a retail store may have a short-run lack of shelf space. As a result, it will experience relatively high variable costs in needing to order goods that it is unable to stock in inventory and possibly accelerate their delivery to fulfill customers' orders. A long-run cost perspective would permit the retail store to build additional store space in order to increase its stock of inventories, thereby using fixed costs (from a short-run perspective) as a substitute for the relatively higher variable costs based on its current fixed store size.

However, there is nothing about the long-run perspective which permits the firm to avoid the unpredictability of customer demand and the lumpiness of ordering stock which drive the need for holding inventories. A retail store, under long-run conditions, can be expected to hold a relatively stable amount of inventories. As specific inventories are depleted, they are periodically restocked. It is true that any particular item in inventory generally gets sold, but it is usually replaced by another. Inventory costs tend to be stable, over anything except the shortest periods of time.

Q. HOW DOES THIS APPLY TO SWBT'S DISTRIBUTION PLANT FILL FACTORS?

A. Distribution fill can be thought of as the inverse of inventory. Unfilled plant is the inventory. Ideally, it will get used by future demand, but in practice, it will need to be replaced by further unused capacity. It is further complicated by the fact that significant unused capacity derives from the inevitable facts of customer mobility and the relative immobility of distribution investments. As customers leave an area, it is not economic to remove the capacity that was installed to satisfy their demand. While, any particular current "stranded" facility represents a "sunk cost," the underlying dynamic process ensures that there will continue to be stranded facilities in the future. Thus, today's

snapshot of network fill is a good representation of the carrying cost of network facilities.

Eliminating (or substantially reducing) unused capacity is simply not a requirement of a long-run perspective. There is no opportunity to substitute (short-run) fixed costs for variable costs (or vice versa) as a way to reduce costs in the "long-run." If BJA/Staff were correct, then the matching of investment to demand (less unused capacity) should be expected to entail a substitution of more variable costs (e.g., labor) in place of today's fixed capacity costs in order to achieve lower costs. The fact that no such substitution occurs is a sign that unused capacity (or its inverse, fill) is simply not a long-run/short-run issue at all. Fill reflects dynamic conditions and these are not affected by a move to the "long-run."

Q. DOES ECONOMIC THEORY REFUTE THAT HIGH FILL IS A REQUIREMENT OF A PROPER LONG-RUN COST PERSPECTIVE?

A. Yes. BJA provided many references to standard undergraduate economic texts as supporting the view that a long-run cost study requires a close match between investment and demand.[1] However, none of the cited texts discuss dynamics at all. They only contain generic discussions of how a long-run cost study permits all inputs to be varied (as do SWBT's cost studies - for example, building investment is variable in SWBT's cost studies). BJA simply cited the wrong texts for the wrong point.

Consider the following discussion regarding cost modeling for the electricity industry:

[1] BJA response (3/20/98) to SWBT RFI 1.1 dated 3/12/98.

"The above short-run analysis underlies long-run decisions like the nature of the plant type to be installed for the replacement of existing plants or to expand the system. Such problems are solved typically by engineers and are known as system planning, and there exists a considerable literature on the subject. System planning is a problem in dynamic analysis. Demand may be growing over time, technology may be changing, relative fuel costs may be changing."[2]

Similarly, consider the following comments specifically aimed at the use of the long-run concept in telecommunications:

"Nevertheless, there are certain limitations about the concepts of the short-run and the long-run which cause us not to favor them... First, in practice, no factor is completely fixed... Second, the long-run cost function does not embody the set of alternatives available to the firm at any time, but is merely a set of alternatives which would be available if things were different (specifically, if the firm had not existing commitments). Finally, this approach does not provide a mechanism for analysing the process by which a firm actually changes its fixed factors, depending on the cost of change, the time it will take, the benefits of doing so, etc. In other words, the notion of short-run and long-run is perhaps not the most useful device for analysing the problems of change over time."[3]

These dynamic considerations are too complex to appear in undergraduate textbooks - the texts cited by BJA/Staff in support of their position. I have no dispute with the definition of the long-run as permitting all factors to be varied. It is the application of this principle to essentially make a dynamic cost problem into a static one to which I object.

Q. DO YOU AGREE WITH AT&T'S POSITION THAT DEMAND FOR SECOND LINES AND INCREASING COMPETITION CALL FOR INCREASED FILL FACTORS IN THE FUTURE? (CA0018)

A. Neither of these factors call for higher fill factors. Second line demand growth is but one factor in a dynamic process. It is not correct to take only a single

[2] Michael A. Crew, and Paul R. Kleindorfer, Public Utility Economics, St. Martin's Press, 1979, p.162.
[3] S.C. Littlechild, Elements of telecommunications economics, Peter Pergrinus, Ltd., 1979, p.72.

dynamic factor into account. As my analysis in Attachment 2 demonstrates, fill will tend to be stable and significantly below engineered fill, even in the presence of second line demand growth. I also do not agree with AT&T's second rationale. If I were to speculate about the effects of increasing competition on fill factors, I would certainly speculate that they will decrease, not increase. Competitive entry will serve to "strand" additional facilities, and in the presence of carrier-of-last-resort obligations will not permit SWBT to operate with decreased facilities in place.

One only needs to look at the long-distance industry in order to see that utilization may well decrease in a more competitive environment. Attachment 3 provides some data on the relative rates of increase of long-distance demand and installed capacity.[4] The obvious conclusion is that increasing competition should not be expected to lead to higher fill levels.

Q. SHOULD SWBT FORWARD-LOOKING LONG-RUN COST STUDIES SPECULATE ABOUT FUTURE SHARING OF POLES AND CONDUIT FACILITIES? (CA0002)

A. No, speculative assumptions should be kept to a minimum in cost studies. In particular, hypothetical assumptions about extensive future sharing of facilities is at odds with both current practice and likely future practices, as well. Extensive sharing of facilities would require other network providers (e.g., electric companies) to redesign their networks along with SWBT. In a "scorched earth" view of the world (which is not the view inherent in the SWBT models approved by the KCC for this proceeding) it is possible that some cost savings could result from the hypothetical design of networks to share facilities. However, this is but an illusion. There is no evidence that such sharing is anticipated or an efficient choice given that these networks, to a large extent, already exist. It would not be economic to replace current

facilities in order to increase future sharing (aside from technological, strategic, and practical constraints on such facilities sharing).

The problem with using such speculative assumptions in cost models is that the models then supplant the competitive process with a regulatory process. Since extensive sharing is not reality, regulatory speculation along these lines means that the regulatory process offers lower costs than either SWBT's actual costs or the costs of facilities-based entry for potential entrants. Thus, competition shifts from the market place to the hearing room, where speculative battles take place over "forward-looking" inputs to cost models.

Q. IS SWBT'S APPROACH TO MODELING CABLE SHEATH SIZES APPROPRIATE? (CA0024, CA0025)

A. Yes. BJA/Staff claim that SWBT's actual cable size mix "does not necessarily provide reliable estimates of the most cost effective or appropriate mixture of cable sheath sizes for use in a forward-looking long run cost study." This is merely a restatement of the fill factor issue. The use of actual cable sheath sizes in SWBT's network provides a snapshot of the dynamic process through which SWBT's network is deployed. The exercise which would permit larger sheath sizes to be used, commensurate with current demand levels, is another static fictional modeling exercise. "Forward-looking" does not mean a static view of the world. Forward-looking networks will need to deal with placing facilities in advance of demand and with changing consumer locations and usage patterns. The result is that a mixture of cable sizes will exist which would not minimize costs for an instantaneous reconstruction of the network to serve current demand. Further, it is clear that it is simply not feasible to simultaneously use larger (optimal in a static world) cable sizes and achieve higher fill levels at the same time. This not an achievable cost standard and is irrelevant to this proceeding.

[4] It is almost meaningless to try to measure "fill" in long-distance networks (particularly for fiber capacity). As a reasonable surrogate, I measure the trends over time for usage and for capacity - these clearly show that capacity

Q. WHAT CONCEPTUAL ISSUE IS RAISED CONCERNING SWBT'S LOOP SAMPLES? (CA0034)

A. CURB objects to SWBT's lack of providing loop sample data by wire center, class of service, type of line, geographical location, etc. However, this complaint is irrelevant to the loop sample that SWBT uses in its loop studies. SWBT's sampling procedure is "systematic random sampling," which consists of selecting a random starting point in the population data (SWBT loops in the entire state of Kansas) and selecting every K^{th} record in the data base (K is determined by the desired random sample size). This is equivalent to simple random sampling. Each loop in the data base has an equal chance of being selected in the sample.

CURB is interested in examining this sample data according to any of a number of loop characteristics. There are two problems with using the data in this manner. First, UNEs are to be used in any manner that the purchaser wishes, so that prices cannot be differentiated according to many of these other characteristics. Second, any use of this data in the manner suggested by CURB is statistically unsound.

For example, suppose the sample data were used to see how loop lengths/costs vary by wire center. The sample does not contain a random selection of loops from each wire center. Not all wire centers may even be represented in SWBT's random sample, and it is likely that few, if any, wire centers will have sufficient loops to obtain reliable estimates of loop lengths/costs for that particular wire center. To answer CURB's questions about how loop costs vary by wire center would require use of a <u>different</u> random sample. SWBT's sampling provides a random sample of loops in each deaveraged zone. This data cannot be used as a random sample of loops for any other purpose.

<u>Operating Cost Factors and Common Costs</u>

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is growing more rapidly than demand, even in the presence of increasing competition.

Q. DO SWBT COST STUDIES MAKE APPROPRIATE USE OF EMBEDDED DATA REGARDING OPERATING AND COMMON COSTS? (MA0010)

A. The way that SWBT derives forward-looking operating and common costs is an appropriate, if overly conservative (low cost) methodology. In the case of both operating cost factors and the common cost allocator, SWBT's methodology essentially assumes that the forward-looking expenses will bear the same relation to the booked expenses as the forward-looking TELRIC costs bear to booked attributable costs. For example, for maintenance factors, the assumed relationship is:

$$\frac{Forward-looking\ maintenance\ expense}{Booked\ maintenance\ expense} = \frac{Forward-looking\ TELRIC\ investmnt}{Booked\ investment\left(CC/BC\right)}$$

The embedded data is used regarding the relationship between booked maintenance expenses and booked investments (brought to current cost basis through the CC/BC; essentially the replacement cost). However, the level of forward-looking maintenance expense is an account specific magnitude that applies this historic relationship to the forward-looking TELRIC investment. TELRIC investments will generally be lower than replacement costs since the latter is the cost of replacing the investment that is in the embedded network and the TELRIC investment is a forward-looking investment using efficient technology and deployment.

For example, average replacement costs are approximately $1150 /loop statewide for Kansas, while the average TELRIC investment is around $800/loop. Thus, SWBT's cost study will produce forward-looking maintenance expenses about 70% of their current level. The implicit assumption is that the extent to which forward-looking investment costs will be lower than historic levels will be mirrored in the operating cost magnitudes. This is an overly conservative (low cost) assumption, since the cost drivers

for lower investment costs (technological advance) are not the same as for operating costs. In general, I would not expect operating costs to fall as rapidly as the investment costs, since the latter are more capital intensive than the former.

Q. DOES A SIMILAR ANALYSIS APPLY TO THE COMMON COST ALLOCATOR?

A. Generally yes, but with somewhat different details. The implicit assumption in SWBT's common cost study can be expressed as:

$$\frac{Forward-looking\ Common\ Cost}{Booked\ Common\ Cost} = \frac{Total\ TELRIC\ Cost}{Total\ attributable\ (non-common)\ TELRIC\ cost}$$

Once again, the assumption is that the common costs will be reduced in the same relation that the attributable element expenses are. Once again, this is overly conservative since the drivers for common costs are different than for elements. In particular, common costs are approximately 90% labor costs and are not subject to the same degree of technological advance as are the UNE costs. Note also that the booked magnitudes are used to establish a relationship, while the forward-looking level of common cost depends on the total forward-looking TELRIC costs.

Q. ARE THERE OTHER IMPLICATIONS OF THIS UNDERLYING CONCEPTUAL BASIS FOR SWBT'S COMMON COST ALLOCATOR?

A. Yes, the dispute between the parties about how to properly calculate the common cost allocator is somewhat off the point. There is no such thing as the "correct" allocator. It is the level of forward-looking common costs which matters and not the percentage allocator. Thus, AT&T's position that total revenues must be the basis for the denominator of the allocator (which I will address further) ignores the fact that common costs are ultimately derived from applying the allocator (a percentage) to the total TELRIC costs. The

Commission cannot determine the appropriateness of the allocator without first determining the TELRIC levels.

Q. ARE THERE OTHER CONFUSIONS THAT RESULT FROM FAILING TO RECOGNIZE THAT THE COMMON COST ALLOCATOR IS A PERCENT? (AE0007, AE0008)

A. There are two issues which derive from fact that the allocator is a percent. Two adjustments which AT&T recommends to SWBT's common cost allocator are an adjustment for the time trend in common costs and an adjustment to reflect "best in class" common costs (the allocator of SWBT's lowest common cost state). Both of these adjustments are inappropriate for SWBT's common cost allocator. First, the time trend that AT&T observes is in common costs per unit of output, not in common costs as a percent of total net cost. The latter exhibits no clear trend but only a singular adjustment (1993-94) resulting from a significant downsizing. The following table shows the SWBT common cost allocator for Kansas over the 1991-96 time period:

Year →	1991	1992	1993	1994	1995	1996
allocator	20%	17.92%	19.93%	14.99%	15.64%	15.59%

Second, the fact that SWBT's common cost allocator is higher (slightly) in Kansas than some states (e.g., Texas: about .2% lower) is irrelevant for several reasons.[5] Most importantly, a higher common cost percentage in Kansas is tied to a lower percentage for other-than-common costs in Kansas. If common costs are a higher percent of the total, then other costs must be a lower percent of the total. Attachment 4 demonstrates this mathematical property. The implication is that it makes no sense to label a lower common

[5] In addition, the AT&T call for a "best in group" adjustment to the common cost factor is apparently left over from other states - the common cost factor in KS is the second lowest for SWBT, with only TX marginally lower. So, this issue is largely irrelevant to this proceeding, but in any case, AT&T's proposed adjustment is *fundamentally incorrect (as described above).*

cost percentage as 'best in class" since it only measures the ratio of common costs to other costs and not the level of costs itself.

A further reason to ignore a "best in group adjustment" is that it could only make sense if common costs were proportional to total output. It is likely, however, that common costs rise more slowly than output, so states with higher output levels should have relatively lower common costs per unit of output than states with lower output levels (other things held constant). So, this comparison between states is further flawed.

Q. SHOULD SWBT ADJUST ITS COMMON COST ALLOCATOR TO REFLECT ANTICIPATED COST SAVINGS FROM THE SBC/PACIFIC TELESIS MERGER? (AE0009)

A. The adjustment to reflect the SBC/Pacific Telesis merger is also inappropriate, for several reasons:

- The merger occurred after the study period used in the common cost study.
- The merger benefits remain speculative - SBC shareholders are bearing the risk that these benefits will be realized.
- It is not clear that the merger will reduce common costs in Kansas. The merging of functions between the companies primarily involve cost reductions in California operations.
- Merger benefits are not "cost free." AT&T has provided no estimates of the costs associated with the attempt to realize merger cost savings.

Q. GIVEN YOUR PREVIOUS COMMENTS, DOES SWBT'S COMMON COST ALLOCATOR REST ON A SOUND THEORETICAL BASIS? (AE0005)

A. There is one potential problem regarding the denominator of total booked non-common cost. AT&T maintains that the denominator should be total revenues, since the TELRIC costs include the cost of capital and SWBT's denominator does not. First, as I have already stated, the allocator should be viewed in the context of the level of common costs is produces, not in its own

right. Notwithstanding this point, SWBT's denominator includes the cost of debt, but not the cost of equity. Use of total revenues is not an appropriate method for including the cost of equity, however. Total revenues would ascribe all of SWBT's profits to the denominator, not just the cost of capital. This has perverse consequences. SWBT success at marketing high margin services would result in a lower common cost allocator applied to UNEs to be sold to CLECs. There is no cost-causation between the two. If an adjustment were deemed appropriate it would be to include a measure of the cost of equity in the denominator.

Q. SHOULD COMMON COSTS BE EXPRESSED AS A PER LINE MAGNITUDE OR AS A PERCENTAGE? (AE0017)

A. There is no clear theoretical consensus on this matter - cost proxy models have approached this in different ways. BJA/Staff is correct that use of a percentage will allocate more common costs to higher cost loops than would a flat common cost/line figure. However, it is not clear which method is most consistent with cost causation. Since rural loops tend to be higher cost (attributable), it may be appropriate to have such lines bear a proportionate share of the common costs (more administrative functions may be associated with these higher investment and operating costs). On the other hand, overhead costs may be more closely related to the number of lines and not to their attributable costs.

In economic terms, there can be no clear resolution of this issue, since cost allocation, by definition, is not cost-causation. Common costs are caused neither by the number of loops or their relative attributable costs (otherwise the costs would not be common). The only cost-causative relationship is that the size of the company is somewhat related to the level of common costs. The issue could be restated as whether size should be measured by number of lines or amount of attributable costs.

Q. IS IT APPROPRIATE TO INCLUDE INFLATION IN SWBT COST STUDIES? (AF0001)

A. Yes, inflation must be accounted for if the cost studies are to be accurate over the near future time period. Today's costs can be expected to change. SWBT uses separate estimates of the inflation in operating costs and in capital costs (the latter is lower than the former) to provide accurate estimates of what costs will be over the interconnection agreement term. This is necessary, since UNEs purchased at these cost-based prices may be purchased at any time during this period - not necessarily purchased just this year.

Q. SHOULD SWBT COST STUDIES ACCOUNT FOR LIKELY INCREASES IN PRODUCTIVITY? (AF0003, AF0004)

A. Yes, but this is a point of some confusion. SWBT cost studies already account for productivity growth. The adjustment is implicit rather than explicit, and takes two forms. First, by using forward-looking technology, much of the anticipated productivity growth is captured. For instance, SWBT still has analog switches in Kansas. By modeling an all digital switching network, SWBT has incorporated the productivity gains due to digital switching already.

Second, SWBT's operating cost factors (as described above) assume the same relationship between forward-looking operating costs and booked operating costs as between forward-looking investments and booked investments.[6] Thus, the efficiency gains represented in forward-looking investments are also reflected in all operating expense factors. To add an explicit productivity adjustment would double-count these efficiency gains. It should also be realized that the use of a productivity adjustment, so familiar from price cap regulation plans, is a valid alternative to the forward-looking

cost exercise (TELRIC). UNE costs could have been based on booked values, subject to an appropriate productivity offset. The TELRIC exercise of estimating what the forward-looking costs will be over the near future is a substitute methodology - it seeks to directly estimate what these costs will be, rather than providing a surrogate measure of what cost reductions, on the average, are to be expected. It makes no sense to do both - to use forward-looking costs and then apply a productivity offset - this only double counts anticipated cost reductions.

Depreciation

Q. WHAT IS YOUR CONCERN WITH THE DISPUTE OVER CORRECT ECONOMIC DEPRECIATION LIVES? (BD0001)

A. I am only addressing the conceptual bases for the competing claims and not the specific lives that are proposed by any party. On a conceptual level, I do not find credible the view that regulatory based (i.e., FCC) prescribed lives are economic lives. First, it is odd that this remnant of the monopoly era (prescribing depreciation lives) is the one historical remnant that some parties wish to bring into a forward-looking cost study. It is well recognized that prescribed lives are the result of a negotiation process that may have been appropriate in a monopoly environment, in which prudent cost recovery was guaranteed. As FCC Commissioner Furchtgott-Roth recently stated: "The Commission's authority to prescribe depreciation rates is merely a vestige of outdated rate-of-return regulation."[7] To this I would agree.

Beyond this anomaly, AT&T's position that the "FCC/KCC 1997 depreciation parameters fully reflect forward-looking cost principles" is inconsistent with

[6] BJA/Staff appear to misunderstand the use of CC/BC adjustments in SWBT's cost studies. They are not a direct measure of productivity improvements, but rather, they have the effect of accounting for productivity gains by mirroring the forward-looking/embedded investment relationship on operating costs.

their view that SWBT's forward-looking costs should be significantly lower than its embedded cost. As I demonstrated in my Direct Testimony in the earlier phase of this docket,[8] the main driver for forward-looking costs to be lower than embedded costs is overly long prescribed depreciation lives. The effect of overly long lives is to build up the booked cost of the company in relation to the true forward-looking costs. If prescribed lives were economic lives, there would be little reason for forward-looking costs to be less than embedded costs.

Q. PLEASE EXPLAIN THIS LAST POINT.

A. The analysis is fairly complex, but the idea is simple. Overly long prescribed lives cause investments to be carried on the books beyond their true useful economic lives. The result is that the booked costs are artificially inflated relative to forward-looking costs. It is ironic that depreciation is one of the most contentious issues in arbitration and cost proceedings and that CLECs generally regard prescribed lives as economic lives. This results from the artificial nature of these proceedings. Embedded costs are data, not subject to dispute in this proceeding, while only the forward-looking cost estimates are influenced by the choice of depreciation parameters. Thus, the artificiality of only considering forward-looking costs, without the attached effect of depreciation on today's embedded costs, provides a misleading picture of the importance of depreciation.

The difference between today's embedded cost and today's forward-looking costs is, in large part, derived from the relationship between prescribed and economic depreciation. If there was no difference, than embedded costs and forward-looking costs would not differ much. But, given that the embedded

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[7] *Telecommunications Reports*, February 9, 1998, page 30. Mr. Furchtgott-Rott called for the FCC to discontinue micromanagement of depreciation rates.

[8] Attachment 2 to the Direct Testimony of Dale E. Lehman on behalf of SWBT. I explored the relationships between forward-looking and embedded costs. An updated version of that analysis was presented at the 17th Annual Conference of the Center for Research in Regulated Industries, Rutgers University, May 27, 1998 (the paper is titled "Back to the Future."

costs enter these proceedings as a fixed data point and that forward-looking costs will result from the proceedings, the link between the two is largely broken. The fact remains, that if AT&T's contention about depreciation lives is correct, then we should expect little difference between forward-looking and embedded costs.

Technology and Non-recurring Costs

Q. DO THE PARTIES DISAGREE ABOUT THE APPROPRIATE TECHNOLOGY TO BE USED IN A FORWARD-LOOKING COST STUDY? (JA0002)

A. The parties appear to define forward-looking technology similarly, but then apply this definition quite differently. AT&T defines the standard as "forward-looking, most economically efficient technology" while SWBT uses "SWBT's network configured with efficient, currently available technology." Thus there appear to be two potential differences - forward-looking versus currently available technology, and what is meant by "efficient."

Q. DOES THE LONG-RUN MEAN THAT "MOST EFFICIENT LEAST COST TECHNOLOGY" MUST BE REFLECTED IN A COST STUDY? (MA0001)

A. The term "most efficient least cost" is not generally a correct economic characterization of proper long-run technology choice. When technology continually progresses, what is most efficient will not be what is least cost at each point in time (only in the absence of technological change, will most efficient equate with least cost at each point in time). Most efficient requires that the present value of total costs be minimized for producing a given level and quality of output. This necessarily requires the continued use of technologies that have been superceded by "lower cost" technologies when viewed from any particular moment of time.

Consider the example of a personal computer purchase. Given the rate of technological progress in the PC industry, today's PC is certain to not be the most modern technology within a short period of time (a month, perhaps). The long-run costs of a PC, to a current owner, are properly calculated by using today's technology and replacing it when the present value of the incremental benefits of the newer machine offset its purchase costs. Suppose you just purchased a $2000 PC and a new chip becomes available one month from today that reduces the PC cost to $1500. It would only make sense to replace the machine you just bought if the operational costs and/or benefits exceeded the $1500 purchase cost of the new machine. Most likely, it is efficient to continue to use the $2000 machine until a later date at which these operational benefits/costs (relative to you existing machine) offset the purchase costs.

Thus, your PC costs are not $1500 - they are greater. The most modern technology is not always the most efficient. In a world of continual technological progress, the two phrases "most modern technology" and "most efficient technology" are simply not synonymous.

Q. DOES THE LONG-RUN MEAN THAT TRANSITION COSTS SHOULD BE IGNORED, AND MOST MODERN TECHNOLOGY ALWAYS DEPLOYED?

A. No, this confuses the long-run with a shift from a dynamic economic analysis to a static one. When dynamic adjustments are important (as they are when initial capital costs are high and there is continual technological progress), they are properly reflected in all economic cost analysis - long-run or short-run. The fact that the more modern technology will eventually be deployed does not mean that it can be deployed costlessly nor that a LRIC study should estimate costs as if no existing technology were in place.[9]

[9] More specifically, if the LRIC study does reflect the most efficient technology at each point in time, setting prices equal to these costs is not efficient.

Q. WHAT IS THE PRACTICAL SIGNIFICANCE OF THESE POINTS IN THIS PROCEEDING?

A. As a practical matter, SWBT cost studies use most efficient technology. AT&T disputes the choice of technology in the areas of OSS, DIP/DOP, and IDLC assumptions. The importance of correctly thinking about the costs of dynamic technological change is to avoid the "trap" that AT&T is setting in this proceeding. If new technology should always instantaneously be reflected in SWBT's cost studies, then today's network and today's costs are to be seen as irrelevant to LRIC costs. Today's network would appear to be inefficient, by definition. This is not true. Today's network and today's costs are sunk, but are intimately related to LRIC costs. Dramatic departures of forward-looking costs and technology from today's network technology and costs should be viewed with skepticism, unless dramatic inefficiency in the current operation can be demonstrated.

AT&T's erroneous characterization of the long-run changes its meaning from "all inputs can be varied" to "all inputs must be varied" and then to "all inputs must be varied without including the transition costs." This represents an unachievable cost standard.

Q. DOES AT&T CORRECTLY PORTRAY THE TECHNOLOGY CHOICE FOR NON-RECURRING PROCESSES IN A LRIC STUDY?

A. No. AT&T calls for only mechanized OSS to be reflected in the cost study. It is not necessarily efficient to install fully mechanized OSS even if, once installed, it may be cheaper to operate. Any potential operating cost savings must be weighed against the installation costs of such systems. Further, since not all CLECs are fully mechanized, it would not be efficient for SWBT to move to only mechanized OSS.

The Commission should not confuse the desire for a modern infrastructure with the means of obtaining it. Basing costs on a hypothetical, modern, more-efficient-than-current practices, network will not make that network

happen. In fact, it will impair SWBT's ability to invest in it, and undermine AT&T's incentive to invest in it. The best means to an advanced infrastructure is to let the market build it - by having prices represent what it costs to provide service, not what it might cost to provide service.

Q. ARE THERE ANY OTHER AREAS IN WHICH AT&T ASSUMES THAT CURRENT TECHNOLOGY MUST BE REPLACED IN A LRIC STUDY, BUT THEN DISREGARDS THE COSTS OF MOVING FROM ONE TECHNOLOGY TO ANOTHER? (MA0002, CA0015)

A. Yes, this is a recurring (no pun intended) theme. For example, AT&T assumes 100% Integrated Digital Loop Carrier (IDLC). This assumption is inappropriate in an unbundled environment, as discussed in the testimonies of Mr. Deere and Mr. Moore. However, even if 100% IDLC was an appropriate forward-looking technology, there would be costs associated with the transition. Specific central office equipment components would be required, and these must be reflected in the cost estimates.

A second example is the assumption of 100% DIP/DOP (dedicated inside and outside plant). This, too, is not representative of the network (see the testimony of Mr. Moore and Mr. Deere). However, even if it were feasible, AT&T has simply disregarded the costs of accomplishing this standard of readiness-to-serve, or they assume simple conversion or resale, which is not the unbundled exercise required. They assume that it is forward-looking technology - therefore it should be in place. However, the costs of putting the required facilities in place are clearly relevant long-run forward-looking costs (not to mention the many issues associated with recombining of UNEs).

Again, the move to a long-run perspective does not mean that transition costs are irrelevant. It only means that all transitions are possible - the costs still need to be included.

Q. DO YOU HAVE OTHER CONCERNS WITH THE AT&T POSITION REGARDING NON-RECURRING COSTS? (MANY JA ISSUES)

A. Yes. The distinction between "most efficient technology" and "least cost technology" is particularly important for non-recurring costs. A forward-looking long-run cost study must utilize most efficient technology, including the costs of implementing it. The costs of implementing new OSS are clearly part of the forward-looking long-run costs and should be reflected in the cost studies. AT&T's position is that if a new OSS is less expensive once installed, then it must be used in the cost study with no account for the transition and investment costs for the new system.

Thus, once again, the pieces of the AT&T position come together to produce an illusory cost level. These "more efficient" OSS should already be deployed, and so the costs of acquiring and implementing them need not be considered. Since these costs are irrelevant, according to AT&T, these new OSS are clearly cheaper than the plant and practices currently used by SWBT.

Q. DO YOU HAVE ANY OTHER CONCERNS WITH THE OTHER PARTIES' APPROACHES TO MODELING NON-RECURRING COSTS? (JA0055)

A. Yes, AT&T calls for the use of a 2% fall out rate and all-mechanized OSS. However, no evidence has been provided that these standards represent efficient deployment of currently feasible technologies for UNE ordering. In addition, not all CLECs will be fully mechanized, so manual processing will still be required for some service orders. The view that all OSS should be mechanized reflects an erroneous interpretation of what efficiency means. Under the AT&T interpretation, non-mechanized CLECs would be inefficient and they would be forced to adopt mechanized practices. This ignores the reality that it would not be efficient for all CLECs to adopt mechanized processes, even if these were fully available today. Similarly, it would not be efficient for SWBT to adopt only mechanized OSS to process CLEC orders.

Q. WHAT IS THE ISSUE ABOUT DOUBLE-COUNTING OF NON-RECURRING COSTS? (AD0001, AD0004, JA0059)

A. The non-recurring activities associated with UNE orders are new activities – by definition, they cannot be double-recovered when maintenance factors are based on a time period which precedes UNE offerings. Some functions may be performed which are similar to those included in the development of maintenance factors. However, the development of a labor rate cannot entail double-recovery until it is applied to some activity, and then, only to the extent that the same activity is charged to two accounts. The potential for future double counting exists, but only to the extent that UNE orders displace such activities now performed in association with retail customers. It should be expected, however, that displacement will be minimal, as the overall level of these non-recurring activities will increase in a competitive environment. One of the likely effects of competition will be increased customer churn, as has been experienced in interLATA long-distance markets. This will increase the aggregate level of non-recurring costs in the industry; this is one of the costs of competition. SWBT essentially treats these non-recurring costs associated with UNEs as new costs to the company.

To the extent that some of these costs are offset by cost reductions in retail services, future cost studies will reflect that fact. It is the design of SWBT cost studies ("what does it cost?") which ensures that any cost offsets will be reflected in these studies. At issue here, is whether or not to include such offsets before they have occurred. To do so would impose asymmetric risk on SWBT (that the cost reductions may not occur) while granting AT&T a subsidy.

Q. IF THE COMMISSION FINDS THAT SOME OF THE NON-RECURRING COSTS SHOULD BE VIEWED AS "DOUBLE-RECOVERING" SOME OF THE MAINTENANCE COSTS, THEN IS IT MORE APPROPRIATE TO REDUCE THE NON-RECURRING COSTS OR THE MAINTENANCE FACTOR?

A. The Commission should try to avoid speculating as to how much, if any, of these costs will be double-counted in the future. If the Commission finds it necessary to do so, then it is better to adjust the maintenance factor than to reduce the non-recurring costs, for several reasons. First, given that any prediction is subject to error, the error is spread over a larger base through the maintenance factor, which applies to all UNEs. Second, the non-recurring costs will occur – it is the extent to which other costs are reduced that is in question. Third, keeping the adjustments within the maintenance factor will facilitate future calibration with the actual data in order to determine whether, in fact, some of the new activities have been offset through reductions in current activities. Fourth, to the extent that churn turns out to be different than expected (either greater or smaller), the nonrecurring payments will automatically adjust. If they were zeroed out on the assumption that maintenance factors already include these costs, then any change in nonrecurring activities would have no impact on cost recovery. Thus, if such speculative adjustment were made, the link between the activities that cause these costs and the costs that are recovered would be severed.

Q. IS IT APPROPRIATE FOR SWBT TO USE EXISTING LABOR RATES IN ITS COST STUDIES? (AB0003)

A. Yes, provided that there is no compelling evidence that such rates should be expected to rise or fall (apart from general inflation) over the near future. BJA/Staff correctly points out that a long-run cost study should not be bound by existing labor contracts . However, these contracts are the best indication of expected labor costs. There is no reason to speculate that such costs will be lower in the future - in fact, there is evidence that skilled labor rates are rising faster than inflation. The BJA/Staff reference to a "scorched node" network is of little relevance to the appropriate labor costs to use in a forward-looking long-run cost study. It is merely an invitation to engage in asymmetric

speculation that future costs will somehow be lower, without providing any evidence in support of such an assumption.

Demand Growth

Q. IS THERE A MISMATCH BETWEEN THE USE OF CURRENT MINUTES IN SWBT'S SWITCHING COST STUDIES AND THE LIFE CYCLE APPROACH TO ESTIMATING SWITCH DISCOUNTS? (DA0009, DA0012, DA0013)

A. No, SWBT's methodology is correct. The use of current minutes is appropriate since SWBT's cost studies use the current snapshot of the dynamic network as the basis for cost estimation. If future minutes of use are to be used as the denominator is cost calculations, then the investments required to serve usage growth must also be included.

The life cycle approach to estimating switch cost discounts is required because the SCIS model uses a single switch discount per switch and the proper discount needs to also reflect dynamic network processes. In a dynamic network, demand at each point in time will be served by switches at different points in their life cycles - some of the capacity may be new switch capacity (with relatively high discounts) and some of the capacity will be provided by growth jobs (with relatively lower discounts). SWBT's life cycle approach to switching costs provides a single discount representative of the mixture of different aged switches that actually exists, and is likely to exist in the future, in SWBT's network.

AT&T would have only replacement jobs used in estimating switch costs or asks that growth in minutes of use be accounted for in the denominator when calculating switching costs/minute. Replacement costs assumes a world in which all switching capacity is placed at a single point in time - a static fiction, not representative of any real network. Accounting for minutes growth (a speculative assumption, in any case) is a dynamic consideration but requires

that the dynamics of investment also be included in the model. SWBT's life cycle approach to switch discounts is not an attempt to model future switch investments, but an attempt to accurately describe the current snapshot of switch investments.

Q. DOES THIS MEAN THAT SWBT HAS COSTED ITS EMBEDDED SWITCHING NETWORK?

A. No. SWBT has replaced its analog switches with digital switches, as well as using current switch discounts in determining switch prices. The mixture of *replacement and growth jobs is a reflection of both the present and expected* future switching network. This is necessary if switching costs are to be an accurate forward-looking costs of SWBT-provided switching services.

Q. MUST SWBT EXPLICITLY MODEL GROWTH IN LINES IN BOTH ITS SWITCHING AND LOOP COST STUDIES?

A. No. SWBT's methodology produces an accurate snapshot of a dynamic process. If demand growth (lines, usage, or otherwise) is to be accounted for in a cost study, then the dynamics of investment must also be included. Dynamic models are far more complex to build, and are unnecessary. A snapshot of the real dynamic processes used in SWBT's network is an accurate representation of dynamic costs. The only dynamic adjustments to this snapshot which are appropriate are for the likely trends in input prices over the near future (as discussed above). Selective use of dynamic inputs (for instance, including growth in the denominator of per unit costs, but not in the numerator) only produces biased results.

Pricing

Q. DOES AT&T CORRECTLY INTERPRET THE PRICING REQUIREMENTS OF THE ACT? (DA0001, MA0011)

A. No, the Act only specifies that UNE prices should be based on cost, nondiscriminatory, established without a rate of return proceeding, and be just and reasonable. The Act (Sec. 251) requires SWBT to unbundle its existing network, not some future network. SWBT proposes to base UNE prices on TELRIC (including a contribution to common costs). TELRIC only requires a forward-looking cost of SWBT's existing network. AT&T confuses forward-looking technology with forward-looking costs. Forward-looking costs will vary from embedded costs for known and quantifiable reasons (as discussed in my Direct testimony in the previous phase of this docket). Technology choice should vary in the two types of models only to the extent that the technology currently being installed in the network differs from that in the embedded base.

AT&T confuses the fact that SWBT cost studies quantify the forward-looking cost of its existing network in Kansas, and that the UNEs being priced are unbundled parts of that existing network. SWBT cost studies, however, do estimate the forward-looking costs of this network - based on most efficient technology and current engineering plans. The Act does not say that costs are to be based on a network different than SWBT's actual network.

The AT&T position is ironic considering AT&T's own definition of "forward-looking" costs. According to the AT&T Brief in Support of Its Motion for Summary Judgment (at 12) in Civil Action No. 3:97CV493 (GTE v. Virginia Commission, U.S. District Court for the Eastern District of Virginia), forward-looking costs are defined as:

"'Forward-looking' costs and 'historic' cost are simply two different ways to estimate 'cost' of the same wires and equipment. The forward-looking approach is premised on the fact that the cost of providing facilities today is their replacement cost - the true economic cost that constrains rates in competitive markets - not what was spent in the past. The historic cost approach, by contrast, looks to the company's accounting books and is based on the level of expenditures (less depreciation)."

This definition is not consistent with AT&T's proposal to base SWBT's UNE prices on the costs of different technology and practices than SWBT actually uses.[10] There is no hint in AT&T's own definition that a forward-looking cost study should speculate concerning how future operating costs might differ from (in particular, be lower than) current operating costs. However, that is precisely what AT&T's "inputs" in this proceeding constitute - gross speculations. The fact is (as I described in my direct testimony in the earlier phase of this docket) that forward-looking costs should not differ too much from embedded costs. It is the AT&T proposed inputs which violate both economic principles and common sense.

Q. WHAT RELATIONSHIP SHOULD BE EXPECTED BETWEEN SWBT'S TELRIC COSTS AND THE RETAIL PRICES FOR ITS SERVICES?

A. Unless carefully conducted, such comparisons are "apples and oranges" comparisons. Retail prices (as for many of the retail loop related services cited by AT&T) are subject to a LRIC price floor. Many such services are limited in availability geographically or have special bundling or contractual provisions (such as long-term contracts). Some services are designed to utilized excess capacity which may exist in SWBT's network. Other services have highly deaveraged prices reflecting competitive market conditions (e.g., PLEXAR prices vary considerably depending on distance from the central office). All of these services (except for basic residential service which has been priced according to public interest objectives) are priced above a LRIC floor, with market conditions determining the extent to which there is any contribution towards common costs and/or SWBT profits. It is important to note that LRIC studies conducted for retail services entail significantly higher common costs than TELRIC studies for network elements (in other words, the

[10] The AT&T definition is not quite correct, since a forward-looking study need not use the same wires and equipment as in the embedded network. The technology may differ, but only to the degree that the technology currently being deployed in the network differs from the embedded network technology. The degree of this difference, however, is far less than that proposed by AT&T in this proceeding.

attributable price floor is relatively low for services, since a much larger portion of SWBT's costs are common across services than across elements).[11]

UNE prices, on the other hand, are wholesale price levels which can impose no restrictions in the purchaser's use of the unbundled network element. Since the TELRIC costs (plus a contribution to common costs) are used to determine a price level, and not just a price floor, these costs must fully cover *all direct costs plus contributions to common costs and normal profits.* Market conditions are not permitted to determine these contributions - they are to be fixed by formula pricing. From an economic point of view, such formula pricing is inflexible and undesirable in competitive markets. However, given that that is how the KCC is setting UNE prices, the determination of a price level to be applied without restriction is very different than the determination of a price floor relevant to targeted services. No relationship should be expected between the two.

Q. SHOULD UNE PRICING BE COMPETITIVE WITH ALL SWBT RETAIL PRICES?

A. No, this would only result in inefficient cream-skimming. Some SWBT retail prices (e.g., basic residential, particularly rural, service) have historically been set at levels below cost. Other services have deaveraged prices according to market conditions. Since use of UNEs cannot be restricted in any way, UNE prices will not be competitive with some services and in some areas. To force UNE prices to compete with SWBT's lowest retail price anywhere would not permit SWBT the opportunity to earn a reasonable profit. It is analogous to requiring an airline to price all of its seats at stand-by fares. Some seats can be priced that way, but an airline would be bankrupt if forced to sell all of its seats at that level.

[11] In fact, this was much of the basis for the FCC's development of the TELRIC methodology - that common costs would be significantly lower for elements than have traditionally been the case with services. The

The disparity between some retail prices and UNE prices might be a problem if that were the only entry means available to CLECs. But it is not. CLECs have two additional avenues for entry: resale and facilities-based entry. Indeed, the UNE price will not be competitive for customers with private lines (or similar targeted services) located close to central offices. This is precisely the segment of the market where facilities-based entry has been occurring and will continue to take place. To insist that UNEs should be competitive under such circumstances is to impose a loss on SWBT for virtually all other uses of UNEs.

Q. SHOULD UNE PRICES MIMIC THE PRICES THAT WOULD RESULT FROM LONG-RUN COMPETITIVE CONDITIONS?

A. This is potentially the most crucial underlying dispute in this proceeding. SWBT cost studies make no pretense to represent, or not to represent, long-run perfectly competitive market conditions. The cost studies attempt to answer the question, "what does it cost SWBT, on a going forward basis, to provide these network elements?" This is the correct price signal to send to potential and actual competitors, on which they can base their entry, investment and pricing decisions. That is how the market process works. The outcome will be that the most efficient providers will succeed.

The alternative is for this Commission to attempt to determine, not what SWBT's costs are, but what they might be under unspecified long-run competitive conditions. This task is futile - the information to make this judgement simply does not exist. To attempt to answer this question is to replace the market process with a regulatory process. The Telecommunications Act of 1996 called for market processes to deliver an advanced infrastructure. Unbundling, open entry, non-discrimination, and prices based on the costs that SWBT actually incurs, are the means to obtain this objective.

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advantage of this is to reduce the problem of arbitrary allocation of common costs.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

Curriculum Vitae

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June 1998

PERSONAL INFORMATION

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EDUCATION

State University of New York at Stony Brook, B.A.
cum laude (Economics), 1972, New York State Regents Scholarship 1968-1972, Summer Intern, Suffolk County Human Rights Commission, 1971.

University of Rochester, M.A. 1975, Ph.D. 1981
University Fellowship, 1972-1975
Research Assistantship, Fall, 1974
Teaching Assistantship, Spring, 1975
Ph.D. Dissertation: "Technology and Optimal Exhaustible Resource Depletion," supervised by Hersh Shefrin.

GRANTS

Co-principal investigator (with Dennis Weisman) for American Enterprise Institute book on the Telecommunications Act of 1996 (target publication for late 1998).

PUBLICATIONS:

"A Yardstick Approach to Optimal Access Pricing," with D.L. Weisman, chapter 12 in Telecommunications Transformation: Technology, Strategy and Policy, edited by E. Bohlin and S.L. Levin, IOS Press, 1998, pp.175-189.

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"The Telecommunications Act of 1996: Jurisdiction, Coordination, and Rent Redistribution," presented at the Rutgers University Conference on Public Utility Regulation, May 1997.

"A Yardstick Approach to Optimal Access Pricing," to be presented at the Global Networking, '97 joint conference of ITS and ICCC, June, 1997.

"From Fully Distributed Costs to Fully Manipulable Costs," presentation on "The States -- Moving Beyond Interim Pricing" panel at "Interconnection...and the Competitive Checklist" conference of *Telecommunications Reports*, April 1997.

"Price Rigidities in Communications Networks," presented at the Rutgers University Conference on Public Utility Regulation, May 1996.

"Internet Information Services" at the 2nd Annual Aspen Internet Festival, October 1995.

"Electronic Commerce" presentation at Society and the Future of Computing, USACM, June 1995.

"The Future of Document Delivery" workshop for the Association of College Research Libraries, Pittsburgh, March 1995. Also, keynote address for the Colorado Interlibrary Loan Association, June, 1995.

"Telephone Pools and Economic Incentives," Rutgers University Conference on Public Utility Regulations, Newport, May, 1995.

"Rural Telecommunications Issues," presented at the National Association of State Utility Consumer Advocates, June 1994, Santa Fe.

"Avoiding Trickle-Down Infrastructures" presented at the l993 International Communication Association Conference.

"Local Exchange Competition and the Information Infrastructure," workshop for the Public Utilities Research Center, University of Florida, l992.

"Access Charges for Private Networks Interconnecting with Public Networks," presented at Columbia Institute for Tele-information, l99l, and the Telecommunications Policy Research Conference, l992.

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"Telecommunications Costing and Pricing Workshop, Public Utilities Research Center, University of Florida, 1991.

"Option Value and Telecommunications Demand," with D. Weisman and D. Kridel, presented at the Bellcore - Bell Canada Demand Modeling Conference, 1990.

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"Mass Market Information Services," presented at the Kennedy School of Government Telecommunications Policy Series, and at the 1988 International Telecommunications Society Conference.

"The External Costs of Bypass," with D.L. Weisman, presented at the TS Cost Recovery Conference, Bellcore, Seattle, July, 1986.

"Asymmetric Pricing and Arbitrage," with A.C. Larson, presented at the 6th International Conference on Forecasting and Analysis for Business Planning in the Information Age, Tokyo, December, 1986.

"A General Theory of Point-to-Point Long Distance Demand," with A.C. Larson and D.L. Weisman, presented at the 1984 Bell Communications Research Conference and at the Telecommunications Demand Modeling Conference in New Orleans, October,1985.

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"Exhaustible Resource Depletion Under Uncertainty," Working Paper #77-1, Saint Mary's University, 1977 - also presented at the Western Economics Association Meetings, June 1977 and in the William Bennett Munro Memorial Seminar and Lecture Series, California Institute of Technology, 1977.

EXPERIENCE

1985 - present	Associate Professor Economics, Fort Lewis College, Durango, Colorado (on leave 1986-88, 1989-91, 1996-1997).
1996- 1997	Senior Economist, Southwestern Bell Telephone Company
1989 - 1991	Visiting Associate Professor of Economics, Villanova University.
1986 - 1988	Member of Technical Staff, Bell Communications Research. - Responsible foreconomic analysis of strategic planning and public policy issues associated with local telephone pricing and information services market development.
1983 - 1985	Assistant Professor of Economics, Fort Lewis College.
1982	Visiting Assistant Professor, The Economics Institute, University of Colorado, Boulder.
1981 - 1983	Assistant Professor of Economics, University of Colorado.
1980 - 1981	Visiting Professor of Economics, Williamette University, Salem, Oregon.
1979 - 1980	Lecturer in Economics, California Polytechnic State University, San Luis Obispo, California.
1977 - 1979	Assistant Professor of Economics, University of Santa Clara, California.
1976 - 1977	Lecturer in Economics, Saint Mary's University, Halifax, Nova Scotia, Canada.
1975 - 1976	Lecturer, Nazareth College of Rochester (part time).
Fall - 1975	Taught Introductory Economics at the Attica Correctional Facility Inmate Education Program, Genesee Community College.
1974 - 1975	Assistant Lecturer, University of Rochester, (part time)

OTHER EXPERIENCE

1994 - 1996 Faculty representative to the State Board of Agriculture (governing body for Fort Lewis College).

I989 - I992 Principal, TELA Group (with Brian Savin, Peter Temin, Joseph Weber): various contracts with domestic and international telephone companies and information providers.

Technical Reviewer for environmental cost and benefit valuation studies, Bonneville Power Administration, 1985 - 1986.

Principal Inv estigator for Energy and Resource Consultants, Inc. on "A Review and Analysis of Alternative Methods for Valuing Damage to Natural Resources," prepared for the American Petroleum Institute, 1985. Acid Rain Deposition Contract, Energy and Resource Consultants, Inc.,1983-1984, contributing consultant.

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- Oklahoma Corporation Commission, Cause Nos. PUD 97000213 and 97000442, Rebuttal testimony on behalf of Southwestern Bell Telephone Company regarding cost and price methodologies for UNEs, March 1998.

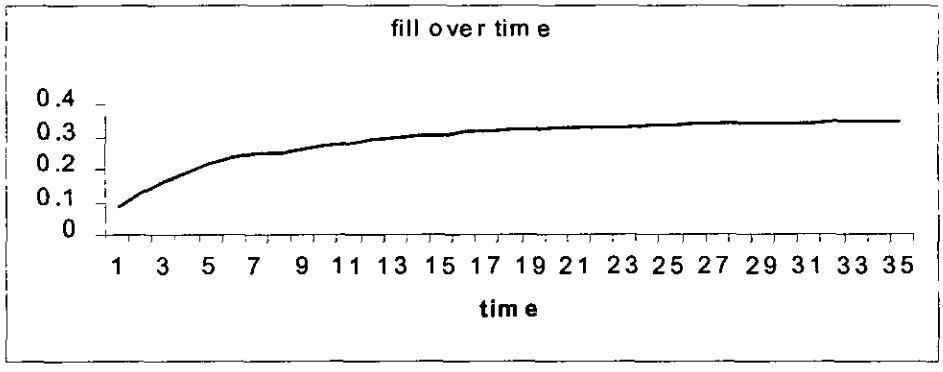
- Colorado Public Utilities Commission, Docket No. 97A-540T, rebuttal testimony on behalf of US WEST Communications regarding alternative regulation, May 1998.

- Kansas Corporation Commission, Docket No. 97-SWBT0411-GIT, rebuttal testimony on behalf of Southwestern Bell Telephone Company regarding interLATA entry, June 1998.

Simulated Fill

AT&T and BJA/Staff believe that SWBT's "forward-looking" fill should somehow be higher than the fill actually experienced in SWBT's network today. Alternatively, actual fill may be an acceptable starting point in a forward-looking cost study, but that it should then increase to some optimal fill level over time (allowing for spare capacity). SWBT maintains that its actual fill factor is a sort of "steady-state" optimal fill - that placing facilities in advance of demand, allowing for spare, and recognizing migration patterns causes the current fill level to be what should be expected in the future. Good time series data on actual fill factors is not available. In order to investigate these disparate claims, I conduct a simple simulation exercise.

I simulate 35 years of data. Each and every year, a network to serve a new subdivision of size 6 is constructed (6 dwelling units). I assume that two lines are installed per dwelling unit. I assume that 2 units are immediately filled (one line each) and an additional unit is filled each year until the subdivision is 67% filled (at which time the network in that subdivision will have 33% fill). The following year a second line is added to one house in each subdivision, and another second line is added 5 years later (for an eventual subdivision fill of 50%). In addition, I assume that a cumulative level of 25% of the used lines experience migration which "strands" these facilities (i.e., the occupant moves out and nobody moves in, either due to changes in living patterns or natural disasters which destroy the building). In effect, this amounts to an annual "stranding" of facilities equal to 25% of the increase in total used lines. Under these conditions, the following graph illustrates the time pattern of actual fill factors:



Note that the fill rapidly stabilizes, and stabilizes at something considerably less than the idealized (subdivision-specific) fill. Different parameters will clearly alter the results. More rapid migration will decrease fill, more demand for second lines will increase it, etc. Regardless of parameters, the asymptotic nature of fill remains (it becomes level after a fairly short period of time).

These numbers are not intended to fully represent reality. What they demonstrate is that in a dynamic setting (facilities placed in advance of demand, readiness-to-serve obligations, and customer migration which strands facilities), realized fill should be expected to be relatively constant, and significantly below "objective" or "optimal" levels. This model should be viewed in the context of the purpose of simplified models, well described by Paul Krugman1:

"The important point is that any kind of model of a complex system - a physical model, a computer simulation, or a pencil-and-paper mathematical representation - amounts to pretty much the same kind of procedure. You make a set of clearly untrue simplifications to get the system down to something you can handle; those simplifications are dictated partly by guesses about what is important, partly by the modeling techniques available. And the end result, if the model is a good one, is an improved insight into why the vastly more complex real system behaves the way it does."

I do not offer the numbers in this exhibit as accurate representations of what to expect. The level for this fill may still be questioned (for example, some may believe that the correct "spare" capacity should less than 50% greater than ultimately expected demand; others may wish to assume that competitive entry will cause a larger stranding of facilities, etc.). However, the facts that

fill does not generally increase over time in a dynamic setting, and that
actual network fill is significantly lower than the anticipated fill for any specific facility

are what I offer as the improved insights into the vastly more complex real dynamic system. The position that fill begins at current actual fill and rises to some objective optimal level is but a static fiction. This simple model provides an example of the types of considerations that must go into a properly dynamic model - considerations which are absent from either the AT&T or BJA/Staff depiction of network utilization.

Two additional observations:

First, AT&T suggests that SWBT's actual fill reflects historic inefficient practices that result from rate of return regulation. If this were true, we should expect to see significantly different fill levels between Texas (which has operated under incentive regulation for almost a decade) and Kansas (which has used rate of return regulation).

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1 Paul Krugman, Development, Geography, and Economic Theory, The MIT Press, 1995, page 71.

The distribution fill factors for SWBT's five states are:

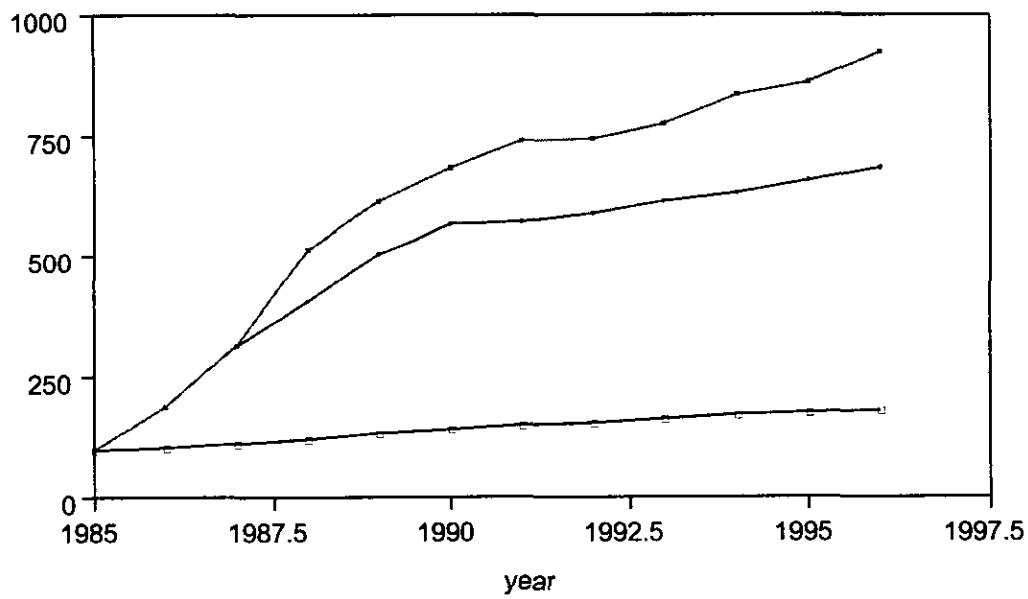
The relative constancy of distribution fill across states is further evidence that these fill levels are the result of efficient network planning in a dynamic environment.

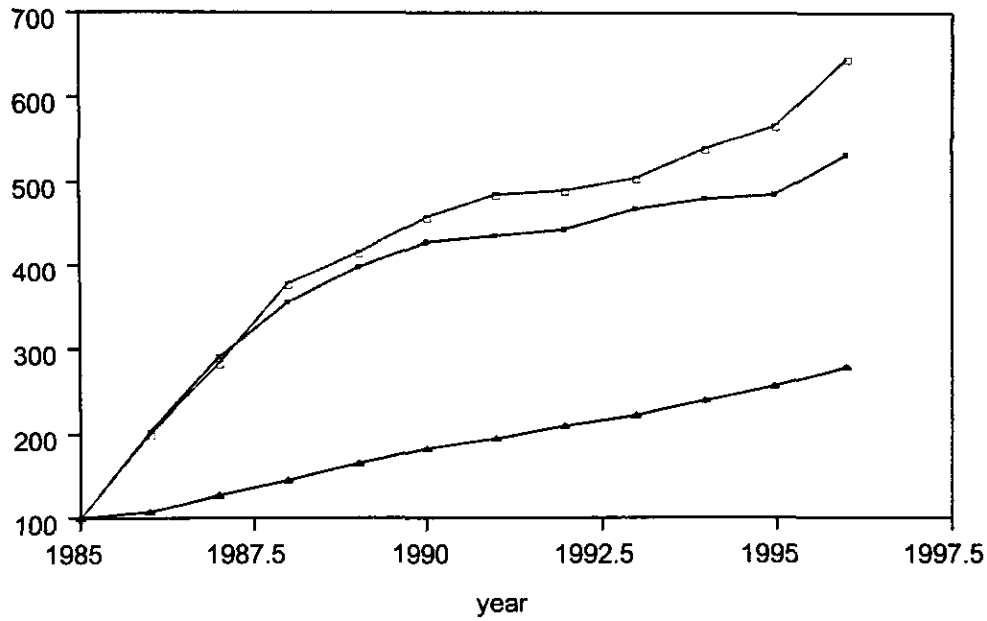
Second, the burden of proof for demonstrating that SWBT's fill factors should be higher clearly falls on AT&T and BJA/Staff. The FCC Order, at ¶680 says that incumbent local exchange companies have the burden of proof for demonstrating their forward-looking costs, given that they possess better cost information than either regulators or CLECs. The only superior cost information that SWBT possesses is information about what SWBT's costs are, not what they might be. No party is disputing that SWBT's distribution fill in Kansas is XXX%, only that they think it should be higher. SWBT's burden of proof is to support the fact that fill is XXX%. The case for fill to increase from current actuals to some hypothetical higher level is based on an inappropriate static model, as demonstrated above. The case that fill should somehow be higher in a forward-looking world is devoid of any of the dynamic considerations which would support such a position. The case that the "steady-state" fill factor "should be higher" than what SWBT experiences is simply unsupported.

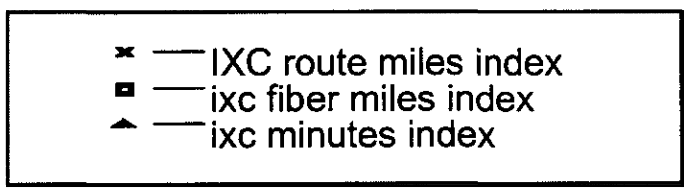
IXC Capacity and Usage

This data comes from two publications: *Fiber Deployment Update*: End of Year 1996, by Jonathan M. Kraushaar, Federal Communications Commission, 1997; and *Trends in Telephone Service*, Federal Communications Commission, February 1998. Two measures of long-distance capacity are considered: route miles and fiber miles. Usage is measured by interstate switched access minutes. There are no unambiguous measures of long-distance network capacity or usage, as discussed in the FCC Fiber Deployment Update. Rather than attempt to derive a measure of utilization, I examine the time trends of these two capacity measures and one usage measure. In order to focus on the time trends, I have indexed all time series so that the 1985 figure is 100. The following two graphs show the time trends for AT&T and the total IXC industry:

AT&T Route miles, fiber miles, and minutes (indexed: 1985=100







As both graphs show, both capacity measures have increased far more rapidly than usage. Thus, the IXC industry suggests that utilization may decrease in an increasingly competitive environment, not that it will decrease.

"BEST IN CLASS" COMMON COST ALLOCATORS

In this attachment I demonstrate that a higher common cost allocator reveals nothing about efficiency or "best in class" practices. Suppose, as AT&T maintains, that SWBT's allocator, α, is higher in Kansas (k) than some other state (o). Then, letting C represent common cost and TC be total cost, we have

$$\alpha_k \equiv \frac{C_k}{TC_k - C_k} > \frac{C_o}{TC_o - C_o} \equiv \alpha_o$$

Cross multiplying each of the equalities and simplifying, gives

$$C_k = \frac{\alpha_k}{1+\alpha_k} TC_k \quad and \quad C_o = \frac{\alpha_o}{1+\alpha_o} TC_o.$$

These expressions give common cost as a percent of total cost (the allocator was as a percent of total cost net of common cost). Since α is higher in Kansas than the Other State (by assumption), then common costs are a higher percent of total cost in Kansas than the Other State. But this means that costs other than common costs must be a lower percent of total cost in Kansas than in the Other State. So, this Other "best in class" state has a lower common cost allocator but has other costs accounting for a higher percent of total cost. What is "best in class" about that?

Consider a concrete example: suppose that the common cost allocator in Kansas is 15% and in some Other state (hypothetical) it is 10%. The following table shows how common costs and other than common costs (attributable costs) compare between the two states:

	Kansas	Other State (hypothetical)
Common cost allocator	15%	10%
Common cost as % of total cost	13%	9%
Other costs as % of total cost	87%	91%

Clearly, if this means that Kansas is less efficient than the Other state with respect to common cost, then Kansas is more efficient in other areas. The error derives from viewing a low common cost percent as somehow desirable. By definition, if common costs are a lower percent of the total, then other costs are a higher percent. In fact, there is no economic basis for believing that a low ratio of common costs is efficient. Common costs are generally associated with significant economies of scope, an efficiency which firms strive to obtain.

The result of this analysis is that nothing desirable (or undesirable) should be inferred from the size of the common cost allocator, since it is a percentage measure.