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ILLINOIS COMMERCE COMMISSION

Illinois Bell Telephone Company	)	
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Filing to increase Unbundled Loop and	)	**Docket No. 02-0864**
Nonrecurring Rates	)	
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SUPPLEMENTAL SURREBUTTAL TESTIMONY OF

MICHAEL STARKEY
WARREN FISCHER, C.P.A.

On behalf of

AT&T Communications of Illinois, Inc.
WorldCom, Inc. d/b/a MCI
McLeodUSA Telecommunications Services, Inc.
Covad Communications Company
TDS Metrocom, LLC
RCN Telecom Services of Illinois, LLC
Globalcom, Inc.
Z-Tel Communications, Inc.
XO Illinois, Inc.
Forte Communications, Inc.
CIMCO Communications, Inc.

March 5, 2004

AT&T/JOINT CLEC EXHIBIT 1.3

PUBLIC VERSION

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ATTACHMENT MS/WF-23: SBC's Actual Fill Factors Adjusted for Inefficiency (**CONFIDENTIAL**)

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I. INTRODUCTION

IA. INTRODUCTION OF WITNESSES

Q. MR. STARKEY, PLEASE STATE YOUR FULL NAME AND BUSINESS ADDRESS FOR THE RECORD.

A. My name is Michael Starkey. My business address is QSI Consulting, Inc., 243 Dardenne Farms Drive, St. Charles, Missouri 63304-1002

Q. MR. FISCHER, PLEASE STATE YOUR FULL NAME AND BUSINESS ADDRESS FOR THE RECORD.

A. My name is Warren R. Fischer. My business address is 2500 Cherry Creek Drive South, Suite 319, Denver, Colorado 80209.

IB. PURPOSE OF TESTIMONY

Q. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY IN THIS DOCKET?

A. Yes, we circulated direct testimony on May 6, 2003 regarding SBC's proposals for Shared and Common costs, Annual Cost Factors ("ACFs"), investment factors, Support Asset Factors ("SAFs"), inflation and productivity factors and fill factors. Next, we circulated rebuttal testimony on January 20, 2004 addressing Staff's testimony that discussed SBC's decision to include support asset costs in its NRC

studies via its labor rates and to assign the mainframe portion of general purpose computing costs as direct costs in its cost studies. We recommended instead that these support asset costs be recovered through SBC's common cost factor. We then circulated surrebuttal testimony on February 20, 2004 to address issues raised by SBC and Staff in rebuttal testimony on numerous cost factor and fill factor issues.

Q. ON WHOSE BEHALF WAS THIS SUPPLEMENTAL SURREBUTTAL TESTIMONY PREPARED?

A. This testimony was prepared on behalf of the following companies: AT&T Communications of Illinois, Inc. ("AT&T"), WorldCom, Inc. d/b/a MCI ("MCI"), McLeodUSA Telecommunications Services, Inc., Covad Communications Company, TDS Metrocom, LLC, RCN Telecom Services of Illinois, LLC, Globalcom, Inc., Z-Tel Communications, Inc., XO Illinois, Inc., Forte Communications, Inc., and CIMCO Communications, Inc.

Q. WHAT IS THE PURPOSE OF YOUR SUPPLEMENTAL SURREBUTTAL TESTIMONY?

A. The purpose of our supplemental surrebuttal testimony is to address issues raised and proposals made by Staff witness Dr. Qin Liu on fill factors.

Q. HAVE YOU HAD AN OPPORTUNITY TO REVIEW THE REBUTTAL TESTIMONY OF STAFF WITNESS DR. QIN LIU?

A. Yes, we have.

Q. PLEASE SUMMARIZE DR. QIN LIU'S REBUTTAL TESTIMONY AS IT RELATES TO FILL FACTORS.

A. In her testimony Dr. Qin Liu defends two general concepts: (1) that "target" and "usable capacity" fill factors like those we have recommended in this proceeding, do not represent a level of utilization likely to be found in an efficient, forward-looking network; and (2) that utilization likely to be found in a truly forward-looking, efficient network can be estimated by adjusting upwards actual utilization levels.[1]

Q. DO YOU AGREE WITH DR. QIN LIU'S CONCLUSIONS?

A. Obviously, we do not agree with the first of Dr. Qin Liu's conclusions. Dr. Qin Liu misinterprets the essence of a proper TELRIC approach, and it is this misinterpretation that limits her vision with respect to usable capacity (and likewise "target") fill factors. In this testimony we identify the primary mistake in her interpretation of a proper TELRIC approach and explain why the fill factors that we have recommended in this proceeding properly estimate the utilization that can be expected in a truly efficient, forward-looking network.

[1] Rebuttal Testimony of Dr. Qin Liu submitted February 20, 2004, pp. 4-5, 13-18.

With respect to Dr. Qin Liu's second conclusion (i.e., her position that the Commission could construct efficient, forward-looking utilization assumptions using actual utilization as a starting point), we do not fundamentally disagree with Dr. Qin Liu's theory. Though we believe Dr. Qin Liu's analysis is overly simplistic, we agree that it provides the Commission with a useful theoretical foundation upon which it could rely. Such an approach, if applied properly, could provide useful information relative to forward-looking fill assumptions. Unfortunately, Dr. Qin Liu did not conduct a sufficiently detailed analysis and failed to provide empirical support in applying her own theory. As a result, her adjusted fill factors dramatically understate utilization levels that are appropriate in an efficient, forward looking environment.

II. "USABLE CAPACITY" FILL FACTORS AND AN EFFICIENT NETWORK DESIGN

Q. IN YOUR TESTIMONY ABOVE, YOU ARE CRITICAL OF DR. QIN LIU'S TESTIMONY AS IT RELATES TO YOUR FILL FACTOR RECOMMENDATIONS. PLEASE EXPLAIN WHY.

A. Dr. Qin Liu makes an important methodological error in evaluating the levels of utilization that could be achieved in a least-cost, most-efficient, forward-looking network design. More specifically, she mixes and matches both static and dynamic

concepts of demand and network sizing, with the result being an improper comparison of the two (from which follows her improper dismissal of usable capacity fill as a forward-looking level of utilization).

Q. PLEASE FURTHER EXPLAIN YOUR VIEW THAT DR. QIN LIU MIXES AND MATCHES STATIC AND DYNAMIC CONCEPTS AS THEY RELATE TO DEMAND AND NETWORK SIZING.

A. As we explained in our direct testimony, the FCC's rules require a proper TELRIC study to be constructed in the following fashion: (1) identify a reasonable "projection of the actual total usage" at a point in time, necessary to accommodate the entirety of the ILEC's wholesale and retail services, (2) after identifying that level of demand, build a network sized to serve that demand using the most efficient, least-cost forward-looking network technology and practices currently available, (3) calculate the total costs associated with building the network in step 2 above and, finally, (4) divide those total costs by the amount of demand projected in step (1) above. Note that in the described process, both the demand and the size of the network are static in nature, i.e., they have both been established at a given point in time – a "snapshot," if you will. It is critical that both primary components of the analysis – demand and network size – be consistent (i.e., both are static, or both are dynamic) when developing a proper fill factor. Unfortunately, Dr. Qin Liu fails to heed this fundamental requirement when she criticizes the use of either usable capacity or target fill factors.

Q. PLEASE EXPLAIN FURTHER.

A. At page 4 of her February 20th, 2004 rebuttal testimony Dr. Qin Liu states the following:

> … Joint CLECs' contention that Usable Capacity fills are the TELRIC fills envisioned by the FCC implicitly assumes either that there is no growth in future demand or that the forward-looking network can be sized or resized at no significant fixed and sunk costs.

Dr. Qin Liu's statement is only partially correct. First, Dr. Qin Liu is correct that our underlying assumption is that future demand can be ignored; however, it is not an implicit assumption, it is explicit and intentional. Second, Dr. Qin Liu is incorrect when she suggests that we implicitly assume that the network can either be sized or resized without significant fixed and sunk costs. In fact, fixed or sunk costs are not particularly relevant to the discussion because TELRIC methodology assumes that all costs are variable. Under the TELRIC concept, the network is sized using most efficient, forward-looking technology to accommodate customer demand. Consistent with this requirement, we assume that the capacity of the network and the demand accommodated by the network must either be measured (1) at a *point in time* – with both variables observed in a static environment, or (2) *over some identifiable timeframe* – at which both demand and network capacity are viewed dynamically as a time-adjusted stream of measurements. We have chosen the first of these options because it is equally valid and because it is the very process that Ameritech used to

develop its fill factors in its internal costing document. Accordingly, we continue to advocate this approach. While the same fill factors would likely result from diligently applying the second type of analysis (i.e., dynamic), the amount of information, time and effort required to identify and negate any short term influences, and the likelihood that assumptions of that magnitude would yield workable results convince us that the application of such a dynamic analysis is a less practicable approach.

Q. DOES DR. QIN LIU PREFER THE DYNAMIC APPROACH?

A. In the first, theoretical part of her testimony, Dr. Qin Liu discusses this same dynamic approach. However, she does not suggest applying such an approach. Instead she simply provides the notion as a theoretical construct. More importantly, in making her recommendations, Dr. Qin Liu does not draw a sufficient distinction between SBC's actual network and a forward looking network. For example, Dr. Qin Liu erroneously implies that an efficient network would size distribution for ultimate demand. As she explains in a recent data response, she bases this conclusion on the SBC's engineering guidelines.[2] Clearly, ILECs' engineering guidelines do not necessarily represent the forward-looking practices. Below we discuss in detail how DSL and wireless telephony are causing a significant reduction in customers' demand for second lines. In the light of this decrease in demand, SBC's practice of installing two lines per living unit is becoming outdated.

[2] Staff's Response to Data Request AT&T MS-155.

Further, Dr. Qin Liu does not make a sufficient distinction between *engineering* and *costing* principles. As we discussed in our Surrebuttal Testimony,[3] the FCC's Virginia Arbitration Order explicitly rejected the concept of ultimate demand in favor of current demand when determining fill factors for the *distribution* network and explained that it is inappropriate to charge CLECs for the uncertain ultimate demand.[4] By mixing the concepts of actual/forward-looking designs and engineering/costing principles Dr. Qin Liu incorrectly concludes that either usable capacity and/or target fills are unattainable in a forward-looking network.

As we stated above, if we assume that (1) both the size of the network and the demand accommodated by that network are analyzed at a specific point in time and (2) that we have sized our network specifically to accommodate that known level of demand, it is only logical that we would size the network so as to maximize its capabilities. The result would be a network operating at usable capacity (or at a level where additional demand sparks the need for additional investment, i.e., target fill). This is exactly what the FCC requires.

[3] Surrebuttal Testimony of Michael Starkey and Warren Fischer submitted February 20, 2004, page 78.

[4] FCC *Memorandum Opinion and Order*. CC Dockets No. 00-218 and 00-251. Adopted August 28, 2003, paragraph 254 (*Virginia Order*).

Q. WHY SHOULDN'T WE CONSIDER ADDITIONAL NETWORK CAPACITY REQUIRED TO ACCOMMODATE ADDITIONAL DEMAND?

A. As we describe above, we could use such a dynamic approach. We could, with equal validity, assume that demand grows over time, and that the network must grow over time to accommodate the increasing demand. However, if we chose to apply such an approach, we would need to measure both the growing demand and increasing network investment over a sufficient period of time so as to remove short-term influences (i.e., TELRIC is a long-run concept). In doing so, we would necessarily end up at the same place we do when using the simpler static approach, i.e., usable capacity.

III. DR. QIN LIU'S METHOD OF ESTIMATING EFFICIENT, FORWARD-LOOKING UTILIZATION

Q. PLEASE DESCRIBE DR. QIN LIU'S METHOD OF CALCULATING THE FILL FACTORS SPONSORED IN HER TESTIMONY.

A. Dr. Qin Liu opines that historical utilization can be used as an effective starting point in calculating forward-looking utilization as long as the analysis considers two forms of potential inefficiency exhibited by historical data: (a) "*ex ante*" inefficiency and (b) "*ex post*" inefficiency.[5] As we understand Dr. Qin Liu's theory, *ex ante* observations are meant to recognize inefficiencies (and hence unnecessary spare capacity) resulting from

[5] Id., pp. 20-22.

inefficiencies introduced as a result of investment incentives other than perfect operational efficiency. *Ex post* observations, on the other hand, measure inefficiencies resulting from imperfect information at the time of investment. According to Dr. Qin Liu, these constitute "innocent mistakes."[6]

In applying this theoretical model to practice, Dr. Qin Liu makes two qualitative judgment calls: (1) she assumes no *ex ante* inefficiencies in SBC's network – in other words, Dr. Qin Liu assumes that SBC was always making the most *efficient* operational decisions given the information available at the time; and (2) she concludes that *ex post* inefficiencies are almost certainly present and require adjustment. Further, Dr. Qin Liu speculates that distribution plant is more prone to *ex post* inefficiencies because it is built for a longer time horizon than feeder plant.

Finally, Dr. Qin Liu makes a quantitative judgment call by recommending specific numbers by which SBC's actual utilization data should be adjusted. These numbers are 15% (distribution) and 7.5% (feeder and DLC).

Q. WHAT EMPIRICAL SUPPORT DOES DR. QIN LIU PROVIDE FOR HER PROPOSED ADJUSTMENT PERCENTAGES?

[6] Id., p. 29.

A. None. Interestingly, instead of providing justification for the chosen numerical values, Dr. Qin Liu devotes almost two full pages[7] of her testimony to the unnecessarily detailed mathematical instructions on how to reduce a number by 15%. The only point that she makes is that the proposed adjustments represent *percentages* of the initial values (SBC's actual fills), rather than *percentage points.* Such unnecessary detail provided for a basic calculation appears to be an attempt to mask the fact that these numerical adjustments do not have any factual or empirical support. Moreover, two Data Requests to Staff (Attorney General 1.2 and AT&T MS-156) asked Dr. Qin Liu to provide support for these numbers. In response to both AT&T MS-156 and Attorney General 1.2, Dr. Qin Liu indicated that she does not have any supporting materials, data or analysis to justify her adjustments beyond theoretical discussion contained in her testimony.

In light of Dr. Qin Liu's complete lack of support for her 15% and 7.5% adjustments to SBC's actual capacity, *any* number drawn at random that produces meaningful fill factors (100 % or less) would be *no more or less arbitrary* than Dr. Qin Liu's proposed adjustment percentages. For example, by doubling Dr. Qin Liu's proposed adjustment percentages, we can generate a set of fill factors that is as valid and "well-founded" as Dr. Qin Liu's proposed fill factors. We present this equally valid set of fill factors in the following table.

[7] Id., pp. 29-30

[* BEGIN CONFIDENTIAL ***]**

Sensitivity Analysis of Staff's Arbitrary Assumptions

	Starting Point: SBC's Actual Fills	Staff's Assumptions: Increase Feeder Fill by 7.5 % and Distribution Fill by 15 %	Modified Assumptions: Increase Feeder Fill by 15 % and Distribution Fill by 30 %
Source	*1*	*2*	*3*
Copper Feeder			
Zone A			
Zone B			
Zone C			
DLC Chassis			
Zone A			
Zone B			
Zone C			
DLC Plug-in			
Zone A			
Zone B			
Zone C			
Distribution			
Zone A			
Zone B			
Zone C			

1 -- SBC's Actual Fill Study *ILCurrentFillData2002 (Jan02).xls*
2 -- Staff Schedule 25.2 to Rebuttal Testimony of Dr. Qin Liu
3 -- Calculated.

[* END CONFIDENTIAL ***]**

As if in an attempt to provide additional support for her proposal, Dr. Qin Liu proclaims that her resulting fill factors are "proxies for the FCC hypothetical fill factors."[8] Unfortunately, calling her proposal a "proxy" imparts no particular advantage to Dr. Qin Liu's method because all the "competing" fill factor concepts in this hearing are proxies for the forward-looking fills. What separates the different fill proposals is the degree of expertise, sound reasoning and empirical support upon which each proposal is based.

Q. DID DR. QIN LIU CRITICALLY REVIEW SBC'S ACTUAL DATA BEFORE CHOOSING IT AS THE BASIS FOR HER ADJUSTMENTS?

A. Apparently not.[9] In fact, it appears that Dr. Qin Liu did not undertake a sufficiently in-depth review of SBC's data; had she done so, she would have noticed that the observed consistent *downward trend* in SBC's actual fill factors clearly contradicts what Dr. Qin Liu describes as an efficient network:

> Moreover, the network utilization rate of an efficiently designed and maintained network is unlikely to have a consistent upward or downward trend.[10]

Similarly, if Dr. Qin Liu had thoroughly examined the data, she would have found, as we did, disturbingly high and increasing percentages of spare capacity due to defective

[8] Rebuttal Testimony of Dr. Qin Liu submitted February 20, 2004, p. 34.

[9] AT&T Data Request to Staff MS-158 asked this question. The following response was provided: "If the question seeks to determine whether Dr. Qin Liu has checked for accuracy each single number or figure in the datasets used by SBC to calculate its actual fill factor, the answer is that Dr. Qin Liu has not done so."

[10] Rebuttal Testimony of Dr. Qin Liu submitted February 20, 2004, p. 20.

facilities.[11] Such high percentages of defective plant, especially in combination with the consistent increase in the percentage of defective plant over time, are certainly not a characteristic of an efficient and well-maintained network. Finally, SBC's actual fill study is a "snapshot" study (one that uses a particular time period) and, as such, it is prone to short-term biases. There are at least two sources of such short-term biases that we identified. Besides the obvious adverse effects of the economic recession and the reduction in demand caused by recession, utilization levels in SBC's study were also affected by SBC's recent broadband initiative, as we have discussed in earlier testimony in this case. SBC's broadband network initiative has largely overlaid existing, working plant with new technology that substantially increases the network capacity available, while subsequently reducing the actual utilization of available plant.[12]

Q. WHEN MAKING THE INEFFICIENCY CORRECTIONS, DR. QIN LIU ASSUMES THAT SBC'S CURRENT NETWORK DOES NOT EXHIBIT ANY *EX ANTE* INEFFICIENCY[13]. DO YOU AGREE?

A. No, we disagree. Dr. Qin Liu uses the term *ex ante* inefficiency to describe network design that was inefficient *at the time* of its construction. Dr. Qin Liu bases her assumption on the belief that SBC was not over-investing in capital during the years of rate of return regulation. In fact, her assumption regarding *ex ante* inefficiency directly contradicts the

[11] Surrebuttal Testimony of Michael Starkey and Warren Fischer submitted February 20, 2004, pp. 115-127.

[12] Id., pp. 132-133.

testimony of Staff witness Dr. Genio Staranczak. For example, in his rebuttal testimony,[14] Dr. Staranczak explains in detail how rate of return regulation not only allows the regulated company to be less frugal in its investment decisions, but also creates incentives "to put in more spare plant than they are likely to ever require."[15]

Dr. Qin Liu bases her opinion about the absence of over-capitalization under a rate of return system on an academic paper – a paper that describes an abstract and over-simplified model. [16] For example, one of the key assumptions in this model is that capital is a perfectly variable input – clearly an assumption that does not apply to the telecommunications industry.[17] The authors explain that without this assumption, they would not be able to achieve their unambiguous results. In other words, if capital is not assumed to be perfectly variable, the authors would not otherwise be able to reach their conclusions. Given that this important assumption does not apply in the telecommunications industry, Dr. Qin Liu's reliance on this paper in support of her opinion (absence of *ex ante* inefficiency) is improper.

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13 Rebuttal Testimony of Dr. Qin Liu submitted February 20, 2004, p. 23.

14 Rebuttal Testimony of Dr. Staranczak submitted February 20, 2004, p. 14.

15 Id.

16 Bawa, V. and Sibley, D., "Dynamic Behavior of a Firm Subject to Stochastic Regulatory Review", International Economic Review, Vol. 21, No. 3 (October 1980).

17 Id., p. 629.

Q. WHY DO YOU EXPECT TO FIND *EX ANTE* INEFFICIENCY IN SBC'S NETWORK GIVEN THAT RATE OF RETURN REGULATION NO LONGER APPLIES TO SBC?

A. There are several sources of such inefficiency. First, as Dr. Staranczak correctly observed, many elements of SBC's network that exist today were constructed under rate of return regulation. Once this plant is in place, it is often uneconomical to remove it.[18] Second, Dr. Staranczak raised another important point: it takes time to change old habits, and SBC has apparently not rethought its *monopoly practices* of plant deployment. As an illustration Dr. Staranczak compares the continuing SBC practice of installing two lines in each new house despite SBC's own forecasts that predict a loss of a significant portion of its customers to wireless and cable industries in the near future.[19] Two other parties in this proceeding raised a similar point that the observed changes in demand render SBC's current engineering practices outdated. Both Citizens Utility Board witness Ms. Susan Baldwin and Attorney General witness Mr. William Dunkel explain that the availability of DSL service reduces the demand for a second line from customers who use the Internet.[20]

Further, Dr. Staranczak had good reason to use the word "monopoly" when critiquing SBC's loop deployment practices. It is the near monopoly status of SBC that creates

[18] Direct Testimony of Dr. Staranczak submitted May 6, 2003, p. 19.

[19] Rebuttal Testimony of Dr. Staranczak submitted February 20, 2004, p. 16.

302 room for inefficiency because a monopoly is not susceptible to the pressure and cost
303 discipline of a competitive market. An inefficient monopoly is able to stay in business
304 whereas an inefficient competitive firm would be driven out of business. This ability of a
305 monopoly to survive despite its inefficiency prompted economists to suggest that a
306 monopoly is prone to *X-inefficiency*, which is inefficiency that stems from *non-*
307 *optimizing* behavior and the separation of ownership and control.[21] This type of
308 inefficiency is different from the over-capitalization associated with rate of return
309 regulation because over-capitalization occurs as an *optimal* response to incorrectly set
310 incentives.
311
312 Apart from X-inefficiency, a monopoly is prone to another type of inefficiency. A
313 monopoly does not have any other firms to use as a standard in judging its own
314 efficiency. In contrast, a competitive market reflects production costs of efficient firms.
315 A particular firm in a competitive market knows that it can improve its efficiency if its
316 own costs are higher that the costs of efficient production.[22] As a result, a monopoly is

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[20] Rebuttal Testimony of Susan Baldwin submitted February 20, 2004, p. 8 and Surrebuttal Testimony of William Dunkel submitted February 20, 2004, p. 10.

[21] The general idea is that inefficiency arises because employees face individual incentives that are different from the best interest of the company. A monopoly is able to coexist with this inefficiency, while a competitive firm would not be able to. See, for example, Kenneth J. Button and Thomas G. Weyman-Jones, "Ownership Structure, Institutional Organization and Measured X-Efficiency," American Economic Review, vol. 82, No. 2 (May 1992), pp. 439-45.

[22] Dennis W. Carlton, Jeffrey M. Perloff. Modern Industrial Organization, Harper Collins College Publishers, 1994, p. 138.

slow at making efficiency improvements compared to a competitive market; said another way, it is *dynamically inefficient.*

Q. DESPITE ITS DEFICIENCIES, CAN DR. QIN LIU'S APPROACH PROVIDE THE COMMISSION WITH A METHOD OF APPROXIMATING FORWARD-LOOKING UTILIZATION LEVELS USING SBC'S "ACTUAL FILL FACTORS" AS A STARTING POINT?

A. With some important modifications it could. More specifically, Dr. Qin Liu's approach needs to be expanded and revised to include the following:

(1) SBC's "actual fill" data, the base upon which Dr. Qin Liu builds her adjusted fill factors in Schedule 25.2, would need to be corrected to account for the numerous problems we identified in our surrebuttal testimony. In order for Dr. Qin Liu's analysis to have any meaning, the actual level of utilization upon which the entire method is built must be calculated correctly.

(2) Dr. Qin Liu's decision to exclude any *ex ante* inefficiency adjustment is unreasonable. As we discussed above, Staff witness Dr. Staranczak explicitly expresses the opposite view. We also discussed above the various sources of inefficiency associated with a monopoly in addition to the potential for overcapitalization under rate of return regulation, which Dr. Qin Liu incorrectly dismissed. Further, initiatives that duplicate existing network capacity with new technology (e.g., technology substitution) can also distort efficiency and specifically, utilization *in the short term*. These effects are of particular relevance in the case of SBC Illinois (in large part because SBC's Illinois network has recently undergone a substantial overlay initiative aimed at providing SBC Illinois the ability to offer new *retail* services).

(3) Finally, if Dr. Qin Liu believes that "actual utilization" levels should serve as the floor from which adjustments are made to reach forward-looking utilization, correcting inefficiency through a more economically sound *frontiers* approach described below is required. This approach would more fully serve

Dr. Qin Liu's purposes than using the gross averages provided by SBC Illinois, or making unsupported numerical assumptions, as Dr. Qin Liu has done.

IV. A MORE ACCURATE IMPLEMENTATION OF DR. QIN LIU'S METHOD

Q. HOW DO YOU PROPOSE TO EVALUATE INEFFICIENCY THAT, AS DR. QIN LIU SUGGESTED, NEEDS TO BE REMOVED FROM SBC'S ACTUAL FILL FACTORS?

A. Economists *measure* inefficiency of a particular entity by comparing it with the best-observed practice. For example, if one company uses more inputs to produce the same amount of output as another company (other things being equal), the production process of the first company is inefficient. In this approach, what is being measured is the relative efficiency of one entity over another, and the best-observed practice represents a *frontier*, against which other entities are judged.

One obvious limitation of this frontier approach is that we cannot judge whether the frontier company itself is efficient or inefficient in absolute terms. This limitation might not be a serious factor when this approach is applied to a competitive market because, as we explained above, the mechanism of the competitive market drives the companies toward efficiency. Consequently, we expect no inefficiency for the frontier company, at least in the long run. However, when applied to a monopoly market, this limitation

becomes particularly important because, as we discussed above, a monopoly a) has an opportunity to be inefficient; b) might not have the same incentives to be as efficient as competitive firms; and c) unlike a competitive firm, does not have the same ability to compare itself against other companies and use this information to seek greater efficiency.

Despite its limitations, this approach is practicable, and we suggest applying it in order to evaluate whether *some* degree of inefficiency exists in SBC's actual network. This approach does not allow us to separate the sources of inefficiency into *ex post* inefficiency and *ex ante* inefficiency, but such a distinction adds nothing to the final result.

Q. PLEASE DESCRIBE HOW YOU APPLIED THIS FRONTIER APPROACH TO SBC'S ACTUAL CAPACITY UTILIZATION DATA.

A. We applied the frontier approach to SBC's capacity utilization at the wire center level. First, we noticed significant variations in the capacity utilization across SBC's wire centers. We also noticed that wire centers with relatively high fill factors in SBC's chosen study month (January 2002) tend to have high utilization levels in other periods of time. Similarly, wire centers with low fills in one month tend to stay at these low levels in other time periods. These observations suggest that some wire centers are more efficient relative to other wire centers. Such differences in efficiency could be due

to the *ex post* inefficiency suggested by Dr. Qin Liu. For example, it is possible that the demand forecast in the wire centers with high fills turned out to be more accurate than the demand forecast in the wire centers with low fill factors. However, it is also possible that the relatively low fill factors of some wire centers were due to *ex ante* inefficiency. For example, as is any industry, telecommunications is not immune from human error. Deploying a network requires a series of complex engineering decisions; network planners sometimes make mistakes, and certain engineers make better decisions than others.

Similarly, SBC's wire centers vary significantly in terms of the number of defective pairs – in some wire centers they are rather large, while in others they are only a fraction of a percent. As we showed in our surrebuttal testimony,[23] there are several reasons why SBC's actual counts of defective pairs should not be considered spare capacity. First, the actual percentages of defective pairs are too high for an efficient network. Second, SBC classifies some of its defective pairs as Universal Bad Pairs, which are pairs that are uneconomical to recover. In other words, SBC's loop inventory tracks these pairs, but they cannot be put back in use and, therefore, do not constitute spare capacity (in rate-of-return vernacular, they are not "used and useful."). Third, depreciation lives already account for the fact that some pairs become defective. Further, over [***** XXX ***]** of SBC's copper loop plant in service is fully depreciated. Since we expect

[23] Surrebuttal Testimony of Michael Starkey and Warren Fischer submitted February 20, 2004, pp. 115-127.

to find more defects in older plant, these defective pairs have already been fully recovered and therefore, should not be included in UNE prices.

Q. HOW DID YOU ADJUST FOR DEFECTIVE PAIRS?

A. Although the concept of defective pairs can hardly be associated with a forward-looking network design, we decided to allow for a small percentage of defective pairs nonetheless, as it is possible that defects may exist due to circumstances outside the control of SBC, such as manufacturer defects. Given that in a number of wire centers defective pairs constitute 1% or less of usable capacity, it appears that this percentage represents the best-observed practice. Using SBC's actual fill data,[24] we substituted the actual count of defective pairs with the calculated count – 1% of usable capacity (unless the actual count was smaller, in which case we kept the actual count) for each wire center. Using these adjusted counts of defective pairs, we recalculated the usable capacity (which includes defective pairs). This adjustment affected three fill factors for which usable capacity appears in the denominator of the fill formula – DLC chassis, copper feeder and distribution. The fills for DLC plug-in were not affected because we did not have the information to adjust the denominator of these fills, which is equipped capacity.

Q. HOW DID YOU REMOVE A PORTION OF *EX POST* INEFFICIENCY?

[24] SBC's fill factor study *ILCurrentFillData2002 (Jan02).xls*.

A. As we explained above, the wide variations in the fill factors across wire centers suggest that in some wire centers demand forecast turned out to be less accurate than in others (among other potential factors). Wire centers with the highest fill factors represent the best-observed practice, i.e., are relatively more *ex post* efficient. Recognizing that the variations in the fill factors across wire centers may be due to reasons other than relative efficiency (for example, differences in population patterns), we decided not to choose a single best wire center. Rather, we chose a number of "best-observed" wire centers in order to remove the likelihood of individual bias. It appears that Dr. Qin Liu was originally thinking along the same lines because she requested data for the five offices with the highest fills from SBC.[25] To be conservative, we picked the top 20 wire centers for each network component where wire center fill data were available (for copper feeder and distribution, DLC chassis and plug-in). Twenty wire centers constitute approximately 7% of the total wire centers in SBC's fill database.

We chose the top 20 wire centers, using the fills calculated as a result of the above described adjustment for defective pairs. We made our selections independently for each network component, i.e., the best wire centers in terms of copper feeder fill are not necessarily the same wire centers that are best in terms of the DLC chassis fill. After we made our selections, we used supplemental historical data[26] to make sure that

[25] Staff Data Requests to SBC QL 4.3-4.6.

[26] Attachments to SBC's response to Staff Data Requests QL 4.01, 4.02 and 4.10 contain capacity and usage data for 2002 and 2003.

no significant increases in capacity happened after the time of SBC's study. Such increases might indicate plant relief efforts, suggesting that the observed high fills might not be sustainable, at least in SBC's practice. If such plant relief efforts were suspected, we removed the wire center in question from the top 20 and replaced it with the wire center with the next highest fill. We also checked to make sure that the selected wire centers varied considerably in size (pair counts), so that our selected sets did not represent only small/rural or large/urban offices. The table below summarizes the adjusted fill factors, which we calculated as a weighted average of the fills in the top 20 wire centers.

[* BEGIN CONFIDENTIAL ***]**

Fill Factors of Top 20 Wire Centers (Adjusted for Defective Pairs).[27]

	Feeder Copper	DLC Chassis	DLC Plug In	Distribution Copper
Statewide				

[* END CONFIDENTIAL ***]**

Q. DID YOU MAKE ANY FURTHER ADJUSTMENTS?

A. Yes, we made one other, relatively small adjustment. As we explained in our surrebuttal testimony,[28] SBC's fill factors have been falling over time. Moreover, this

[27] Derivation of these numbers is contained in Attachment MS/WF-23, sheet *All Zones CLECs Analysis*.

[28] Surrebuttal Testimony of Michael Starkey and Warren Fischer submitted February 20, 2004, pp. 109-110.

decrease is happening because capacity is growing *despite* falling usage (an illogical result if network efficiency is a primary factor in SBC's engineering efforts). This disconnect between changes in capacity and usage could be attributed to various factors, including *ex ante* inefficiency – network deployment that ignores the changed realities of today's market, or *ex post* inefficiency – network deployment that is based in erroneous demand forecasts. Falling fills could also be due to various short-term phenomena – cyclical fluctuations in the economy (recession), or technological overhauls, such as SBC's broadband initiative - Project Pronto. Though the last two factors do not necessarily constitute inefficiency, they reflect short-term distortions captured by the data in SBC's study period (January 2002) that ought to be removed when calculating forward-looking fills.

Q. HOW DID YOU IMPLEMENT THIS ADJUSTMENT?

A. We made this adjustment by comparing actual fills in SBC's study month with data from other time periods. For its Illinois distribution network, SBC provided fill data starting from 1997. Out of the available annual data we picked the year 1998 for two reasons: first, this was the year before Project Pronto was announced; second, this was a "middle" year in a sense that it was not the best or the worst year of the business cycle. For example, in our surrebuttal testimony we presented a graph of the S&P 500 index for 1996-2003.[29] As can be seen from this graph, this index of stock market

[29] Surrebuttal Testimony of Michael Starkey and Warren Fischer submitted February 20, 2004, p. 39.

performance (one of the measures that characterize the state of the economy) reached its peak in 1999, with the second highest value observed in 2000, and the low points being the years 2002 and 1996.

Comparison of SBC's actual fills in its study period (January 2002) and in 1998 shows that distribution fill factors were approximately [*****XXX**]** *percentage points* higher in 1998 compared to SBC's study period (or, equivalently, [***** XX ***]** *times* the value of the fill factor in SBC's fill study). The change in fill factors between these two periods was the highest in the urban density zone. This confirms our hypothesis that the difference is due to the effect of the business cycle (because urban areas tend to have a higher portion of business line demand that is likely to be more sensitive to the state of the economy than is the residential market). We calculated the ratios of the fill factors in 1998 and SBC's study period for each zone and used them to proportionally adjust the fill factors up, thus removing the effect of the business cycle. We made this adjustment for distribution plant only because no similar data were available for other network components.

Q. PLEASE SUMMARIZE YOUR FINAL ADJUSTMENTS TO SBC'S ACTUAL FILL FACTORS THAT YOU PERFORMED AS PART OF YOUR MORE ACCURATE IMPLEMENTATION OF DR. QIN LIU'S APPROACH.

A. We used the statewide fill factors for the top 20 wire centers as listed in the table above and SBC's proposed statewide fills to calculate the multipliers by which zone fill factors should be increased. These multipliers represent the same approach as the one used by Dr. Qin Liu[30] – that is, they remove some inefficiency observed in SBC's fill data by proportionally increasing the fill factors for each zone by the same percent (although the primary difference is that our adjustments are based on real data rather than speculations). We then made one further adjustment to the distribution fills in order to remove the short-term recessionary decrease in fill factors that was likely to be in effect during SBC's study period. The multipliers in this case varied by zone, with the highest multiplier being in urban zone. The table below summarizes the final results.

[* BEGIN CONFIDENTIAL ***]**

SBC's Actual Fill Factors Adjusted for Inefficiency and Effects of the Business Cycle[31]

Zone	Feeder Copper	DLC Chassis	DLC Plug In	Distribution Copper
A				
B				
C				
Statewide				

[* END CONFIDENTIAL***]**

Q. PLEASE EXPLAIN WHAT THESE DATA REPRESENT.

[30] Rebuttal Testimony of Dr. Qin Liu submitted February 20, 2004, p. 29.

A. These data represent SBC's actual fill factors, adjusted to remove the following types of inefficiency: a) relative inefficiency of SBC's wire centers as measured against its "best" wire centers; b) unreasonable proportion of defective pairs, some of which are uneconomical to recover and some of which are already accounted for through depreciation lives; and c) short-term decrease in capacity utilization associated with the business cycle and/or other short-term events.

Our adjustments did not remove other types of inefficiency that we were unable to quantify from the available data. Most importantly, the data do not allow us to judge the degree of inefficiency in the "best" wire centers. For example, the "best" wire centers still have a significant portion of spare distribution capacity. Would a competitive firm tolerate such low levels of utilization? The answer is "no." We base this conclusion on the fact that SBC has been deploying its distribution plant using ultimate (long-term) demand as the basis, while competitive firms tend to have shorter planning horizons. Shorter planning horizons typically mean a reduced degree of uncertainty, which suggests reduction in *ex post* inefficiency –the inefficiency associated with incorrect demand forecasts. We expect that with the development of competition SBC will likewise adopt shorter planning horizons. In this respect, we agree with various parties in this proceeding who point to the decrease in demand for second lines resulting from the development of DSL, as well as competition from wireless and cable

[31] Derivation of these numbers is contained in Attachment MS/WF-23, sheet *CLECs Adjustments*.

telephony. Logic suggests that this reduction in demand should alter forward-looking engineering practices. Indeed, some ILECs have already changed their loop deployment methods. For example, in 2002, *Forbes* magazine reported that BellSouth, facing a decreased demand for second lines, started placing only *one* line per each housing unit.[32] In other words, even in its best wire centers, SBC's actual fills reflect an outdated engineering design – a design that was based on a demand model that has become obsolete.

Q. HOW DOES YOUR IMPLEMENTATION OF DR. QIN LIU'S APPROACH RELATE TO YOUR PREVIOUS PROPOSALS REGARDING FILL FACTORS IN THIS PROCEEDING?

A. Our more accurate implementation of Dr. Qin Liu's approach is a third best alternative for the fill factors that we are recommending in this case. In our direct testimony we made our original proposal – to adopt the same fill factors SBC uses in its retail cost studies. In that same testimony, we suggested a second best alternative – to use the target fill factors approved by the Commission in the prior UNE case as the floor for the new fill factors. We continue to stand by those recommendations. In previous testimony we have provided our extensive rationale for these recommendations and we will not repeat that material here. However, the rationale behind this third proposal is to provide the Commission with a more accurate measure of fill factors *in case the*

[32] *Forbes*, Top Stories "Bad Connection" by Scott Woolley, August 12, 2002.

Commission decides to base the fill factors on SBC's actual capacity utilization data, as suggested by Staff witness Dr. Qin Liu. In other words, if the Commission determines, as proposed by Dr. Qin Liu, that actual utilization data should serve as the basis for the fill factors, we recommend that the Commission adopts our adjustments. These adjustments eliminate at least some portion of inefficiency that exists in SBC's current network. We provide the Commission this third option as a more accurate implementation of Dr. Qin Liu's theoretical approach, whose proposed adjustments appear largely to be the result of guesswork, with little, if any, basis in actual facts or empirical data.

The following table summarizes the fill factor proposals made by the various witnesses in this proceeding.

[* BEGIN CONFIDENTIAL ***]**

Fill Factors: Comparison of Alternative Proposals

	SBC's Proposal: Actual Fills	Staff's Rebuttal Proposal (Dr. Qin Liu): Adjusted Actual Fills	Modification of Staff's Rebuttal Proposal: Actual Fills Adjusted for Observed Inefficiency	Staff's Direct Proposal (Mr. Green) / Joint CLECs' Option 1: Fills Ordered in Prior TELRIC Case	Joint CLECs' Option 1: Fills Used in Retail Studies
Source	*1*	*2*	*3*	*4*	*5*
Copper Feeder					
Zone A					
Zone B					
Zone C					
DLC Chassis					
Zone A					
Zone B					
Zone C					
DLC Plug-in					
Zone A					
Zone B					
Zone C					
Distribution					
Zone A					
Zone B					
Zone C					

1 -- SBC's Actual Fill Study *ILCurrentFillData2002 (Jan02).xls*

2 -- Staff Schedule 25.2 to Rebuttal Testimony of Dr. Qin Liu.

3 -- This testimony.

4 -- Direct Testimony of Mr. Bud Green, page 14 (fill factors ordered in Docket No. 96-0486/96-0569). Also proposed here by Attorney General (Mr. William Dunkel). Suggested by Joint CLECs as a floor to fill factors in Direct Testimony of Michael Starkey and Warren Fischer.

5 -- Direct Testimony of Michael Starkey and Warren Fischer, pages 189 and 193-196.

[* END CONFIDENTIAL***]**

Q. DOES THIS CONCLUDE YOUR SUPPLEMENTAL SURREBUTTAL TESTIMONY?

A. Yes.