PUBLIC VERSION

ON BEHALF OF BELLSOUTH TELECOMMUNICATIONS, INC.

DIRECT TESTIMONY OF ANIRUDDHA (ANDY) BANERJEE, Ph.D.

BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

DOCKET NO. 2003-327-C

MARCH 12, 2004

I. INTRODUCTION AND SUMMARY

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

A. My name is Aniruddha (Andy) Banerjee. I am a Vice President at NERA Economic Consulting located at One Main Street, Cambridge, Massachusetts 02142.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL, PROFESSIONAL, AND BUSINESS EXPERIENCE.

A. I earned a Bachelor of Arts (with Honors) and a Master of Arts degree in Economics from the University of Delhi, India, in 1975 and 1977 respectively. I received a Ph.D. in Agricultural Economics from the Pennsylvania State University in 1985, and subsequently served there as an Assistant Professor of Economics. I have over eight years of experience teaching undergraduate and graduate courses in various fields of Economics, and have conducted academic research that has led to several publications and conference presentations.

Since 1988, I have held various positions in the telecommunications industry. Prior to my present position, I have been an economist in the Market Analysis & Forecasting Division at AT&T Communications in Bedminster, NJ, a Member of Technical Staff at Bell Communications Research in Livingston, NJ, and a Research Economist at BellSouth Telecommunications in Birmingham, AL. In these positions, I was responsible for conducting economic and market analysis, building quantitative demand models for telecommunications services, developing economic positions and strategies, and providing

expert testimony support on regulatory economic matters.

In my present capacity, I provide quantitative and regulatory economic analysis for telecommunications industry clients principally on matters of concern to local exchange carriers. I have testified before state and federal regulators on interconnection and unbundling, universal service, local and long distance competition, efficient rate rebalancing, and inter-carrier compensation. I have participated in several proceedings on antitrust damage issues, price and alternative regulation, and telephone company mergers. I have published several papers and made several presentations at international forums on topics such as telephone service quality performance, mobile telephony growth, telecommunications privatization, and Internet economics. My curriculum vita is attached to this testimony as Exhibit AXB-1.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. In my Direct Testimony, I present evidence based on the potential deployment test for determining whether or not competitive local exchange carriers ("CLECs") are impaired without access to an incumbent local exchange carrier's ("ILEC's") unbundled network elements ("UNEs"). This test is prescribed by the Federal Communications Commission ("FCC") for circumstances in which specific "triggers"—signifying actual competitive availability of the desired UNEs—do not exist.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. Upon applying the potential deployment test to loops and transport facilities in BellSouth's service territory in South Carolina, I find that CLECs are not impaired without access to BellSouth's unbundled loops in 38 customer locations, but that the number of inter-office transport routes on which CLECs are not impaired without access to BellSouth's transport facilities is zero.

Q. ARE THESE CUSTOMER LOCATIONS AND ROUTES INCREMENTAL TO THOSE ALREADY INCLUDED IN THE TRIGGERS ANALYSIS?

A. Although no route qualifies in South Carolina presently under the potential deployment test, the number of such routes is supposed to be incremental to those included in the triggers analysis. However, that need not be the case for customer locations. Because of

differences in building-address conventions, it is possible that—despite best efforts—some overlap may remain between the customer locations identified in the potential deployment test and in the triggers analysis. Any overlap should not, however, be considered particularly significant because the customer locations in that overlap would already qualify for relief under the triggers analysis.

II. POTENTIAL LOOP DEPLOYMENT

Q. PLEASE DESCRIBE THE FCC'S POTENTIAL DEPLOYMENT TEST FOR IDENTIFYING CUSTOMER LOCATIONS WHERE CLECS ARE NOT IMPAIRED WITHOUT ACCESS TO UNBUNDLED LOOPS FROM THE ILEC?

A. For DS3 and dark fiber, the FCC's *Triennial Review Order*[1] allows state commissions to analyze "whether [a] particular customer location *could* be economically served by competitive carriers through deployment of alternative loop transmission facilities" even if the location does not meet the triggers test provided by the FCC.[2]

The FCC requires that, in conducting such an analysis,

> a state must consider and may also find no impairment at a particular customer location even when this trigger has not been facially met *if* the state commission finds that no material economic or operational barriers at a customer location preclude [CLECs] from economically deploying loop transmission facilities to that particular customer location at the relevant loop capacity level. In making a determination that CLECs *could* economically deploy loop transmission facilities at that location at the relevant capacity level, the state commission must consider various factors affecting the ability to economically deploy at that particular customer location. These factors include: evidence of alternative loop deployment at that location; local engineering costs of building and utilizing transmission facilities; the cost of underground or aerial laying of fiber or copper; the cost of equipment needed for transmission; installation and other necessary costs involved in setting up service; local topography such as hills and rivers; availability of reasonable access to rights-of-way; building access restrictions/costs; availability/feasibility of similar quality/reliability alternative

[1] FCC, *In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, CC Docket No. 01-338, *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, and *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket No. 98- 147, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking ("*Triennial Review Order*"), released August 21, 2003.

[2] *Triennial Review Order*, at ¶335.

transmission technologies at that particular location.[3]

Q. WHAT IS THE PURPOSE OF BELLSOUTH'S POTENTIAL DEPLOYMENT ANALYSIS?

A. The purpose of BellSouth's potential deployment analysis for loops is to identify customer locations that do not meet the triggers, but which "could be economically served by competitive carriers" when the criteria described above are examined. As stated earlier, 38 such locations have been identified in BellSouth's service territory in South Carolina.

Q. HOW MANY CLECS ARE REQUIRED TO "ECONOMICALLY SERVE A LOCATION?"

A. In the self-provisioning trigger analysis described above, the *Triennial Review Order* sets *two* CLECs as the lower threshold for competitive supply that would be sufficient for no impairment. Therefore, I assume that a minimum of two CLECs is also required in my potential deployment analysis. That is, if one actual CLEC currently serves a location, to establish non-impairment it would only require the demonstration that one more CLEC could potentially deploy loop facilities to that location. If no actual CLEC currently serves that location, then it would be necessary to demonstrate that two CLECs would potentially be able to deploy loop facilities. This methodology allows me to take into account "evidence of alternative loop deployment at that location," as the *Triennial Review Order* requires.

Q. PLEASE DESCRIBE BELLSOUTH'S POTENTIAL DEPLOYMENT ANALYSIS AT A CONCEPTUAL LEVEL.

A. BellSouth's potential deployment analysis investigates the economic attractiveness to CLECs of deploying fiber-based loop facilities to additional customer locations where they may not have such facilities at the present time. The financial viability of extending fiber to an additional customer location is determined using a net present value ("NPV") test, as prescribed by the *Triennial Review Order* (fn. 260). That is, with a positive NPV, it is

[3] *Id.* Emphasis in original.

economically rational for a carrier to deploy fiber to that location, as the potential revenue exceeds the potential cost. The "revenue" in this case is derived from the portion of end-user spending that a CLEC could capture by serving a particular customer location. The "cost" comprises the expenses that the CLEC would incur (both upfront and on an ongoing basis) to extend its network by deploying fiber to the additional location from its nearest current "fiber node," i.e., a BellSouth wire center at which it is collocated currently or a fibered building.

Q. HOW DO YOU CALCULATE THE REVENUE OPPORTUNITY PER BUILDING?

A. I use data from TNS Telecoms, a third-party data source that provides an estimate of wireline telecommunications spending per tenant for business locations nationwide. For each building located in BellSouth's service territory in South Carolina, I sum the spending of all tenants in that building to get an estimate of the total end-user spending per building.

Q. DO YOU BELIEVE THAT TNS TELECOMS IS AN ACCURATE SOURCE OF DATA ON TELECOMMUNICATIONS SPENDING?

A. Yes. TNS Telecoms is the leading market research firm for site-specific demand for telecommunications services. In the context of universal service, the FCC, AT&T, MCI, and many other companies have relied on TNS Telecoms to estimate the exact locations of business and voice lines. Moreover, a comparison of revenue estimates from TNS Telecoms with national revenue estimates made by J.P. Morgan confirms that the estimated spending reported by TNS Telecoms is reasonable and even a little conservative (about 10% lower).

Q. HOW DO YOU DETERMINE THE COST TO DEPLOY LOOP FACILITIES PER BUILDING?

A. This calculation proceeds in two steps. First, I determine the length of the fiber facilities that a carrier would have to deploy in order to connect a building (customer location) to its network. Next, I determine the costs of installing and providing service over such a facility.

Q. HOW DO YOU DETERMINE THE LENGTH OF THE FIBER LOOP THAT A CLEC NEEDS TO EXTEND ITS FACILITIES TO A CUSTOMER LOCATION?

A. The determination of the length of the fiber loop requires the creation of two tables. The first table contains, for each CLEC, information on every building and wire center currently connected by its self-deployed fiber. This is the same information (compiled from discovery, BellSouth's internal data, and GeoResults) that is used by BellSouth witness Shelley Padgett in her Direct Testimony in this proceeding to conduct the triggers test for unbundled loop and transport facilities. BellSouth's internal records and standard address-matching software provide the latitude and longitude for every wire center.

The second table contains all buildings in the TNS Telecoms database that are associated with at least $5,000 of estimated retail wireline spending per month (this minimum spending threshold is a conservative "filter" that is applied to make the table smaller and, therefore, more manageable). This file also includes the latitude and longitude for each building, as provided by TNS Telecoms.

Given the two tables, a Microsoft Excel and Visual Basic program is used to determine, for every building in the second table, the two CLECs that have the nearest "fiber nodes," defined as buildings or the wire centers where they have already deployed fiber (as listed in the first table). Distance between the building under consideration for potential deployment and a node is calculated as the North-South right angle distance, which generally overestimates the distance because a more direct route can usually be found. The specific formula used for this purpose is described in the FCC's rules in 47 CFR Section 73.208(c).

Q. HOW DO YOU DETERMINE THE COST FOR A CLEC TO EXTEND LOOP FACILITIES TO A CUSTOMER LOCATION?

A. The necessary elements to construct the loop and the cost of each such element are presented in the Direct Testimony of BellSouth witness A. Wayne Gray in this proceeding. I rely upon Mr. Gray's evidence to establish the physical cost of the loop in my analysis.

Q. WHAT ADDITIONAL COSTS DO YOU CONSIDER?

A. I consider four other types of cost that CLECs incur to serve customers: (1) cost of goods

sold (COGS), (2) other network costs (i.e., not including the loop which was already covered above), (3) sales and marketing (S), and (4) general and administrative (G&A).

I rely on the BellSouth Analysis of Competitive Entry model for business customers with four or more lines to determine COGS and other network costs.[4] Based on this model, COGS and other network costs combined are 25% of revenue. I have used a sales and marketing cost of **BEGIN PROPRIETARY** *** **END PROPRIETARY** times the monthly revenue.[5]

Sales cost is incurred in year zero (the first year of operations), along with other costs of establishing service to a customer. In addition, sales and marketing cost is incurred on an ongoing basis as the CLEC offsets the churn of approximately 20% per year for business customers with other gross customer additions. Finally, G&A is assumed to be 27.4% of revenue, obtained as a weighted average of G&A costs for long distance voice service (15% of revenue) and remaining services (28.5% of revenue).[6]

Q. HAVING DETERMINED THE REVENUES AND COSTS, HOW DO YOU CALCULATE THE NPV OF THE DEPLOYMENT?

A. The NPV is calculated in the standard way from the after-tax cash flows, assuming that all capital expenditures are made in year zero and depreciate over 10 years and using the tax and cost of capital assumptions that were filed in Docket No. 2003-326-C. That is:

1. Calculate required capital expenditures in year zero.
2. Calculate the annual depreciation and the resulting depreciation tax-shield using an average tax rate of 39%.
3. Calculate network-operating expenses, including COGS and SG&A.
4. Calculate pre-tax operating income by subtracting network operating expenses from revenue.
5. Calculate after-tax operating income and, hence, cash flows (by adding the depreciation tax shield).
6. Calculate the 10-year NPV, using the mid-year convention for cash flows and a

[4] See Direct Testimony of James Stegeman in Docket No. 2003-326-C.

[5] See Direct Testimony of Debra Aron in Docket No. 2003-326-C.

[6] *Id.*

discount rate of 10.8%. To be conservative, I do not assume any continuing value beyond the 10-year period.

Q. HOW DO YOU SELECT THE BUILDINGS THAT SATISFY THE POTENTIAL DEPLOYMENT TEST?

A. The buildings that satisfy the potential deployment test are those with NPV > 0 at some assumed market share. To be conservative, I assume that any building that only requires the CLEC to achieve a market share of 15% or less for the loop deployment to yield a positive NPV satisfies the potential deployment test. This assumption is consistent with both CLEC experience in the marketplace and the information found in JP Morgan's *Broadband 2001* report (which estimates that the overall CLEC share of telecommunications spending in a building could be as high as 50%).

Q. BASED ON THE ANALYSIS THAT YOU HAVE JUST DESCRIBED, WHICH CUSTOMER LOCATIONS SATISFY THE POTENTIAL DEPLOYMENT TEST FOR NON-IMPAIRMENT WITH RESPECT TO LOOPS AND DARK FIBER?

A. Exhibit AXB-2 shows the list of customer locations that satisfy the test for potential deployment of fiber-based facilities. These buildings, therefore, meet the test for potential deployment of dark fiber and DS3 loops, and I conclude that there is no impairment for those facilities at the customer locations on that list.

Q. ARE YOU SUBMITTING THE FINAL LIST OF BUILDINGS THAT QUALIFY FOR UNBUNDLING RELIEF ON THE BASIS OF THE POTENTIAL DEPLOYMENT TEST?

A. No. BellSouth reserves the right to change the list of buildings after receiving responses to additional discovery requests.

III. POTENTIAL TRANSPORT DEPLOYMENT

Q. PLEASE DESCRIBE THE FCC'S POTENTIAL DEPLOYMENT TEST FOR IDENTIFYING ROUTES WHERE CLECS ARE NOT IMPAIRED WITHOUT ACCESS TO UNBUNDLED TRANSPORT FROM THE ILEC.

A. For DS3 and dark fiber, the *Triennial Review Order* allows state commissions to analyze

the *potential* ability of CLECs to deploy transport facilities along a particular route even if the route does not meet the triggers described above.[7]

The FCC requires that in conducting this analysis,

> a state must consider and may also find no impairment on a particular route that it finds is suitable for "multiple, competitive supply," but along which this trigger is not facially satisfied. States must expressly base any such decision on the following economic characteristics: local engineering costs of building and utilizing transmission facilities; the cost of underground or aerial laying of fiber; the cost of equipment needed for transmission; installation and other necessary costs involved in setting up service; local topography such as hills and rivers; availability of reasonable access to rights-of-way; the availability or feasibility of alternative transmission technologies with similar quality and reliability; customer density or addressable market; and existing facilities-based competition.[8]

Q. WHAT IS THE PURPOSE OF BELLSOUTH'S POTENTIAL DEPLOYMENT ANALYSIS?

A. The purpose of BellSouth's potential deployment analysis is to identify routes that do not meet the triggers for transport, but which are suitable for "multiple competitive supply" when the criteria described above are examined. My potential deployment analysis reveals, however, that no transport route qualifies in BellSouth's service territory in South Carolina.

Q. HOW MANY CLECS ARE REQUIRED ON A ROUTE FOR "MULTIPLE COMPETITIVE SUPPLY?"

A. In the self-provisioning trigger analysis described above, the *Triennial Review Order* sets *three* CLECs as the lower threshold for "multiple competitive supply" that would be sufficient for non-impairment. Therefore, I assume that a minimum of three CLECs is also required in my potential deployment analysis. That is, if two actual CLECs currently serve a route, to establish non-impairment, it would only require the demonstration that one more CLEC could potentially deploy transport facilities along that route. If no actual

[7] *Triennial Review Order*, at ¶410.

[8] *Id.*

CLEC currently serves that route, then it would be necessary to demonstrate that three CLECs would potentially be able to deploy transport facilities. This methodology allows me to take into account "existing facilities-based competition," as the *Triennial Review Order* requires.

Q. PLEASE DESCRIBE BELLSOUTH'S POTENTIAL DEPLOYMENT ANALYSIS AT A CONCEPTUAL LEVEL.

A. BellSouth's potential deployment analysis investigates the economic attractiveness to CLECs of deploying fiber-based transport facilities to additional BellSouth wire centers where they may not have such facilities at the present time. The financial viability of extending fiber to an additional wire center is determined using a net present value ("NPV") test, as prescribed by the *Triennial Review Order* (fn. 260). That is, with a positive NPV it is economically rational for a CLEC to deploy fiber to that wire center, as the potential revenue exceeds the potential cost.

The "revenue" in this case (unlike that in the potential loop deployment situation) is the savings that a CLEC could realize by no longer having to lease from BellSouth the unbundled transport and special access for routes that connect a wire center where the CLEC is not collocated currently to other wire centers where it is already collocated. The "cost" comprises the expenses that the CLEC would incur (both upfront and on an ongoing basis) to extend its network by deploying fiber to the additional wire center from the nearest current collocation site where it has fiber facilities.

From an economic perspective, this analysis represents the familiar "buy or build" decision. Its purpose is to determine whether it is more economical for the CLEC to continue leasing transport facilities from BellSouth or to build its own facilities.

Q. HOW DO YOU DETERMINE THE POTENTIAL REVENUE WHEN A CLEC EXTENDS ITS NETWORK TO AN ADDITIONAL WIRE CENTER BY INVESTING IN ITS OWN FIBER TRANSPORT FACILITIES?

A. As described above, the potential revenue to a CLEC from extending its network to an additional wire center where it is not currently collocated can be conservatively estimated as that CLEC's current total spending on BellSouth leased transport from that wire center

to other wire centers within its network. This spending, which the CLEC saves (or avoids) by deploying its own fiber transport facilities, is determined for every CLEC from BellSouth's actual September 2003 billing records for wholesale transport (UNE and special access). Although a CLEC that has installed its own facilities could likely generate additional revenue by leasing transport on a wholesale basis to *other* carriers, my conservative estimate of potential CLEC revenue does not account for that possibility.

Q. HOW DO YOU DETERMINE THE CLEC'S ADDITIONAL COST TO EXTEND ITS NETWORK TO AN ADDITIONAL WIRE CENTER?

A. As explained in Mr. Gray's Direct Testimony, a CLEC's network is typically fully interconnected, i.e., transport facilities connect every wire center within a LATA at which the CLEC is collocated. It follows that, to add a new wire center to its network, a CLEC merely has to extend fiber to it from any location at which it is currently collocated. To calculate the cost of that network extension, it is first necessary to identify the nearest location from which the extension can be made. Subsequently, it is necessary to determine the expenses that would be incurred to lay the new fiber and add the equipment needed to make the fiber operational and ready to provide transport. I describe each of these steps below.

Q. IN CONSIDERING A WIRE CENTER THAT MAY BE ADDED TO THE CLEC'S NETWORK, HOW DO YOU DETERMINE THE NEAREST LOCATION (WIRE CENTER) WHERE THE CLEC CURRENTLY HAS FIBER?

A. That determination requires the creation of two tables. The first table contains, for each CLEC, information on every wire center currently connected by its self-deployed fiber. This is the same information (compiled from discovery and BellSouth's internal data) that is used in BellSouth witness Shelley Padgett's Direct Testimony to conduct the triggers test for unbundled loop and transport facilities. BellSouth's internal records and standard address-matching software provide the latitude and longitude for every wire center.

The second table contains, for each CLEC, the remaining wire centers at which the CLEC is *not* collocated presently, but at which it could *potentially* collocate to augment its existing network.

Given the two tables, queries in Microsoft Access are used to determine, for each CLEC, the distance between each wire center from the second table and the *nearest* wire center from the first table. This exercise provides the distance that needs to be covered to connect a currently off-network wire center to the nearest on-network wire center. As for extending loop facilities, distance here is also calculated as the North-South right angle distance, which generally overestimates the distance because a more direct route can usually be found.

Q. HOW DO YOU DETERMINE THE COST TO EXTEND THE CLEC'S NETWORK TO AN ADDITIONAL WIRE CENTER?

A. The network design and the costs of the various components of that network design necessary to extend the CLEC's network are described in the Mr. Gray's Direct Testimony. I rely on Mr. Gray's evidence to establish the cost of extending the CLEC network in my analysis.

Q. HAVING DETERMINED THE REVENUES AND COSTS, HOW DO YOU CALCULATE THE NPV OF THE DEPLOYMENT?

A. The NPV is calculated in the standard way from the after-tax cash flows, assuming that all capital expenditures are made in year zero and depreciate over 10 years, and incorporating the tax and cost of capital assumptions as filed in Docket No. 2003-326-C. That is:

1. Calculate required capital expenditures in year zero.
2. Calculate the annual depreciation and the resulting depreciation tax-shield using an average tax rate of 39%.
3. Calculate network operating expenses.
4. Calculate pre-tax operating income by subtracting network operating expenses from revenue.
5. Calculate after-tax operating income and, hence, cash flows (by adding the depreciation tax shield).
6. Calculate the 10-year NPV, using the mid-year convention for cash flows and a discount rate of 10.8%. To be conservative, I do not assume any continuing value beyond the 10-year period.

Q. HOW DO YOU SELECT THE WIRE CENTERS (AND, HENCE, THE ROUTES) THAT MEET THE POTENTIAL DEPLOYMENT TEST?

A. For a given CLEC, the wire centers that satisfy the potential deployment test are those for which NPV > 0 as calculated according to the methodology described above. Once those wire centers are identified, it is a simple matter to calculate the additional routes on which a CLEC would be able to deploy its own transport facilities. Once this is done for every CLEC, it is a matter of simply counting the routes for which a finding of no impairment must be made.

Q. BASED ON THE ANALYSIS THAT YOU HAVE JUST DESCRIBED, DOES ANY ROUTE SATISFY THE POTENTIAL DEPLOYMENT TEST FOR NON-IMPAIRMENT WITH RESPECT TO TRANSPORT FACILITIES?

A. No.

Q. IS THAT FINDING ABOUT ROUTES CONCLUSIVE?

A. No. Although, at this time, I find that no route qualifies in BellSouth's service territory, BellSouth reserves the right to revise that finding after receiving responses to additional discovery requests.

IV. GENERAL ISSUES

Q. YOUR POTENTIAL DEPLOYMENT TEST IDENTIFIES SEVERAL CUSTOMER LOCATIONS (BUILDINGS) AND TRANSPORT ROUTES THAT CLECS COULD POTENTIALLY SERVE. PLEASE COMMENT ON WHY CLECS SEEM TO HAVE PASSED UP THOSE BUSINESS OPPORTUNITIES SO FAR.

A. CLECs are unlikely to have chosen voluntarily to pass up profitable business opportunities presented by the customer locations that are identified by my potential deployment test. Entry and expansion decisions by firms are dictated by a variety of factors including the availability of alternative deployment strategies, the appropriate scale of efficient operations relative to the level of available demand, access to capital markets, and (frequently) the business models and objectives of those firms regarding the scope and timing of their activities. In the environment in which CLECs operate in South Carolina, the availability of UNEs at regulated prices is likely to have an important bearing on CLEC choices because the relative economics of leasing UNEs and deploying owned

facilities may well prompt CLECs to choose to expand through the use of UNEs rather than by deploying their own facilities. As a result, although the presence of facilities meeting the triggers test is evidence of non-impairment, the absence of such facilities *cannot* be taken as evidence of impairment. The advantage of having a "potential deployment" test in addition to the triggers is that this fact is properly recognized.

Q. WHAT IMPACT, IF ANY, DOES ACCESS TO CAPITAL HAVE ON POTENTIAL DEPLOYMENT CONSIDERATIONS?

A. None. The FCC (through the *Triennial Review Order*) set criteria to be applied when conducting the potential deployment test, and no additional criteria (e.g., access to capital, capacity ceilings) are necessary or permitted. It is important to keep in view that the potential deployment test is merely a gauge of whether a CLEC *could*, if it so chose, feasibly deploy its own loop facilities to a customer location or over a transport route; it is decidedly not a test of whether it *would* do so. As for any concern about CLEC access to capital, the prevailing circumstances of the capital market are already reflected in the return on equity, which determines, in turn, the CLEC's cost of capital.

Q. IN YOUR POTENTIAL DEPLOYMENT ANALYSIS, DO YOU INCLUDE ALL COSTS INCURRED BY CLECS TO SERVE RETAIL CUSTOMERS?

A. Yes. Beyond the investment cost associated with loops, I also include two categories of cost: "COGS and other network cost," and SG&A. As I explained earlier,

1. "COGS and other network cost" includes all network-related expenses beyond the cost of the loop, including any potential capacity upgrades to the CLEC's existing network that would be necessary to provide retail services to *new* customer locations. For example, this category of cost includes the cost of voice switches (both operating expenses and depreciation), switched access and other interconnection costs, various transport, transit, and peering costs, cost of data network equipment, etc.
2. "SG&A" includes all CLEC expenses, including sales and marketing, billing, customer care, and overhead expenses.

These categories are more than sufficient to account for CLECs' expenses. The basis for these inputs is detailed in the Direct Testimony of Debra Aron in Docket No. 2003-326-C. The expenses in the two categories above, which are based on actual CLEC experiences, amount to more than 50% of retail revenue.

Q. CAN YOU PROVIDE ADDITIONAL DETAIL REGARDING THE ASSUMPTION OF AT LEAST $5,000 OF MONTHLY REVENUE PER BUILDING?

A. The $5,000 monthly revenue figure is used primarily as a filter to reduce the number of buildings considered in the potential deployment analysis. By using this filter, I have reduced the number of buildings in South Carolina from well over 92,000 to approximately 1,500. Thus, while it is reasonable to infer that a certain minimum level of revenue (customer spending) is necessary to allow a CLEC to recover, over a suitable period of time, its fixed investment costs, the $5,000 monthly figure is an approximation rather than a minimum monthly requirement. A lower level for the monthly spending filter would be less effective at reducing the number of candidate buildings (to which to apply the potential deployment test), making the analysis unnecessarily cumbersome.

Q. PLEASE EXPLAIN THE BASIS FOR YOUR ASSUMPTION THAT BOTH CLECS IN A BUILDING WOULD HAVE 15% OF THE AVAILABLE REVENUE.

A. My assumption that each of the two potential CLECs serving a new building would have 15% of the available revenue is based on actual CLEC experience in the marketplace. I rely on three specific market reports that document revenue shares achieved by CLECs serving business customers. These are (1) *Teligent, Inc. Initial Report* by Ferris Baker Watts, September 21, 2000, (2) *Winstar Communications, Inc. Initial Report* by Ferris Baker Watts, January 26, 2001, and (3) *Broadband 2001* by McKinsey & Company and J.P. Morgan, April 2, 2001.

Q. HOW DO YOU RECONCILE YOUR ASSUMPTION THAT TWO CLECS CAN EACH GAIN A 15% SHARE IN A BUILDING WITH THE POSSIBILITY THAT CUSTOMERS ARE TIED UP IN LONG-TERM CONTRACTS WITH THEIR CURRENT SUPPLIERS?

A. This is a reasonable assumption because, when selecting buildings from the TNS Telecoms database, all the buildings with fewer than three tenants were removed from consideration. This left only buildings with a large enough pool of potential customers to be targeted by CLECs. Also, customers in the enterprise market typically have a choice of multiple telecommunications suppliers that gives those customers an opportunity to negotiate better

contracts and to obtain redundancy to protect against network failures. This multiple supplier environment, together with the filter on number of tenants per building, ensures that opportunities exist for CLECs to gain market share in a building. It is unlikely for all tenants in a building to be tied up in long-term contracts at the same time, or for all of those contracts to be far from expiration.

Q. YOU CHARACTERIZE THE CLEC'S DECISION TO DEPLOY ITS OWN FIBER LOOP ON A TRANSPORT ROUTE AS PART OF A "BUILD OR BUY DECISION." WHY DOESN'T THAT CHARACTERIZATION APPLY TO LOOP DEPLOYMENT?

A. There is a fundamental difference between the two situations. Loops deployed to business customer locations in buildings are part of a retail facilities-based local exchange service, the revenue for which accrues in the form of spending on that service by end-user business customers. With a retail service, no "build or buy" decision is involved.

On the other hand, transport is a wholesale service where the CLEC has a choice of deploying either its own facilities or purchasing/leasing them from the ILEC. The "revenue" in this instance is the cost saved from the forgone option.

Q. PLEASE EXPLAIN HOW YOUR ANALYSIS ADDRESSES THE FACTORS SET FORTH IN THE APPLICABLE RULES FOR LOOP AND TRANSPORT POTENTIAL DEPLOYMENT.

A. I detail below the manner in which I take the nine factors or criteria into account.

<u>Loops</u> (see *Triennial Review Order*, ¶335, and Rules §51.319(a)(5)(ii), (6)(ii))

Factor 1 (*Evidence of alternative loop deployment at that location*)

As described above, I count actual loops deployed to the customer location towards the two carriers required to show competitive supply. That is, if one actual carrier currently serves a location, a finding of non-impairment would only require the demonstration that one more carrier could potentially deploy facilities to that location.

Factors 2 to 5 (*Local engineering costs of building and utilizing transmission facilities; the cost of underground or aerial laying of fiber or copper; the cost of equipment needed for transmission; installation and other necessary costs involved in setting up service*)

The costs of building the network to the customer location and setting up service are fully considered in the analysis and are detailed in Mr. Gray's Direct Testimony.

Factor 6 (*Local topography such as hills and rivers.*)

To determine the cost of deploying a fiber cable to a customer location, I use, as a reasonable proxy, the conservative assumption that the fiber loop follows a right-angle path from the CLEC's fiber node to the customer location. Because the locations for which potential deployment is viable are located in urban commercial areas with few topography concerns, and since CLECs already have fiber nodes relatively close to these locations, the right-angle methodology that is a conservative alternative and a reasonable method to account for local topography.

Factor 7 (*Availability of reasonable access to rights-of-way*)

Costs associated with rights-of-way are taken into account, as described in Mr. Gray's Direct Testimony.

Factor 8 (*Building access restrictions/costs*)

Based on BellSouth's experience in deploying high-capacity services to commercial buildings, few building access restrictions or costs constitute a material barrier to loop deployment. Typically, building owners in BellSouth's service territory do not charge access fees and, in the limited situations in which this occurs, such costs are passed directly on to end-user customers.

Factor 9 (*Availability/feasibility of similar quality/reliability alternative transmission technologies at that particular location*)

Although the *Triennial Review Order* provides the flexibility to consider alternative transmission technologies that may be more cost effective for particular customer locations, BellSouth has chosen to model costs for a fiber-optics network architecture similar to the one it uses when deploying loops to high-capacity buildings.

<u>Transport (</u>see *Triennial Review Order*, ¶410, and (§51.319(e)(2)(ii), (3)(ii))

Factors 1 to 4 (*Local engineering costs of building and utilizing transmission facilities; the cost of underground or aerial laying of fiber or copper; the cost of equipment needed*

for transmission; installation and other necessary costs involved in setting up service) The costs of building the network and setting up service are fully considered and are described in Mr. Gray's Direct Testimony.

Factor 5 (*Local topography such as hills and rivers*)
The transport analysis is similar to the loop analysis, which uses, as a proxy, the conservative assumption that the fiber loop follows a right-angle path from the CLEC's fiber node to the wire center. Because the wire centers involved are in fully urbanized commercial areas with few or no topography concerns, and since CLECs already have fiber nodes relatively close to these wire centers, this methodology is a conservative and a reasonable method to account for local topography.

Factor 6 (*Availability of reasonable access to rights-of-way*)
Costs associated with rights-of-way are taken into account, as described in Mr. Gray's Direct Testimony.

Factor 7 (*Availability/feasibility of similar quality/reliability alternative transmission technologies along the particular route*)
Although the *Triennial Review Order* provides the flexibility to consider alternative transmission technologies that may be more cost effective for particular routes, BellSouth has chosen to model costs for a fiber-optic network architecture similar to the one it uses when deploying interoffice transport facilities.

Factor 8 (*Customer density or addressable market*)
My analysis of potential deployment of transport facilities uses a "build versus buy" decision where the benefit of self-deployment (i.e., building) for each CLEC is the savings achieved by not leasing wholesale transport from BellSouth. Since I use the actual BellSouth revenues by CLEC for each specific route in the analysis, this methodology goes one step further than considering the addressable market. Instead, it considers the *actual* market (i.e., circuits and revenues) served by each CLEC that BellSouth believes to be unimpaired.

Factor 9 (*Existing facilities-based competition*)

As described above, I count actual transport facilities deployed towards the three carriers required to show competitive supply. That is, if two actual carriers currently have transport facilities along a route, a finding of non-impairment would only require the demonstration that one more carrier could potentially deploy facilities on that route.

Q. WHAT IS THE IMPACT OF THE D.C. CIRCUIT COURT OF APPEALS OPINION (OF MARCH 2, 2004) ON THE *TRIENNIAL REVIEW ORDER* IN THIS PROCEEDING?

A. Currently, the impact of the DC Circuit Court's opinion is unclear. At the time of filing this testimony, the DC Circuit Court had vacated large portions of the rules promulgated as a result of the *Triennial Review Order*, but stayed the effective date of the opinion for at least sixty days. Therefore, my understanding is that the *Triennial Review Order* remains intact, but its content, and the rules adopted thereto, must be suspect in light of the court's harsh condemnation of large portions of the order. This condemnation includes specific criticisms of the route-specific transport analysis. At this time, I will reserve judgment, and the right to supplement my testimony as circumstances dictate, with regard to the ultimate impact of the DC Circuit Court’s opinion on this case.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

Exhibit AXB-1

ANIRUDDHA (ANDY) BANERJEE, Ph.D.

BUSINESS ADDRESS

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Dr. Banerjee is a Vice President at NERA. He is responsible for providing analysis of, and expert witness testimony on, regulatory and economic issues of concern to telecommunications companies and other public utilities, preparing and responding to interrogatories in regulatory proceedings, and conducting econometric/statistical analysis to support marketing and market research activities of telecommunications companies. Dr. Banerjee works on a range of issues including Internet economics, price cap and incentive regulation, antitrust violations and remedies for damages, protections against anti-competitive pricing, local and long distance competition, pricing of interconnection and unbundled services, pricing and optimal tariff design, reciprocal and inter-carrier compensation, resale and avoided cost, benchmark and proxy cost models, universal service, service quality, and cellular telephony. His market research activities are carried out, as needed, in collaboration with leading providers of telecommunications data or directly with telecommunications companies.

Before coming to NERA, Dr. Banerjee was a Research Economist (and internal economic consultant) at BellSouth Telecommunications where he was responsible for providing economic policy guidelines to key decision-makers and the Officer Body, preparing testimony and cross-examination questions, responding to interrogatories, and building econometric models to answer business questions. He provided quantification support for BellSouth's successful initiative of designing and securing price cap regulation for itself in each of its nine states, and contributed to BellSouth's policies on local and toll imputation, universal service, interconnection pricing, rate rebalancing, and per use pricing of vertical services. In the process, Dr. Banerjee collaborated with consultants from McKinsey and Company and Strategic Policy Research, Inc. He also represented BellSouth's participation in the National Telecommunications Demand Study, an ongoing study of demand trends in the telecommunications industry.

Prior to BellSouth, Dr. Banerjee was an economic consultant as a Member of the Technical Staff at Bell Communications Research and a Staff Supervisor at AT&T. Dr. Banerjee has several years of experience teaching graduate and undergraduate courses in economic theory, statistics, econometrics, industrial organization, and public finance. He has conducted research on the dynamics of futures markets and various aspects of time series econometrics. He has presented a number of papers on telecommunications economics issues at national business and academic conferences.

EDUCATION

THE PENNSYLVANIA STATE UNIVERSITY

Ph.D., Agricultural Economics, 1985

UNIVERSITY OF DELHI, INDIA

M.A., Economics, 1977 (Delhi School of Economics)

UNIVERSITY OF DELHI, INDIA

B.A., Economics (Honors), 1975 (St. Stephen's College)

EMPLOYMENT

NATIONAL ECONOMIC RESEARCH ASSOCIATES, INC.

2002- Vice President. Responsible for applying economic theory, regulatory economics, and econometric analysis to a variety of issues and problems facing both regulated and non-regulated firms (including public utilities). Provide expert witness testimony and strategic advice.

1995-2002 Senior Consultant, Communications Practice. Responsible for applying economic theory, regulatory economics, and econometric analysis to a variety of tasks: supporting telecommunications firms in litigation and regulatory matters, market research, and strategic planning. Provided expert witness testimony and strategic advice.

BELLSOUTH TELECOMMUNICATIONS

1992-1995 Research Economist, Statistics and Econometrics Group. Developed, led, and disseminated economic and econometric research on issues of concern to BellSouth Telecommunications in particular and the telecommunications industry in general. Contributed to each of the following areas: regulatory economics, demand analysis (growth and elasticities), market potential, diffusion, pricing, cost, new product planning, forecasting, market research, competitive analysis, and the development of strategy/policy positions for BellSouth. Supervised and collaborated with other BellSouth economists and strategic planners and outside consultants.

BELL COMMUNICATIONS RESEARCH

1989-1992 Member of Technical Staff, Regulatory Economics and Pricing Theory, Demand Response Analysis Group. Developed various statistical and econometric methods and models that are applicable to the study of demand for various types of telephone service. The focus was on analysis, forecasting, and rate design support to client companies including BellSouth, U S West, NYNEX, and Bell Atlantic. Developed software for demand and market potential analysis using advanced mathematical/statistical languages. Transformed original techniques research into business tools for analysts within client companies.

AT&T COMMUNICATIONS

1988-1989 Staff Supervisor, Market Analysis and Forecasting, Consumer Markets and Services. Assisted and contributed to demand analysis and forecasting efforts of the group. The focus was on demand issues related to AT&T's business and residential long distance telephone services.

THE PENNSYLVANIA STATE UNIVERSITY

1985-1988 Assistant Professor, Department of Economics. Developed and taught undergraduate and graduate courses in economics and econometrics. Conducted personal research in economics and econometrics. Supervised graduate student research leading to M.S. and Ph.D. degrees in economics. Developed the econometrics component of a new graduate program in policy analysis at Penn State. And, advised undergraduate economics students on their curriculum and course selection. Taught courses on introductory macro-economic theory, introductory and intermediate micro-economic theory, industrial organization,

public sector economics, statistics, and introductory econometrics. Developed and taught advanced graduate econometrics and time series courses (frequency-domain econometrics and spectral analysis, dynamic simultaneous equations systems and state space models, causality, model testing and validation, nonlinear time series, and asymptotic theory.

1982-1985 Instructor, Department of Economics. Taught a number of undergraduate economics courses including macro-economic theory, micro-economic theory, public sector economics, and statistical foundations of econometrics.

1979-1982 Research Assistant, Department of Agricultural Economics & Rural Sociology. Assisted in research activities of Professor Robert D. Weaver of the Department of Agricultural Economics. Research areas included: stabilization of prices of internationally traded agricultural commodities; choice under risk-aversion by a firm faced with multiple sources of uncertainty; impacts of public policy on risk-averse firms; market efficiency, role of information, distribution of asset returns, and market equilibrium; and productivity and cost relations in the wheat, corn, and soybean producing areas of the U.S. using crop survey data from the U.S. Department of Agriculture. Most of the work consisted of literature research, writing computer programming, and econometric data analysis.

UNIVERSITY OF DELHI, INDIA

1977-1979 Lecturer, Department of Economics, Shri Ram College of Commerce. Taught undergraduate economics courses including micro-economic theory, public finance, and economic planning and policy.

HONORS AND AWARDS

Marquis' Who's Who in the South and Southwest, 1995-96
Gamma Sigma Delta Honor Society of Agriculture, inducted 1983
Phi Kappa Phi, inducted 1982

Department Head Award, BellSouth Telecommunications, 1993
Department Head Commendation, Bell Communications Research, 1992

Vice President's Award, Bell Communications Research, 1990

PAPERS AND PUBLICATIONS

CONTRIBUTIONS TO NERA REPORTS

"NERA Reply Declaration" (on FCC's proposal to reform the TELRIC methodology for determining prices of unbundled network elements), with William E. Taylor and Harold Ware, for BellSouth Telecommunications (filed with FCC in WC Docket 03-173), January 30, 2004.

"NERA Declaration" (on FCC's proposal to reform the TELRIC methodology for determining prices of unbundled network elements), with William E. Taylor and Harold Ware, for BellSouth Telecommunications (filed with FCC in WC Docket 03-173), December 16, 2003.

"NERA Reply Declaration" (on FCC's unbundled network element policy and effects on competition and entry), with William E. Taylor, Charles Zarkadas, and Agustin Ros, for BellSouth Corporation (filed with FCC in CC Docket Nos. 01-338, 96-98, and 98-147), July 17, 2002.

"A Unified Inter-Carrier Compensation Mechanism for all Forms of Interconnection: Calling Party's Network Pays or Bill and Keep?" (with William E. Taylor), for BellSouth Corporation, filed November 5, 2001.

"Efficient Inter-Carrier Compensation for Internet-Bound Traffic: Reply to Time Warner Telecom," (with William E. Taylor), ex parte with FCC on behalf of Qwest Corporation, October 23, 2000.

"An Economic and Policy Analysis of Efficient Intercarrier Compensation Mechanisms for ISP-Bound Traffic," (with Agustin Ros and William E. Taylor), ex parte with FCC on behalf of U S WEST Communications, Inc., November 12, 1999.

"Determining Fair and Reasonable Rates Under Competition: Response to Major Themes at the FPSC Workshop," for BellSouth Telecommunications, Inc., November 1998.

"Costing and Pricing Principles for Determining Fair and Reasonable Rates Under Competition," for BellSouth Telecommunications, Inc., September 1998.

"Local Telecommunications Competition: An Evaluation of a Proposal by the Communications Staff of the Florida Public Service Commission," with William E. Taylor, for BellSouth Telecommunications, Inc., November 1997.

"Costing and Pricing Principles for Competitive Telecommunications: A Critique of David Gabel's Recommendations," for BellSouth Telecommunications, March 1997.

"Comments (on Universal Service and the Hatfield Model)," with William E. Taylor, for BellSouth Telecommunications, Inc. (filed with the Federal Communications Commission for CC Docket No. 96-45), August 1996.

"Telephone Company Provision of Broadband Services: Economies of Scope, Competition, and Public Policy," for BellSouth Interactive Media Services, 1995.

"Economic Welfare Benefits from Rate Rebalancing," for Stentor Resource Centre Inc., 1995.

TESTIMONY

Direct testimony on the matter of the potential deployment test of non-impairment for loop and transport facilities in Kentucky, on behalf of BellSouth Telecommunications, Inc., Kentucky Public Service Commission, Case No. 2003-00379, March 10, 2004.

Direct testimony on the matter of the potential deployment test of non-impairment for loop and transport facilities in Alabama, on behalf of BellSouth Telecommunications, Inc., Alabama Public Service Commission, Docket No. 29054 Phase III, March 5, 2004.

Direct testimony on the matter of the potential deployment test of non-impairment for loop and transport facilities in Tennessee, on behalf of BellSouth Telecommunications, Inc., Tennessee Public Service Commission, Docket No. 03-00527, March 1, 2004.

Direct and Rebuttal testimony on the matter of the potential deployment test of non-impairment for loop and transport facilities in North Carolina, on behalf of BellSouth Telecommunications, Inc., North Carolina Utilities Commission, Docket No. P-100 SUB 133S, February 16, 2004, and March 1, 2004.

Direct, Supplemental Direct, and Rebuttal testimony on the matter of the potential deployment test of non-impairment for loop and transport facilities in Georgia, on behalf of BellSouth Telecommunications, Inc., Georgia Public Service Commission, Docket No. 17741-U, January 30, 2004, February 12, 2004, and February 18, 2004.

Direct, Supplemental Direct, and Surrebuttal testimony on the matter of the potential deployment test of non-impairment for loop and transport facilities in

Florida, on behalf of BellSouth Telecommunications, Inc., Florida Public Service Commission, Docket No. 030852-TP, December 22, 2003, January 9, 2004 and February 4, 2004.

Rebuttal testimony on the matter of rate rebalancing of local and switched access rates in Florida, on behalf of BellSouth Telecommunications, Inc., Florida Public Service Commission, Docket Nos. 030961-TL, 030867-TL, 030868-TL, and 030869-TL, November 19, 2003. [Appeared at Hearings, December 2003]

Declaration, on behalf of Qwest Communications International, Inc., evaluating alternative statistical methods for selecting an appropriate benchmark to determine state eligibility for federal universal service support. Federal-State Joint Board on Universal Service, December 20, 2002.

Rebuttal Testimony opposing Oregon Public Utility Commission Staff and other intervenors on adjustments to rate structure design proposed by Qwest Corporation for its intraLATA long distance services, on behalf of Qwest Corporation, Oregon Public Utility Commission, Docket No. UT 125 Phase II, May 3, 2001. [Appeared at Hearings, May 2001]

Rebuttal testimony opposing the position of Global NAPs, a competitive local exchange carrier, that it is owed reciprocal compensation for the carriage of Internet-bound traffic, on behalf of BellSouth Telecommunications, Inc., Florida Public Service Commission, Docket No. 991267-TP, December 20, 1999. [Appeared at Hearings, January 2000]

Affidavit, on behalf of the United States Telephone Association, Review of the Depreciation Requirements for Incumbent Local Exchange Carriers, CC Docket No. 98-137, November 23, 1998 (with William Taylor).

Affidavit supporting BellSouth Telecommunications Inc.'s motion to dismiss liability case brought by Public Storage Inc. of California because of lack of personal jurisdiction, before the U.S. District Court of the Central District of California, Case No. 90-3943 R (RZX), September 1998.

Affidavit and Reply Affidavit supporting the application by BellSouth Corporation for provision of in-region, interLATA services in Louisiana, Round 2, CC Docket No. 98-121, July-August 1998.

Affidavit and Reply Affidavit supporting the application by BellSouth Corporation for provision of in-region, interLATA services in Louisiana, CC Docket No. 97-231, October-December 1997.

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Alabama, on behalf of GTE South and Contel of the South in Arbitration with AT&T, Alabama Public Service Commission, Docket No. 25704, November 1996. [Testified at Hearings, December 1996]

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Texas, on behalf of GTE Southwest in Arbitration with ASCI, Texas Public Utility Commission, Docket No. 16,473, November 1996. [Testified at Hearings, December 1996]

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Oklahoma, on behalf of GTE Southwest in Arbitration with AT&T, Oklahoma Corporation Commission, Cause No. PUD 960000242, November 1996. [Testified at Hearings, November 1996]

Direct Testimony critiquing the use of the Benchmark Cost Model for setting the unbundled loop rate for BellSouth in Georgia, on behalf of BellSouth Telecommunications, to Georgia Public Service Commission, Docket 6759-U, October 1996. [Testified at Hearings, October 1996]

Consolidated Direct and Rebuttal Testimony critiquing bill and keep compensation for interconnection, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petitions by Continental Cablevision, Metropolitan Fiber Systems of Florida, and MCI Metro Access Transmission Services), November 1995. [Testified at Hearings, January 1996]

Direct Testimony on unbundling by local exchange carriers and related cost issues, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950984-TP (Petitions by Metropolitan Fiber Systems of Florida, and MCI Metro Access Transmission Services), November 1995. [Testified at Hearings, January 1996]

Rebuttal Testimony critiquing bill and keep compensation for interconnection, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petition by Teleport Communications Group), September 1995.

Direct Testimony addressing interconnection rate structure design, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petition by Teleport Communications Group), September 1995.

Testified on behalf of BellSouth Telecommunications in Universal Service Proceeding, Tennessee Public Service Commission, Docket 95-02499, October 1995.

Prepared NERA testimony/comments/affidavits presented to:

- state regulatory commissions on
    1. Price cap, local competition, interconnection, and unbundling issues (Arizona, Connecticut, Kentucky, Louisiana, Mississippi, Pennsylvania, New Mexico, Vermont)
    2. Regulatory Reform (Arizona)
    3. Rate case (Arizona, New Mexico)
    4. Universal service issues (Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, New Jersey, New Mexico, North Carolina, South Carolina, Tennessee)
    5. Loop cost subsidies: measurement and testing (New Mexico, North Dakota)
    6. Resale and avoided cost (Alabama, Louisiana, Tennessee)
    7. Network Cost models (Alabama, Georgia, Massachusetts, Missouri, New Jersey, New York, Oklahoma, Pennsylvania, Texas)
    8. Estimation of Loop Cost (New York)
    9. Local company entry into interLATA long distance (Alabama, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee)
    10. TELRIC pricing of unbundled elements (Alabama, Delaware, Maryland, Mississippi, New Jersey, North Carolina, South Carolina, Tennessee, Virginia, Washington DC, West Virginia)
    11. Access charge reform (Arizona, Nebraska, Pennsylvania)
    12. Rate rebalancing and welfare impacts (Ohio, Florida)
    13. Pricing flexibility under price caps (New Mexico, North Carolina, Wyoming)
    14. Cost recovery for Operations Support Systems and service quality and performance measurement (Alabama, Arizona, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee)
    15. Reciprocal compensation for cellular, paging, and internet service providers (Alabama, Arizona, Colorado, Florida, Georgia, Idaho, Kentucky, Louisiana, Massachusetts, Mississippi, Montana, Nebraska, New Mexico, North Carolina, Oregon, South Carolina, Tennessee, Washington)
    16. Payphone rates and new services test (Arizona, Louisiana, South Carolina, Tennessee)
    17. Telephone company mergers (Arizona, Minnesota, Montana, Utah, Washington, Wyoming)

18. Reclassification of competitive services (Arizona, Nebraska, Washington, Wisconsin)
19. Fair competition and promotions (Alabama, Florida)

- Federal Communications Commission in dockets or ex partes on
    1. Unbundled Network Element rules and pricing (for BellSouth)
    2. TELRIC rules (for BellSouth)
    3. CMRS interconnection (for NYNEX)
    4. Benchmark and proxy cost models (for BellSouth, Southwestern Bell, and NYNEX)
    5. Universal service (for BellSouth)
    6. InterLATA authority (for BellSouth)
    7. Access reform (for BellSouth)
    8. Regulatory forbearance for hicap services (for BellSouth)
    9. Depreciation reform (for USTA)
    10. Inter-carrier compensation for Internet-bound traffic (for U S WEST/Qwest)
    11. Unified Compensation Mechanism for All Forms of Interconnection (for BellSouth)

- Canadian Radio-television and Telecommunications Commission in price cap proceeding (for Manitoba Telephone System)

- Telefonica Spain, on matters of reciprocal compensation

- Civil Action No. 94-324 (GK), FreBon International Corp. v. Bell Atlantic Corp., et al., Defendant's Expert Disclosure Statement

- Case No. 99-1706, U.S. District Court, Southern District of Florida, Supra Telecommunications & Information Systems v. BellSouth Telecommunications, Expert Reply Report on Economic Assessment of Damages

- Arbitration V, CPR Institute for Dispute Resolution Arbitral Tribunal, Supra Telecommunications & Information Systems v. BellSouth Telecommunications, Expert Reply Report on Economic Assessment of Damages

TELECOMMUNICATIONS-RELATED PAPERS

"Drivers of Demand Growth for Mobile Telecommunications Services: Evidence from International Panel Data," 2003, forthcoming in book published by the International Telecommunications Society. Co-authored with Agustin Ros.

"Patterns in Global Fixed and Mobile Telecommunications Development: A Cluster Analysis" (with Agustin Ros), *Telecommunications Policy*, Vol. 28, 2004, pp. 107-132.

"Does Incentive Regulation "Cause" Degradation of Retail Telephone Service Quality?" *Information Economics and Policy*, Vol. 15, 2003, pp. 243-269.

"Interconnection Rules and Inter-Carrier Compensation: Implications for Carrier Incentives and Economic Welfare," 2000. Co-authored with Agustin Ros.

"Telecommunications Privatization and Tariff Rebalancing: Evidence from Latin America" (with Agustin Ros), *Telecommunications Policy*, Vol. 24, 2000, pp. 233-252.

"The Internet: Implications for Regulation and Public Policy," 1999. Co-authored with Agustin Ros.

"The Internet: Market Characteristics and Regulatory Conundrums," 1999. Co-authored with Agustin Ros. Chapter in *Forecasting the Internet: Understanding the Explosive Growth of Data Communications*, edited by Lester D. Taylor and David G. Loomis, Kluwer Academic Publishers.

"Using Covariances of Share Changes to Determine Substitutability" (an application to media advertising), 1997. Co-authored with Michael Salinger.

"The Case Against Imputation of Access Charges in IntraLATA Toll Prices: Economic Efficiency and Fairness Reconsidered," BellSouth Telecommunications, 1994.

"Pricing of Local Exchange Interconnection Service From the Perspective of Economic Theory," BellSouth Telecommunications, 1993.

"Economies of Scale and Scope, Subadditivity of Costs, and Natural Monopoly Tests for Regulated Utilities," BellSouth Telecommunications, 1993.

"Fairness and Economic Efficiency in Regulation: Imputation v. Equal Contributions in IntraLATA Toll Pricing," Report to the Task Force on Imputation of Access Charges in IntraLATA Toll Price, BellSouth Telecommunications, 1993.

"Economic Analysis of Efficient versus Imputation-Based Pricing by a Regulated Public Utility," Report to the Task Force on Imputation of Access Charges in IntraLATA Toll Price, BellSouth Telecommunications, 1993.

"**E**: A Maximum Likelihood Estimation Program, A User's Guide to Some Applications," Bell Communications Research, 1992.

"Error Components Panel Data Modeling of Share Equation Systems: An Application to Telecommunications Access Demand," Bell Communications Research, 1989.

"Analysis of Demand Migration and Take Rates for Special Access High Capacity Services," Bell Communications Research, 1990.

"Business Outbound Service System: An Empirical Modeling Framework," AT&T, 1989.

MISCELLANEOUS PAPERS

"Does Futures Trading Destabilize Cash Prices? Evidence for U.S. Live Beef Cattle," (with R.D. Weaver), *Journal of Futures Markets*, Vol 10(1), 1990, (pp. 41-60).

"Market Structure and the Dynamics of Retail Food Prices," (with R.D. Weaver and P. Chattin), *Northeastern Journal of Agricultural and Resource Economics*, Vol 18(2), 1989, (pp. 160-170).

"Cash Price Variation in the Live Beef Cattle Market: The Causal Role of Futures Trade," (with R.D. Weaver), *Journal of Futures Markets*, Vol 2(4), 1982, (pp. 367-389).

"Unemployment Rate Dynamics and Persistent Unemployment Under Rational Expectations: A Comment," (with V. Moorthy), *Working Paper No. 8-87-1*, Department of Economics, The Pennsylvania State University, 1987.

"The Standard Errors of Characteristic Roots of a Dynamic Econometric Model: A Computational Simplification," *Working Paper No. 5-87-3*, Department of Economics, The Pennsylvania State University, 1987.

"Market Structure, Market Power, and Dynamic Price Determination in the Retail Food Industry," (with R.D. Weaver), *Working Paper No. 5-87-2*, Department of Economics, The Pennsylvania State University, 1987.

"Does Futures Trading Destabilize Cash Prices? Evidence for Live Beef Cattle," (with R.D. Weaver), *Working Paper No. 5-87-1*, Department of Economics, The Pennsylvania State University, 1987.

"Existence of Portfolios with Simultaneous Trading in Unrelated Speculative Assets," *Working Paper No. 8-86-2*, Department of Economics, The Pennsylvania State University, 1986.

"Models of Cash-Futures Market Complexes for Commodities Characterized by Production Lags," *Working Paper No. 7-86-2*, Department of Economics, The Pennsylvania State University, 1986.

"Cash Price Stability in the Presence of Futures Markets: A Multivariate Causality Test for Live Beef Cattle," (with R.D. Weaver), *Staff Paper No. 45*, Department of Agricultural Economics and Rural Sociology, The Pennsylvania State University, 1981.

"Optimal Interpolation and Distribution of Time Series by Related Series Using a Spectral Estimator for the Residual Variance," Bell Communications Research, 1990.

"Size and Power Characteristics of Three Tests of Nonlinearity in Time Series," AT&T, 1989.

"Model Testing and Selection in Applied Econometrics," AT&T, 1989.

CONFERENCE PRESENTATIONS

"Public Policy and Strategic Planning in Telecommunications: Implications for Pricing, Fair Competition and Interconnection," International Telecommunications Society Asia-Australasian Regional Conference, Perth, Australia, June 22-24, 2003.

"Competition Policy and the Internet, Cost-Based Local Loop Regulation and Market Power in Call Termination," International Telecommunications Society Asia-Australasian Regional Conference, Perth, Australia, June 22-24, 2003.

"Demand Growth for International Mobile Telephony," International Telecommunications Society Asia-Australasian Regional Conference, Perth, Australia, June 22-24, 2003.

"Drivers of Demand Growth for Mobile Telecommunications Services: Evidence from International Panel Data," International Telecommunication Society 14th Biennial Conference, Seoul, South Korea, August 18-21, 2002.

Discussant of "Providing Location and Context Aware Services for Mobile Commerce: Technological Approaches, Applications, and Policy Issues" by Charles Steinfield and Junghyun Kim, and "Explaining the Success of NTT DoCoMo's I-Mode Wireless Internet Service," by Martin Fransman, International Telecommunication Society 14th Biennial Conference, Seoul, South Korea, August 18-21, 2002.

Discussant of "The Impotence of Imputation," by T.Randolph Beard, David Kaserman, and John Mayo, 21st Annual Eastern Conference of the Advanced Workshop in Regulation and Competition, Rutgers University, Newport, RI, May 22-24, 2002.

"Does Incentive Regulation "Cause" Degradation of Retail Telephone Service Quality?" 20th Annual Eastern Conference of the Advanced Workshop in Regulation and Competition, Rutgers University, Tamiment, PA, May 23-25, 2001. Also presented at 19th Annual International Communications Forecasting Conference, Washington DC, June 26-29, 2001, and National Association of Regulatory Utility Commissioners, Summer Committee Meetings, Seattle, WA, July 17, 2001.

"Telecommunications Privatization and Tariff Rebalancing: Evidence from Latin America and Relevance to India," India Telecom 2000 Conference Keynote Speech, New Delhi, India, October 31-November 2, 2000.

"Interconnection Rules and Inter-Carrier Compensation: Implications for Carrier Incentives and Economic Welfare," (with Agustin Ros), 19th Annual Eastern Conference of the Advanced Workshop in Regulation and Competition, Rutgers University, Lake George, Bolton Landing, NY, May 24-26, 2000. Also presented at International Telecommunication Society 13th Biennial Conference, Buenos Aires, Argentina, July 2-5, 2000.

"The Internet: Implications for Regulation and Public Policy," (with Agustin Ros), 27th Annual Telecommunications Policy Research Conference, Alexandria, VA, September 25-27, 1999.

"The Internet: Market Characteristics and Regulatory Conundrums," (with Agustin Ros), International Communications Forecasting Conference, Denver, CO, June 15-18, 1999.

"Telecommunications Privatization and Tariff Rebalancing: Evidence from Latin America," (with Agustin Ros), 18th Annual Eastern Conference of the Advanced Workshop in Regulation and Competition, Rutgers University, Newport, RI, May 26-28, 1999.

"An Estimate of Current Universal Service Obligations and the Likely Impact of Federal and State Universal Service Plans," (with Agustin Ros and Neil Zoltowski), International Communications Forecasting Conference, St. Louis, MO, June 9-12, 1998.

"Competitive Telecommunications and its Aftermath: Economic Policy Issues and Modeling Needs," International Communications Forecasting Conference, Dallas, TX, April 16-19, 1996.

"On Modelling the Dynamics of Demand for Optional and New Services," International Communications Forecasting Conference, Toronto, Canada, June 13-16, 1995.

"The Case Against Imputation of Access Charges in IntraLATA Toll Prices: Economic Efficiency and Fairness Reconsidered," Rutgers University Advanced

Workshop in Regulation and Public Utility Economics, Seventh Annual Western Conference, San Diego, CA, July 6-8, 1994.

"Future Directions in Modeling the Demand for Vertical Services," National Telecommunications Demand Study Conference, La Jolla, CA. March 24-25, 1994.

"**E**: A Maximum Likelihood Estimation Program," National Telecommunications Forecasting Conference, Crystal City, VA, June 1-4, 1993.

Discussant of "The National Telecommunications Demand Study," National Regulatory Research Conference on Telecommunications Demand, Denver, CO, August 3-5, 1992.

"Using Demographics to Predict New Service Take Rates: Discrete Choice Analysis vs. Categorical Data Analysis," National Telecommunications Forecasting Conference, Atlanta, GA, May 5-8, 1992.

"Price Cap Regulations for the LECs: Implications for Demand and Revenue Forecasting," National Telecommunications Forecasting Conference, Boston, MA, May 30, 1991.

"Demand Migration for Special Access High Capacity Services," Rutgers University Advanced Workshop in Regulation and Public Utility Economics, Third Annual Western Conference, San Diego, CA, July 11-13, 1990.

"Error Components Panel Data Modeling of Telecommunications Access Demand," Bellcore-Bell Canada Telecommunications Demand Analysis Conference, Hilton Head, SC, April 22-25, 1990, and Bell Atlantic Business Research Conference, Baltimore, MD, October 24-27, 1989.

"Analysis of Integrated Demand Systems," Rutgers University Advanced Workshop in Regulation and Public Utility Economics, Second Annual Western Conference, Monterey, CA, July 5-7, 1989.

Panel Discussion on "The Regulatory and Operational Impacts of Price Caps," National Telecommunications Forecasting Conference, San Francisco, CA, May, 1989.

Exhibit AXB-2: Customer locations that meet the criteria for potential deployment of high-capacity loop facilities

Index	Address	City
1	171 ASHLEY AVE	CHARLESTON
2	19 HAGOOD AVE	CHARLESTON
3	316 CALHOUN ST	CHARLESTON
4	66 GEORGE ST	CHARLESTON
5	1000 ASSEMBLY ST	COLUMBIA
6	1122 LADY ST	COLUMBIA
7	1201 MAIN ST	COLUMBIA
8	1330 LADY ST	COLUMBIA
9	1333 MAIN ST	COLUMBIA
10	1333 TAYLOR ST	COLUMBIA
11	1426 MAIN ST	COLUMBIA
12	1441 MAIN ST	COLUMBIA
13	1535 CONFEDERATE AVE	COLUMBIA
14	1835 ASSEMBLY ST	COLUMBIA
15	1901 MAIN ST	COLUMBIA
16	2414 BULL ST	COLUMBIA
17	7201 TWO NOTCH RD	COLUMBIA
18	955 PARK ST	COLUMBIA
19	BELLE W BARUCH UNIV OF SC	COLUMBIA
20	180 N IRBY ST	FLORENCE
21	181 E EVANS ST	FLORENCE
22	555 E CHEVES ST	FLORENCE
23	1 INSIGNIA PL	GREENVILLE
24	107 FREDERICK ST	GREENVILLE
25	1200 WOODRUFF RD	GREENVILLE
26	2 N MAIN ST	GREENVILLE
27	206 S MAIN ST	GREENVILLE
28	220 N MAIN ST	GREENVILLE
29	301 UNIVERSITY RDG	GREENVILLE
30	55 BEATTIE PL	GREENVILLE
31	7 N LAURENS ST	GREENVILLE
32	700 HAYWOOD RD	GREENVILLE
33	701 GROVE RD	GREENVILLE
34	75 BEATTIE PL	GREENVILLE
35	4055 FABER PLACE DR	NORTH CHARLESTON
36	4500 LEEDS AVE	NORTH CHARLESTON
37	101 N PINE ST	SPARTANBURG
38	204 E MAIN ST	SPARTANBURG