BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

REBUTTAL TESTIMONY OF

JAMES W. WELLS, JR.

ON BEHALF OF

AT&T COMMUNICATIONS OF THE SOUTHERN STATES, INC.

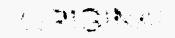*REDACTED VERSION*

Docket Nos. 960833-TP/960846-TP/971140-TP/960757-TP/960916-TP

December 9, 1997

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6

7 **I.**   **INTRODUCTION**

8 **Q.**   **PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

9 A.   My name is James W. Wells, Jr., and my office address is 5280 Laithbank Lane,

10   Alpharetta, GA 30022

11

12 **Q.**   **BY WHOM AND IN WHAT CAPACITY ARE YOU EMPLOYED?**

13 A.   I have been an employee of AT&T for the past twenty-five years. My current

14   position is District Manager - Outside Plant Cost Engineering in the

15   Cost/Technical Analysis and Advocacy Division of the Local Services Division of

16   AT&T. My area of expertise is Outside Plant (OSP) infrastructure planning,

17   design and construction, including costing aspects of the local loop.

18

19 **Q.**   **ON WHOSE BEHALF ARE YOU TESTIFYING?**

20 A.   I am testifying on behalf of AT&T Communications of the Southern States, Inc.

21

22 **II.**   **PURPOSE:**

23 **Q.**   **WHAT ARE THE PURPOSES OF YOUR TESTIMONY?**

24 A.   The purposes of my testimony are:

25

1   •   to offer an analysis of and recommend modifications to the OSP portions of

2   the Local Loop portion of BellSouth's Florida Cost Study and

3   •   to rebut the testimonies of BellSouth witnesses Daniel Baeza, Daonne

4   Caldwell and William Zarakas.

5

6 **Q.**   **HAVE YOU PROVIDED OTHER TESTIMONY IN THIS PROCEEDING?**

7 **A.**   No.

8

9 **III.**   **QUALIFICATIONS AND EXPERIENCE:**

10 **Q.**   **PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND OSP**

11   **WORK EXPERIENCE.**

12 **A.**   I have Bachelor of Engineering (Electrical Engineering) and Master of Business

13   Administration degrees and certification as a Project Management Professional. I

14   have gained OSP experience in the following assignments:

15

16   •   with South Central Bell Telephone Company (now BellSouth) in

17   Birmingham, AL: OSP Construction Foreman - 1 year, OSP Facilities

18   Engineer - 4 years, OSP Planning Engineer - 2 years,

19   •   with Western Electric and AT&T Network Systems (now Lucent

20   Technologies): Technical Representative for OSP Products - 5 years and

21   District Manager - OSP Engineering and Construction - 5 years,

22   •   with AT&T Local Infrastructure and Access Management: District Manager

23   OSP Engineering and Construction - 1 year,

24

1		• with AT&T Local Services Division: District Manager Outside Plant Cost
2		Engineering - 8 months.
3		
4	**IV.**	**SYNOPSIS:**
5	**Q.**	**HOW DOES YOUR TESTIMONY FIT INTO AT&T's OVERALL CASE?**
6	A.	My testimony addresses engineering and costing aspects of the Outside Plant

7   (OSP) portion of the local loop, which is the network infrastructure from the

8   central office to the customer's premise. The impact of my recommendations on

9   the total cost of the local loop is included in the testimony of Mr. Wayne Ellison.

10

11 **Q.** **PLEASE PROVIDE AN OVERVIEW OF YOUR CONCERNS WITH**

12   **BELLSOUTH'S COST STUDY.**

13 A.   In my testimony I:

14   • demonstrate that BellSouth's Cost Study is not the least cost, most efficient,

15   forward looking model utilizing currently available technology, for the OSP

16   portion of the local loop;

17   • identify several flaws in BellSouth's OSP cost modeling methodology and

18   errors in its spreadsheet values and calculations; and

19   • make appropriate recommendations for improvements to BellSouth's Cost

20   Study.

21

22   My testimony addresses the following OSP specific aspects of BellSouth's

23   Florida Cost Study:

24   • Forward Looking Assumptions - in which I examine BellSouth's assumptions

25   concerning:

1   –   number of cross-connect boxes in a loop,

2   –   minimum copper cable size,

3   –   bridged tap,

4   –   average fiber cable sizes and

5   –   two-channel Digital Subscriber Lines.

6

7   These assumptions determine how certain loops in BellSouth's sample are

8   redesigned, or recasted, to reflect what BellSouth incorrectly asserts is a least

9   cost, most efficient, forward looking local loop OSP network architecture

10   utilizing currently available technology.

11

12   •   OSP Cost Modeling Assumptions - in which I review BellSouth's

13   assumptions concerning:

14   –   distribution cable utilization,

15   –   customer drops,

16   –   network interface devices,

17   –   building entrance terminals,

18   –   circuit level costs and

19   –   structure sharing.

20

21   These assumptions underlie the process employed by BellSouth in determining

22   the cost of a single "hypothetical representative loop"[1] for the entire state of

23   Florida.

24

25

1   •   Loading Factors - in which I describe how BellSouth's cable material and

2   conduit loading factors are major add-ons used in BellSouth's Cost Study to

3   inflate local loop investment for what should be relatively minor material

4   expenses.

5

6 **V.**   **CONCERNS WITH BELLSOUTH'S COST STUDY FOR FLORIDA**

7 **Q.**   **DOES BELLSOUTH'S COST STUDY REFLECT LEAST COST, MOST**

8   **EFFICIENT FORWARD LOOKING ASSUMPTIONS WITH RESPECT**

9   **TO OSP IN ACCORDANCE WITH TSLRIC METHODOLOGY?**

10 A.   No, it does not. The set of OSP assumptions in BellSouth's Cost Study do reflect

11   an improvement over the major inefficiencies of BellSouth's current network

12   design, as evidenced by the sample of loops in its network. However, BellSouth's

13   Florida Cost Study does not produce the least cost, most efficient, forward

14   looking, local telecommunications network based upon currently available

15   technology, which is the correct approach to determining the Total Services Long

16   Run Incremental Cost (TSLRIC) for the OSP elements of the local loop. A set of

17   OSP assumptions that embraces this concept would reflect:

18

19   •   the economies of large scale projects,

20   •   minimization of cable not on the path to the customer,

21   •   costing of a single sheath in cable cross sections,

22   •   minimization of travel time between work locations,

23   •   maximization of structure sharing,

24   •   most efficient utilization of the OSP infrastructure,

25

1   •   elimination of backward looking network components and methods of

2   operation from loading factors, and

3   •   prudent deployment of currently available technology.

4

5   In the following examples, I demonstrate how BellSouth's Cost Study fails to

6   employ these OSP TSLRIC assumptions.

7

8 **Q.**   **WHY ARE THE BELLSOUTH COST STUDY ASSUMPTIONS**

9   **CONCERNING THE NUMBER OF CROSS-CONNECT BOXES IN A**

10   **LOOP NOT FORWARD LOOKING?**

11 **A.**   A forward looking OSP network design would have a single Feeder Distribution

12   Interface (FDI) or cross-connect box in a loop. However, BellSouth has

13   incorporated sampled loops (e.g., FL # 689) with multiple cross-connects into its

14   single hypothetical representative loop. It is recommended that BellSouth add

15   "single cross-connect box" to its list of forward looking redesign criteria for its

16   sampled loops.

17

18 **Q.**   **WHY ARE BELLSOUTH'S COST STUDY ASSUMPTIONS**

19   **CONCERNING MINIMUM CABLE SIZE NOT LEAST COST?**

20 **A.**   BellSouth employs a minimum distribution cable size of 25 pairs.[2] The impact of

21   this 25 pair minimum is to exaggerate the number of pairs of distribution cable

22   needed in sparsely populated areas or a side street with eight or fewer customers

23   because the next generally available and economically applicable lower sized

24   cable is 12 pair 24 gauge cable. Based on BellSouth's distribution cable sizing

1   factor of ▮ lines per living unit, then customer demand of eight or fewer lines or

2   living units should be served more economically by 12 pair cable.

3

4   Mr. Baeza testifies that 25 pair is the smallest pair size cable that BellSouth

5   utilizes because of the cost of having additional cable sizes in their inventory, plus

6   the training costs. However, BellSouth has filed installed cost input values for

7   copper aerial cable per foot as follows: 25 pair, 24 gauge - $▮, 12 pair, 24

8   gauge - $▮ and 25 pair, 26 gauge - $▮.[3] The potential installed cost savings

9   is at least ▮% from utilizing a 12 pair 24 gauge aerial cable instead of a 25 pair

10   cable. Any cost savings for BellSouth from not having 12 pair 24 gauge cable as

11   a choice in its inventory cannot begin to offset these potential savings. BellSouth

12   currently has more than ▮ cable types and sizes of cable in its inventory.

13

14   BellSouth's operating practice of 25 pair minimum size cable and 25 pair

15   distribution cable administration are major contributors to BellSouth's rather low

16   copper distribution cable utilization factor of ▮%, which in turn drives up

17   BellSouth's TSLRIC cost for distribution cables of all sizes. The very example

18   that Mr. Baeza uses to substantiate BellSouth's low distribution utilization rate

19   would have a utilization factor of 75% if 12 pair cables were deployed on the side

20   streets.[4]

21

22   Mr. Baeza's cost savings arguments include reduced training from not having 6

23   and 12 pair cables. There quite simply are no additional training requirements to

24   place or splice these smaller size cables.

25

7

1   BellSouth's position on this issue is based on their embedded operating practice

2   of having a minimum 25 pair cable. BellSouth can certainly choose to run its

3   business as it see fit. However, for the purpose of establishing the cost basis for

4   Unbundled Network Elements, BellSouth should model the least cost, most

5   efficient, currently available technology, which in this case is 12 pair 24 gauge

6   cable. The result would be cost savings in cable material, utilization and loading

7   factors.

8

9   Q.   **WHY DO YOU BELIEVE THAT BELLSOUTH'S ASSUMPTIONS**

10   **CONCERNING USE OF BRIDGED TAP ARE NOT LEAST COST AND**

11   **FORWARD LOOKING?**

12   A.   The term bridged tap applies to copper cable that is not on the direct path of the

13   cable pair between the customer and the central office. As used in BellSouth's

14   Cost Study, it includes "pure bridged tap" (i.e., bridged to the cable pair between

15   the customer and the central office) as well as "end section" (i.e., extending past

16   the customer). "Pure bridged tap," which is prevalent in BellSouth embedded

17   network and thus its loop sample, is a consequence of outdate multiple plant

18   design. BellSouth's Cost Study exaggerates copper cable costs by including up to

19   2,500 feet of either type of bridged tap from its sampled loops after deleting all of

20   its irregular bridged tap between load coils and repeaters. Even with this

21   limitation to the amount of bridged tap that is actually deployed in BellSouth's

22   network, the cost impact of this mostly inefficient bridged tap adds a staggering

23   ██% - ██% to the BellSouth's total loop investment in Florida. (The range of

24   bridged tap investment is estimated based on BellSouth's filings in similar UNE

1   cost dockets in other states since BellSouth did not file the relevant spreadsheet

2   (i.e., allcomp) in this proceeding.)

3

4   In his direct testimony regarding bridged tap, Mr. Baeza continues BellSouth's

5   futile quest to develop an example to substantiate the inefficiencies of "pure

6   bridged tap," as opposed to "end section.[5]   He states that his example

7   demonstrates that bridged tap "is actually desirable in many cases, since it avoids

8   the necessity of building additional plant to serve our customers." This statement

9   is incorrect and misleading.   With 40 homes in the subdivision in Mr. Baeza's

10   example, 20 homes along the main street and 20 homes on the cross street, a 100

11   pair cable is required from the central office. Therefore, no cable from the central

12   office is avoided by the designed bridged tap in the example. The OSP planner or

13   design engineer would allocate 50 pairs along main street and 50 pairs to the cross

14   street. The multiplying of the 50 pairs allocated to the cross street for assignment

15   along the main street as described in Mr. Baeza's example is neither required nor

16   desired and is contrary to the Detailed Distribution Area Planning practice.[6]

17

18   Using BellSouth's own example to further illustrate the uneconomical use of

19   designed bridge tap, the 100 pair cable along the main street could have been

20   tapered to a 25 or 50 pair cable at the cross street and still served the demand, if it

21   was otherwise economical to do so. Mr. Baeza asserts that, "Opening the sheath,

22   cutting the cable and splicing the new cable are not free. As well, costs are

23   incurred in training, warehousing and inventorying splicing equipment and in the

24   maintenance of those splices." He seems to overlook the obvious fact that there

25   will be a splice anyway of the 50 pair cable going down the cross street to the 100

1   pair cable coming down the main street at the potential taper point. Therefore, the

2   correct economic considerations in determining whether or not to taper the cable

3   would be the wire joining cost of splicing to a 25 or 50 cable continuing on down

4   the main street versus the material cost savings of the 25 or 50 pair cable instead

5   of continuing on with the 100 pair cable. Thus, Mr. Baeza's example of

6   reasonable "bridged tap" avoids no costs, violates distribution design practice, and

7   precludes potential cost savings from tapering the cable along the main street.

8

9   One more observation regarding Mr. Baeza's testimony on "bridged tap" is that if

10   he really wanted to use it to avoid the necessity of building additional plant, then

11   in his previous example on distribution cable utilization, the 25 houses could have

12   been served with 50 pairs via "bridged tap" with a 75% utilization (based on (25

13   houses x 1.5 lines per house) / 50 pairs).

14

15   There should be zero "pure bridged tap" and minimal "end section" in a forward

16   looking local loop design based on the current Serving Area design concept. The

17   elimination of "pure bridged tap" from BellSouth's redesign assumptions and the

18   limitation of the single "end section" bridged tap to 2,000 feet in accordance with

19   BellSouth's own directive[7] would substantially lower the ██% - ██% of bridged

20   tap copper cable material investment in BellSouth's Cost Study. If BellSouth

21   were to recast its sampled loops in accordance with this recommendation, I

22   estimate that there would be a 3% - 5% reduction in BellSouth's total loop

23   investment. Other local loop cost models, by comparison, have no "pure bridged

24   tap" in their designed loops.

25

1 **Q.** **WHY ARE THE BELLSOUTH COST STUDY ASSUMPTIONS**

2 **CONCERNING AVERAGE FIBER CABLE SIZE NOT LEAST COST?**

3 **A.** For loops longer than 12,000 feet on copper feeder, the BellSouth Cost Study

4 redesigns such loops with average size fiber cables that can be larger and more

5 expensive than necessary, thereby exaggerating material investment. In Florida,

6 these average sized fiber cables are ▮ fiber for aerial, ▮ fiber for buried, ▮ fiber

7 for underground and ▮ for building entrance. BellSouth's Cost Study offers no

8 substantiation for these cable sizes, which differ significantly by state. It is

9 incredulous to model ▮ fiber cable as the <u>average size</u> building entrance fiber

10 cable, especially when these buildings are more than ▮ feet from the wire

11 center.

12

13 In rebuttal to this point in Louisiana, Ms. Caldwell makes the incredible statement

14 that, "Regardless of these facts, on a per DSO equivalent basis, or any other

15 comparable basis for that matter, 25 pair cable is no more costly than 11 or 6 pair

16 cable and 30 strand fiber cable is not more costly than 6 strand fiber cable."[8]

17 BellSouth's own cost data in this docket show the cost of 6 strand fiber cable to

18 be $▮ per foot and 30 strand fiber cable to be $▮ per foot. In addition, it

19 also cost more to splice the 24 extra fibers in a 30 strand fiber cable.

20

21 Mr. Baeza states that "the truth is that one-sixth of a six pair cable is more

22 expensive the one-twenty fifth of a 25 pair cable."[9] BellSouth's methodology of

23 determining cost on a per circuit or DS0 equivalent basis may be appropriate for

24 allocating and recovering costs associated with an embedded investment. But, a

25 forward looking bottom up cost model based on the concepts of least cost and

11

1   most efficient would properly size and fully cost each cable in the local loop

2   network. If a 6 or 12 pair cable is of sufficient capacity to serve the customer

3   demand, then that 6 or 12 pair 24 gauge cable costs less than BellSouth's 25 pair

4   26 gauge cable. Furthermore, and even more importantly, the modeling of 6 and

5   12 pair cable sizes increases the distribution cable utilization factor, which lowers

6   local loop investment even more because of the way that BellSouth has modeled

7   utilization in its cost study.

8

9   By way of comparison, other local loop cost models will determine and then

10   properly size copper and fiber cables for each cable segment of each feeder route

11   in each and every wire center for the entire state of Florida; thereby modeling

12   more realistic material costs for fiber cables in this regard.

13

14   Q.   **HOW ARE THE BELLSOUTH COST STUDY ASSUMPTIONS**

15   **CONCERNING THE USE OF TWO-CHANNEL DIGITIAL SUBSCRIBER**

16   **LINE (DSL) SYSTEMS NOT LEAST COST AND FORWARD LOOKING?**

17   A.   BellSouth's Cost Study oversizes copper cable spare capacity, thereby increasing

18   material costs and decreasing forward looking utilization factors. Two-channel

19   DSL Systems can operate over 2-wire non-loaded loops out to 18,000 feet and

20   provide a second line capability as needed, which is more economical than having

21   a spare cable pair for each customer. Thus, a least cost, most efficient set of

22   forward looking assumptions utilizing currently available technology would be to

23   reduce some of the spare capacity in copper cables and drops for the non-DLC

24   loops less than 12,000 feet by employing two-channel DSL as the economic

25   alternative if all of the spare cable capacity is used.

1   The reason that a two-channel DSL System, or BellSouth's Digital Added Main

2   Line (DAML), is more economical than providing excessive spare copper cable

3   capacity is based on the following analysis. With copper utilization rates of ██%

4   for distribution cables and ██% for feeder cables, a substantial amount of

5   BellSouth's loop investment is in spare capacity. Judicious utilization of two-

6   channel DSL systems, or DAML, would raise BellSouth's utilization rates and

7   lower its investment.

8

9   BellSouth did not file its investment per local loop in Florida for this proceeding;

10 however, in UNE cost dockets in other states BellSouth has filed $██ - $██

11 for a 2-wire analog voice grade loop, service level 1. For economic comparison

12 purposes this investment in a spare copper circuit that has very limited

13 redeployment capability is made at time point zero. A two-channel DSL system,

14 or DAML, cost approximately $700. This investment is incurred at some point in

15 the future, if needed. Relatively few of them will likely be needed because there

16 are only ██ lines per residence in Florida. DAML is also highly redeployable.

17

18 So the appropriate economic comparison is:

19 • spare capacity in the form of excessive cable investment that is at least ██% to

20 as much as ██% more costly per circuit, is a sunk investment at time point

21 zero, and is provided for all potential users of second lines, versus

22 • lowered initial cable investment, a smaller cost per additional line that is

23 incurred if, when and only in the amount needed by customers, and is not a

24 sunk investment because it can be redeployed if customer service

25 requirements change.

1   Mr. Baeza appears to have an entirely different view on how to model and cost a

2   network according to TSLRIC principles. In his rebuttal testimony in Louisiana

3   he states that, "Spending $500 to $700 to gain a pair, and perhaps save an

4   additional drop, at three times the cost of provisioning the pair in the initial cable

5   sizing seems excessive."[10] His oversimplified comparison assumes incorrectly

6   that ultimate spare facilities for all customers must be provided on initial

7   installation and that the economic choice is spare copper pairs or DAML systems

8   initially for all. He does not consider the probability of occurrence, the capability

9   for redeployment nor the discounting of cost associated with a future expenditure

10   for the DAML as the economically viable alternative.

11

12   Mr. Baeza also states that the incremental cost of the spare pair is one third of the

13   cost of DAML, which would be $167 to $233. I believe that CLECs would be

14   most interested in leasing BellSouth's spare capacity based on this amount of

15   incremental investment. However, BellSouth's Cost Study uses average

16   investment that is much higher than TSLRIC because, in part, BellSouth's copper

17   utilization rates are too low.

18

19   BellSouth's Loop Technology Deployment Directives allow for two-channel DSL

20   systems (referred to therein as DAML for Digital Added Main Line) as

21   BellSouth's last choice for distribution relief.[11] Mr. Wayne Gray (Mr. Baeza's

22   counterpart for Georgia) confirmed at his deposition that DAML is a viable

23   alternative for providing a second line.[12] With two-channel DSL Systems as a

24   viable alternative to oversizing cables for all potential customer needs, initial loop

25   investment will be lowered by raising BellSouth's "forward looking" copper cable

14

1   utilization factors. Furthermore, any future investment in DSL Systems is only

2   required if, when, and for as long as specifically required.

3

4   Mr. Baeza further argues that "DAML is less expensive if demand is only

5   temporary. If demand is permanent and ongoing, the correct solution is to size the

6   distribution cable to provide for the projected demand."[13] He misses the point that

7   DAML is being proposed as the economical alternative to excessive spare copper

8   pairs for unprojected future demand. Instead, BellSouth would rather deploy and

9   charge current customers, particularly its CLEC customers, for the excessive

10   capacity to possibly serve future customers.

11

12   Q.   **WHAT IS YOUR CONCLUSION REGARDING BELLSOUTH'S**

13   **FORWARD LOOKING OSP ASSUMPTIONS IN ITS LOCAL LOOP**

14   **COST STUDYING?**

15   A.   My conclusion, based on the examples I describe above, is that BellSouth's

16   "forward looking" assumptions fall short of being the least cost, most efficient

17   utilization of currently available technology, and many of BellSouth's OSP

18   assumptions are not really forward looking at all. BellSouth's Cost Study in

19   numerous ways seeks to recover BellSouth's backward looking, embedded costs

20   incurred in building its existing network.

21

22   Q.   **DOES BELLSOUTH'S COST STUDY INCLUDE ALL THE FORWARD**

23   **LOOKING ASSUMPTIONS OF BELLSOUTH'S INTERNAL NETWORK**

24   **DEPLOYMENT PLANS?**

1   A.   No. BellSouth witnesses have acknowledged that the BellSouth Cost Study

2   specifically does not incorporate many of the forward looking assumptions of

3   BellSouth's own network deployment directives.[14] On the other hand, BellSouth's

4   Cost Study incorporates other aspects of its "Loop Technology Deployment

5   Directive" that perpetuate the underutilization – and therefore exaggerate the

6   material cost – of BellSouth's existing copper plant. For example, the low

7   utilization of copper cables in BellSouth's Cost Study may be partly attributable

8   to BellSouth's internal and self-serving business decision to ███████████

9   ██

10   ██████████████.[15]

11

12   **OSP COST STUDYING ASSUMPTIONS:**

13   A.   **COPPER DISTRIBUTION CABLE UTILIZATION**

14   Q.   **HAS BELLSOUTH MADE REASONABLE ASSUMPTIONS IN**

15   **PROJECTING ITS UTILIZATION OF COPPER DISTRIBUTION**

16   **CABLE?**

17   A.   No. Based on the criteria of a forward looking, least cost, most efficient local

18   loop utilizing currently available technology, I conclude that BellSouth's copper

19   distribution utilization projection of ███% is too low. A more efficient, forward

20   looking distribution network for Florida would incorporate distribution cable fill

21   factors of approximately 70% with commensurate utilization reasonably projected

22   at 60%. BellSouth's projected distribution utilization results in approximately

23   ███% more distribution cable investment than should be required.

24

1   It is important to explain the difference between "fill factor" and "utilization."

2   The fill factor for a copper cable is defined in bottoms up cost models as the

3   percentage of the lines served divided by the number of pairs required to serve

4   those lines, allowing for a reasonable amount of spare capacity.   The fill factor

5   for copper cable is used in these other cost models to divide into the number of

6   customer lines to determine the number of cable pairs required, which is then

7   increased to the next larger available cable size, which becomes the number of

8   pairs available.

9

10   A better descriptive name for "fill factor" would be "cable sizing factor." On the

11   other hand, the term "utilization" is defined as the number of lines served, divided

12   by the number of pairs available.

13

14   The following is an example of how a copper cable fill factor works to create

15   spare capacity. If the demand along a particular street was for 60 lines and the

16   applicable fill factor in that density zone was 75%, then a bottoms up cost model

17   would determine that 80 pairs (i.e., 60 / .75) would be the number of cable pairs

18   required to serve the demand. So, the fill factor alone, in this example, has

19   modeled 20 additional cable pairs, which is a fill factor spare capacity level of

20   33% (i.e., 20 / 60).

21

22   However, since copper cables come in discrete sizes, the bottoms up cost model

23   would select the next larger available cable size, which is a 100 pair cable, to

24   serve the 60 customers along that street. The initial utilization would be 60%

1 (i.e., 60 lines / 100 pairs available), and the initial spare capacity would be 40%

2 (i.e., 40 / 100).

3

4 Since the bottoms up cost model fill factor defines the upper limit on initial

5 utilization, then the least amount of spare capacity initially will be 100% less the

6 fill factor. The actual spare capacity will likely be much greater depending upon

7 the actual demand and the rounding up to the next cable size. Thus, the average

8 "cable utilization" that results from the bottoms up cost model will be

9 significantly less than the input values for fill factors for the cost model. It is a

10 misrepresentation to claim that the bottoms up cost model fill factors are

11 unreasonably higher than the ILECs utilization factors because that is simply not

12 an "apples-to-apples" comparison.

13

14 The average utilization for a cable section can be approximated as the average of

15 the initial and planned maximum utilization (i.e., initial customer lines and

16 planned maximum divided by the size of cable placed). Initial and planned

17 maximum utilization can be approximated by first constructing a spreadsheet of

18 customer lines divided by a given fill factor and rounded up to the next larger

19 cable size and calculating the initial and planned maximum utilization. Then, by

20 averaging these initial and planned maximum utilizations over a range of

21 customer line requirements, the average utilization can be approximated, as in

22 Exhibit JWW1.

23

24

25

1   This methodology produces cables that account for the "lumpiness" of cable

2   investments, will serve reasonably projected future demand, allow for as much as

3   5% defective pairs, and permit churn in the outside plant.

4

5 Q. **WHAT IS YOUR BASIS FOR CONCLUDING THAT BELLSOUTH'S**

6   **DISTRIBUTION CABLE UTILIZATION IS TOO LOW?**

7 A. At a ██% utilization factor, BellSouth's distribution cables will have outlived

8   their usefulness long before they exhaust their excessive spare capacity, as

9   demonstrated below. BellSouth has based its copper distribution utilization on the

10   ratio of <u>current</u> access lines divided by <u>ultimate</u> cable requirements. BellSouth

11   expects an annual average access line growth rate of ██% (based on historical

12   data) over the next ten years.[16] Starting at a ██% fill on existing distribution

13   cables, it would take at least ██ additional years of compounded growth to reach a

14   typical fill at relief of 85%. On the other hand, BellSouth's stated service life for

15   aerial and buried copper cables is only ██ years. In other words, BellSouth has

16   sized its distribution cables to far exceed reasonably foreseeable capacity

17   requirements during their useful life.

18

19   Another reason why BellSouth's copper cable utilization rate is too low is the

20   rather high actual defective pair rate of ██% for BellSouth's copper cables.[17] In

21   my opinion, a 5.0% defective pair rate is unacceptably high and is more than

22   covered by the fill factors.

23

24   When asked about this matter in her deposition, Ms. Daonne Caldwell,

25   BellSouth's Cost Witness, was not aware if BellSouth had any standards for an

acceptable defective pair rate. She also mistakenly stated that defective pairs had

not been counted as available pairs in establishing BellSouth's Cost Study

utilization factors.[18]

My reasons for stating that a 5% defective pair rate is too high are based on the

following:

- BellSouth receives copper cables that should have zero defective pairs,
- BellSouth performs cable acceptance test on cable projects and should not

  be turning up for service newly installed cables with more than 1%

  defective pairs, and
- BellSouth UNE cost studies have modeled its investment per cable pair to

  be $███ - $███ in other dockets.
- BellSouth's cost to clear a defective pair is approximately $███.[19]

Thus, as the defective pair rate begins to approach 5%, it becomes very

economical to identify and repair or replace major causes. That is unless

BellSouth has such large surplus of spare cable pairs that there is no economic

need to recover the █% - █% in excessive defective pairs. Low cable utilization

(i.e., excessive spare pairs in the cable) encourages high defective pair rates

because it is often expedient to simply "cut a change" and transfer the customer

having trouble to a spare pair, thus leaving the initial pair defective.

Mr. Baeza's reasoning that defective pairs (or fibers) is justification for lowered

utilization[20] is certainly not a model for a least cost, most efficient local loop

network and should be unacceptable. BellSouth has rationalized its high defective

1   pair rate in part because of its low utilization rates. In this cost study BellSouth is

2   now trying to rationalize its low utilization rates base in part on its high defective

3   pair rate.

4

5   Q.   **DO   BELLSOUTH'S   DISTRIBUTION   CABLE   UTILIZATION**

6   **ASSUMPTIONS COMPORT WITH BELLSOUTH'S ACTUAL BUSINESS**

7   **PLANS?**

8   No.   BellSouth's own Loop Technology Deployment Directive states that

9   "███

10   ██

11   ████████████████████████████████" and "█████████████████████████

12   ████████████████████████████".[21]   A BellSouth Network

13   Infrastructure Planning Witness has equated this to sizing cable based on

14   anticipated demand in a particular area in the next ██████████ years,[22] as

15   compared to the █ years of spare capacity remaining in cables with ██%

16   average utilization under BellSouth's Cost Study.

17

18   Historically, BellSouth has sized its distribution cables based on ultimate demand

19   utilizing a guideline of ██ pairs per living unit[23] plus business demand, but is

20   now sizing based on ██ pairs per living unit.[24] So, if BellSouth is currently

21   placing distribution cables that are of smaller size based on only the ██ year

22   demand or to provide only ██ lines per living unit as opposed to its past practice

23   of ██ pairs per living unit, then it logically follows that distribution cable

24   utilization rates will rise in the future. Instead, BellSouth's Cost Study reflects

25   the lower distribution cable utilization of its backward looking embedded network

21

1   deployment of ▮ pairs per living unit.   The importance of this point is that

2   lowered utilization rates have a direct linear impact on unnecessarily high local

3   loop investment in BellSouth's Cost Study.

4

5   Mr. Baeza offers as partial justification for BellSouth's low utilization rates that

6   "consideration also has to be given to churn and sufficient pairs must be available

7   to handle dual or nonconcurrent service activity which is likely to increase with

8   the presence of multiple Local Exchange Companies. As a result, cable sizing

9   requirements will increase, and thus help ensure that utilization factors will

10   remain constant."[25] However, when a customer changes service from BellSouth

11   to a Competitive Local Exchange Carrier (CLEC) via a UNE there should be no

12   change in the cable portion of the local loop; in other words, there should only be

13   concurrent service activity in so far as the cable pair or DLC channel is concerned.

14   Thus, no additional OSP facilities with lower utilization should be attributed to

15   customers changing from BellSouth to CLECs over BellSouth UNEs as Mr.

16   Baeza has argued.

17

18   Mr. Baeza also testifies that the various Florida plant utilization factors contained

19   in the cost studies BellSouth has presented are reasonable and represent what he

20   believes that BellSouth's utilization factors will be in the future.[26]   This is

21   contradicted by BellSouth's own publicity regarding second line growth:

22

23   BellSouth is driving revenue and profit growth by aggressively marketing

24   additional telephone lines to our customers. Additional lines are key to

25   satisfying the expanding consumer demand for connections to the Internet,

1   Home fax machines, children's phones, telecommuting tools and home

2   office phones. With 1.3 million additional lines, BellSouth has the most

3   of any telephone company in the U.S. Our additional lines increased by

4   21 percent in 1995, and accounted for nearly half of all new residential

5   connections.[27]

6

7   For the purposes of defining a least cost, most efficient, forward looking cost

8   model for the local loop to establish the cost basis for UNEs, it is inconceivable

9   that BellSouth would be allowed to use its historical embedded utilization rates.

10   As used in BellSouth's cost model, utilization rates have a direct linear impact on

11   material costs. If the utilization rates used by BellSouth are set 20% too low for a

12   least cost, most efficient, forward looking cost model for the local loop, then the

13   resulting UNE rates will be 20% too high.

14

15 Q.   **HOW THEN IS A MORE APPROPRIATE ASSUMPTION FOR COPPER**

16   **DISTRIBUTION UTILIZATION DETERMINED?**

17 A.   Mr. Baeza constructed a useful table in Exhibit DMB-3 to his Rebuttal Testimony

18   in the Louisiana Cost Docket that shows the effect of sizing cables based on ▮

19   pairs per living unit (i.e., a fill factor of ▮%) and rounding up to the next

20   available cable size.[28] This table has been reproduced with the addition of 6 and

21   12 pair cables as Exhibit JWW1. The conclusion drawn from this example is that

22   the average utilization over the life of the cables would be 62.5% (the initial

23   utilization would be 50.0% (i.e., 8,911 / 17,822) and the ultimate utilization would

24   be 75.0% (i.e., 13,366.5 / 17,825) with average utilization being 62.5%).

25

1   Q.   **DOES BELLSOUTH'S COST STUDY APPLY CABLE UTILIZATION**

2   **FACTORS CORRECTLY?**

3   A.   No. The BellSouth Cost Study uses its copper distribution, copper feeder and

4   fiber cable utilization factors to factor up the amount of investment that it

5   determines on a per DSO circuit basis.   It makes no differentiation among

6   utilization rates for its embedded aerial, buried or underground applications, even

7   though BellSouth's practice is to size its cables differently based on the type of

8   plant. Typically, buried cables are sized to serve forecasted demand over a longer

9   period of time, and consequently would have lower average utilization than aerial

10   or underground cables. BellSouth's witnesses repeatedly assert correctly that it is

11   undesirable to dig up streets and lawns to reinforce buried cables. What they do

12   not mention, and what BellSouth's Cost Study does not model, is the fact that

13   BellSouth's aerial and underground cables cable sections are sized for shorter

14   relief intervals and have higher average utilization rates due to the lower cost and

15   minimal disruption of cable reinforcement.

16

17   **B.   COPPER FEEDER CABLE UTILIZATION**

18   Q.   **IS THE UTILIZATION RATE USED FOR COPPER FEEDER IN THE**

19   **BELLSOUTH COST STUDY APPROPRIATE AND IF NOT, WHAT DO**

20   **YOU RECOMMEND?**

21   A.   No, it is not appropriate. The copper feeder utilization used by BellSouth is the

22   embedded fill measured at the Main Distributing Frame (MDF) in the central

23   office where all the copper feeder pairs are terminated. It is commonly referred to

24   as "MDF fill".

25

1   The copper feeder utilization of ▮▮% used by BellSouth in this proceeding is

2   based on the embedded copper feeder, which is not appropriate for TSLRIC. As

3   explained more fully by economic witnesses,[29] the utilization excluding

4   anticipated growth, or what is called "fill at relief" by OSP engineers, is the

5   appropriate utilization for TSLRIC. The "fill at relief" reflects the estimated

6   capacity of the existing network. Based on my experience, the appropriate "fill at

7   relief" for copper feeder pairs is 90% - 95% based on assigned pairs and 85% -

8   90% based on working pairs. BellSouth has also stated that 85-90% is the

9   appropriate "fill at relief" for copper cables.[30]

10

11   Assigned pairs includes feeder pairs that are spare (commonly referred to as idle

12   assigned pairs) but are left assigned to a customer location to avoid a field visit

13   when service is re-connected. A good example of an idle assigned pair is one

14   connected to an apartment that has been vacated but the service for the new tenant

15   has not yet been connected. This typically represents about 5% (as a percent of

16   the assigned pairs). Also, it is important to recognize that when the feeder cables

17   reach the 85% - 90% "fill at relief", it does not automatically mean that relief is

18   required. It is a "trigger" for the outside plant engineer to study the feeder route

19   to determine whether relief is appropriate. The most important factors to consider

20   in making that decision are spare capacity and growth. Obviously if there is no

21   growth or the growth is small, feeder relief may not be required at the time that

22   the "fill at relief" is reached. The importance of focusing on spare capacity and

23   growth as opposed to automatically reinforcing the feeder network when it

24   reaches 85% or 90% fill, cannot be over emphasized. This is critical to achieving

25   and maintaining efficient utilization of the copper feeder network.

1   BellSouth uses a copper feeder utilization factor of ██% in Florida, which

2   reflects low utilization of the copper feeder investment. Assuming BellSouth's

3   stated annual growth rate of █% per year, the BellSouth cost study includes spare

4   copper feeder capacity for ██ to ██ years growth from its average copper feeder

5   utilization, as opposed to the utilization at the time that a feeder route has been

6   relieved with a new cable. This is excessive because feeder cables are generally

7   sized at the time of placement for only three to five years growth, as corroborated

8   by BellSouth's Loop Technology Deployment Directives.[31] Based on this three to

9   five year period and an 85-90% "fill at relief", the fills for the feeder cables

10 should range between 70% (i.e. the lowest fill will be 85% - 15%) and 90% (i.e.

11 the upper fill will be 90%). Thus, the average should be about 80% which is what

12 I recommend as the appropriate utilization for copper feeder cables in this

13 proceeding.

14

15 Q.   **WHAT ARE THE FACTORS THAT AFFECT THE MDF FILL AND CAN**

16   **YOU PROVIDE SOME EXPLANATIONS OF WHY THE BELLSOUTH**

17   **UTILIZATION IS THAT LOW?**

18 A.   Based on my experience and the BellSouth information that is applicable to all

19   states, I believe the following five factors contribute significantly to BellSouth's

20   low copper feeder utilization:

21

22   1. A major factor is the high percentage of defective pairs based on the following

23   data regarding BellSouth's defective pair rate:[32]

24

25

Year	Defective Rate
1991	██%
1992	██%
1993	██%
1994	██%
1995	██%
1996	██%

1

2   There are a number of factors that contribute to this high defective percentage

3 of pairs. When feeder utilization is low, there is little incentive to clear

4 defective pairs, and customer troubles are cleared by transferring the customer

5 to a good pair. This results in a continuous increase in the level of defective

6 pairs. High numbers of defective pairs is not efficient utilization of the copper

7 feeder investment and should not be included in TSLRIC. Based on the

8 experience of the Hatfield Model OSP Engineering Team, the target level for

9 defective pairs has traditionally been 2% - 3% for copper feeder cable. If the

10 actual defective pair level exceeded this range, an attempt should be made to

11 clear defective pairs prior to placing additional cable. Furthermore, with the

12 advancement in methods and technology for splicing, terminal equipment,

13 cable material, and SAC (Serving Area Concept) design which minimizes

14 rearrangement of the copper pairs, an appropriate forward looking defective

15 pair level should be considerably lower than the embedded level.

16

17   2. The BellSouth strategy for deployment ███████████████████

18 ██████████████████████ leads to low copper feeder utilization.

1   Where BellSouth ██████████████████████████████████████

2   ████████████████████████, resulting in the copper feeder utilization

3   being lower than it would be otherwise. As indicated in BellSouth's

4   deployment directives, ███

5   ████████████████████████████████ contribute to low feeder

6   utilization and should be excluded from the utilization used in TSLRIC.

7

8   3. Over-sizing of feeder cables based on optimistic forecasts of growth is a

9   significant contributor to low feeder utilization. Generally, low growth central

10   offices are the major offenders. Because the growth in these central offices is

11   low, it takes a very long time to correct the problem. Furthermore, with the

12   BellSouth emphasis on DLC deployment for strategic reasons, the low

13   utilization in these central offices will take even longer to correct. It is not

14   appropriate to reflect excess copper feeder cable capacity in a TSLRIC study.

15

16   4. The utilization measured at the MDF usually understates the true fill of the

17   copper feeder route. Because of a concern about exhausting the conduit

18   capacity entering a central office (there is a room called a cable vault,

19   typically in the basement, where the cables enter the central office from the

20   outside) some engineers automatically oversize the feeder cable that enters the

21   central office. In these cases the utilization measured at the MDF is lower

22   than the fill measured further away from the central office. For this reason

23   MDF fill usually provides an erroneous measurement of the copper feeder

24   investment utilization. While it is simple to determine the fill at the MDF, it

25   is not an appropriate measurement of the feeder cable utilization, and it is

1   definitely not an appropriate utilization measurement of the copper feeder

2   network for TSLRIC.

3

4   5. BellSouth did not adjust the embedded fill factor to reflect the difference

5   between the embedded local loop network design and the forward looking

6   network design assumed for TSLRIC. BellSouth states that their cost study

7   assumes that all loops over ▮ kilofeet are served on DLC and that loops less

8   than ▮ kilofeet are served by copper cables. This results is a very important

9   difference that significantly impacts the fill on the copper feeder network.

10   The embedded (or existing) network involves multiple gauges (fine gauge

11   cables for the short loops and coarse gauge cables for the long loops) whereas

12   in the forward looking network the copper feeder will consist of only one

13   gauge. With the requirement for only one gauge, the fill will be significantly

14   higher because in the multi-gauge situation the cables have to be sized

15   separately for each gauge, resulting in lower fills.

16

17 **Q.**   **WHAT EFFECT DOES BELLSOUTH'S USE OF EMBEDDED COPPER**

18   **FILL MEASURED AT THE MDF HAVE ON ITS STUDY?**

19 **A.**   BellSouth has understated its copper feeder cable utilization and thus overstated

20   the copper feeder costs in this cost study by:

21   • choosing to use the embedded fill, measured at the MDF, which is not an

22   appropriate measure of copper feeder route fill,

23   • not adjusting the embedded fill for the excessive defective pairs,

24   • not adjusting for inappropriate over-sizing,

1 • not adjusting for the negative impact on copper feeder utilization of DLC

2   deployment and

3 • not adjusting the embedded fill to reflect the forward looking requirement for

4   only one gauge.

5

6 BellSouth's use of its low embedded copper feeder utilization ██% does not

7 reflect efficient utilization of the copper feeder network. In his Exhibit DMB-1,

8 Mr. Baeza "demonstrates that BellSouth has a better than average utilization rate

9 as compared to other RBOCs [Regional Bell Operating Companies]."[33] It is true

10 that BellSouth's company average embedded feeder utilization of ██% is

11 slightly above the RBOC embedded average of ██%, as is the BellSouth -

12 Florida's embedded feeder utilization rate of ██%. Nevertheless, the relevant

13 criteria for the cost models in this UNE proceeding is "most efficient." By that

14 criteria, BellSouth falls far, far short of the "best in class" RBOC embedded

15 feeder utilization rate of 92.2% as shown in Mr. Baeza's Exhibit DMB-1. And of

16 course, the other relevant criteria for these cost models is forward looking, as

17 opposed to embedded utilization.

18

19 Based on BellSouth's own guidelines, and the analysis above, I recommend that

20 this Commission require a utilization of 80% in the BellSouth Cost Study for the

21 copper feeder network.

22

23

24

25

1   **C.   DROPS AND NIDs**

2   Q.   **HAS BELLSOUTH MADE REASONABLE ASSUMPTIONS IN ITS COST**

3   **STUDYING OF DROPS AND NETWORK INTERFACE DEVICES**

4   **(NIDs)?**

5   A.   No, it has not. A drop is the individual service wire that typically extends from a

6   cable terminal at the curb or rear lot line to the network interface device (NID) on

7   the outside wall of the customer's premise. Drop and NID costs are a major

8   component of BellSouth's local loop costs because they apply to most loops.

9   BellSouth's drop and NID costs of $█████ is an excessive amount, which can be

10   attributed in large part to four of BellSouth's Cost Study drop assumptions which

11   are flawed: 1) average drop length is too long, 2) telecommunications labor costs

12   for drops are too much, 3) the percentage of aerial drops is too low, and 4) the

13   sizing of residence buried drops is too large.

14

15 Q.   **DO YOU BELIEVE THAT BELLSOUTH'S ASSUMPTION FOR**

16   **AVERAGE DROP LENGTH IS ACCURATE OR REALISTIC?**

17 A.   No – BellSouth's assumption for average drop length appears inaccurate for

18   several reasons. First, in its cost study, BellSouth utilizes average drop lengths of

19   ███ feet for aerial and ███ feet for buried based on the opinion of its subject

20   matter experts. However, there is no evidence that an actual survey of drop

21   lengths was done, and it can only be surmised that the opinion survey was

22   representative of the entire state.

23

24   Even if BellSouth's regional estimates for drop lengths were accurate for today –

25   and there is no actual evidence that they are – changing demographics should

1   decrease average drop lengths in the future. In his direct testimony Mr. Baeza

2   asserts, "I believe that there is no basis to conclude that the length of these drops

3   would be expected to change in the future."[34] However, in deposition, Mr. Gray

4   does indeed foresee changes in the demographics of the customers of local

5   telephone services in the future. He anticipates that business growth may change

6   the business-residence mix, rural areas will become even less rural, and there will

7   possibly be more concentration of customers and more multiple dwelling units.[35]

8   He also foresees that more densely populated areas would have smaller lots with

9   shorter drops, and that there are cases where no drop wires are required.[36] Such

10   changes in customer demographics should result in shorter average drop lengths

11   in the future in contradiction to Mr. Baeza's testimony and the assumptions of

12   BellSouth's Cost Study.

13

14   Q.   **WHAT DO YOU RECOMMEND AS THE APPROPRIATE DROP**

15   **LENGTH?**

16   A.   First of all, as a comparative benchmark to BellSouth's drop length figures, the

17   Bellcore Survey of BOC Loops[37] showed an average drop length of only 73 feet.

18   Mr. Baeza challenges this national average drop length by asserting that

19   BellSouth's region is a relatively rural area and thus should have longer than

20   average drops.[38] A comparison of access lines per square mile for the former Bell

21   Operating Companies shows that BellSouth has approximately 99 access lines per

22   square mile versus a national average of approximately 119. Thus, BellSouth's

23   region is approximately 17% to the rural side of the national average. However,

24   BellSouth - Florida has approximately 237 access lines per square mile, roughly

1   twice the national average, and is definitely not a "more rural environment" as

2   claimed by Mr. Baeza.

3

4   My observation from having worked in OSP for BellSouth in Alabama for seven

5   years, from having field surveyed OSP in ten CBGs all around the state of

6   Georgia in preparing a response to a data request from the Georgia PSC Staff,

7   from living in BellSouth's service areas in four states for most of my life, and

8   from traveling extensively throughout BellSouth's nine state region, is that more

9   than 80% of BellSouth's residential and small business customers have either no

10   drop or drops that are less than 150 feet in length. I therefore recommend

11   adjusting BellSouth's average drop length for both aerial and buried drops to 100

12   feet.

13

14   Q.   **WHY DO YOU CONCLUDE THAT BELLSOUTH'S ASSUMPTIONS FOR**

15   **TELECOMMUNICATIONS DROP LABOR COSTS ARE TOO HIGH,**

16   **AND WHAT DO YOU RECOMMEND?**

17   A.   BellSouth has included in its costs for telecommunications labor ▮ minutes for

18   travel, ▮ minutes for Network Interface Device (NID) installation, and ▮

19   minutes for terminating the drop, for a total of ▮ minutes. There is also an

20   additional ▮ minutes of telecommunications labor for placing an aerial drop.

21   BellSouth has assumed an average travel approach between drop placements, in

22   contrast to a least cost, forward looking, large scale project approach that would

23   minimize travel between drop placements. My recommendation is that

24   BellSouth's telecommunications labor time for travel, NID installation and drop

1   termination should be reduced to 60 minutes total, with an additional 20 minutes

2   for placing an aerial drop.

3

4   Q.   **WHY DO YOU CONCLUDE THAT BELLSOUTH'S ASSUMPTION**

5   **REGARDING ITS PERCENTAGE OF BURIED DROPS IS TOO HIGH,**

6   **AND WHAT DO YOU RECOMMEND?**

7   A.   The BellSouth Cost Study models ██% of drops as aerial and ██% as buried

8   for both business and residence lines, based on data from BellSouth's loop

9   sample, which suggest that these are the actual percentages of loops served by

10   aerial and buried terminals. I believe that this modeling methodology is flawed

11   because it does not account for BellSouth's very common practice of buried cable

12   terminals having aerial drops, but not vice versa. Lacking data on actual physical

13   drop percentages for BellSouth in Florida, my recommendation, based on

14   extensive personal observations in other BellSouth states, is that the drop

15   percentages in BellSouth's Cost Study should be adjusted to 35% aerial and 65%

16   buried drops.

17

18   Q.   **WHY DO YOU CONCLUDE THAT BELLSOUTH'S ASSUMPTION**

19   **REGARDING THE SIZE OF ITS BURIED DROP FOR RESIDENCES IS**

20   **TOO LARGE, AND WHAT DO YOU RECOMMEND?**

21   A.   BellSouth's Cost Study shows that it serves ██ lines per residence, but assumes

22   █ pair buried drops for both residences and businesses. However, a █ pair drop,

23   which is the size that the BellSouth Cost Study assumes for its aerial drop

24   applications, creates an average of ██% spare capacity (based on ██ / █ (i.e.,

25   ██%) of the capacity of █ pair drops being utilized). While BellSouth can certainly

1   choose to invest in █ pair buried drops to every residence to preclude ever having

2   to reinforce any of them, it is not economically justified that a CLEC should fully

3   support the resulting ██% average spare capacity (based on ██ / █ (i.e., ██%)

4   of the capacity of █ pair drops being utilized). Furthermore, the availability of

5   second line DSL Systems working on copper pairs out to 12,000 feet provides a

6   viable alternative for up to four subscriber lines on a 2-pair buried drop for those

7   residence customers who may someday require more than two lines.

8

9   My recommendation, for the purpose of costing UNEs, is that all residence buried

10   drops should be 2 pair. From the Copper Cable Table in the BellSouth Cost

11   Study, the cost premium for 5 pair versus 2 pair BSW is $██ per foot. For

12   BellSouth's average ██ foot buried drop, this would represent a direct material

13   savings of $██ per drop (including the 6% sales tax) for the ██% of buried

14   drops serving residences.

15

16   Additionally, BellSouth has costed NID Material (Bridge & Protector) for two

17   pair aerial and buried. Thus, █% of the residential station protectors are spare.

18   Station protectors are very modular and can be installed as needed. BellSouth has

19   therefore modeled excessive investment in station protection of approximately

20    $██ for each residence customer location versus the cost of placing single

21   station protection on each residential working line.

22

23   **Q.   WHY DO YOU CONCLUDE THAT SOME OF BELLSOUTH'S DROP**

24   **AND NID COSTS WERE NOT FACTORED FOR THE AVERAGE**

1   **NUMBER OF LOOPS PER RESIDENCE, AND WHAT DO YOU**

2   **RECOMMEND?**

3   A.   In its Drop Wire/NID Material spreadsheets, BellSouth's Cost Study has correctly

4   factored for the number of residence and business loops with drops in its

5   calculation of Material for Drop and NID, Contractor Labor, and Telco - Install

6   and Terminate Drop Labor. However, it has not applied this factor appropriately

7   to Exempt Material, Telco - Travel Time, or Telco Install NID Labor. Exhibit

8   JWW2 correctly applies these factors to all of the appropriate elements.

9

10   Q.   **CAN YOU SUMMARIZE THE COMBINED IMPACT OF YOUR**

11   **RECOMMENDATIONS FOR ADJUSTMENTS TO BELLSOUTH'S DROP**

12   **COSTS?**

13   A.   The interdependent impact of all of these recommendations, as detailed in Exhibit

14   JWW2, would be to lower the total average weighted material for drop investment

15   from $███ to $███. This represents a major reduction of $███ in the drop

16   investment, resulting in a substantial reduction (my estimate is ██% - ██% since

17   BellSouth did not file the spreadsheet for total loop investment) in the total

18   material investment for BellSouth's hypothetical representative local loop.

19

20   Q.   **DOES YOUR ANALYSIS OF TELECOMMUNICATIONS DROP LABOR**

21   **ALSO APPLY TO BELLSOUTH'S CALCULATION OF THE COSTS FOR**

22   **NIDs?**

23   A.   Yes it does. First of all, it is unlikely that AT&T would request BellSouth to

24   install a stand-alone NID for leasing as UNE. The reasoning is that a CLEC

25   might wish to lease an existing BellSouth NID as an Unbundled Network

1   Element. However, if no BellSouth NID existed at the customer's location, it is

2   likely that the CLEC would choose to install its own stand-alone NID rather than

3   incur the expense for BellSouth to make a trip to just install a stand-alone NID.

4   Therefore, BellSouth's Cost Study should calculate the costs for a NID as if the

5   NID had been installed along with the drop. BellSouth has loaded the full █

6   minutes of travel that it costed for drops and NIDs into its standalone NID costs.

7   Under a least cost, forward looking approach, the travel time would be minimal

8   for the original installation of the NID along with the drop, and what travel time

9   there is should be shared between the drop and the NID. My recommended

10   reductions in travel time to 15 minutes and in total NID labor to 25 minutes,

11   coupled with the 35% aerial and 65% buried drop occurrence recommendation,

12   will produce revised Material Inputs to the costs for 2-Wire and 4-Wire NIDs as

13   detailed on Page 4 of Exhibit JWW2.

14

15 **D.**   **BUILDING ENTRANCE TERMINALS**

16 **Q.**   **HAS BELLSOUTH MADE REASONABLE ASSUMPTIONS IN ITS COST**

17   **STUDYING OF BUILDING ENTRANCE TERMINALS (i.e., OSP CABLE**

18   **TERMINATIONS INSIDE OF BUILDINGS THAT OFTEN REQUIRE**

19   **ELECTICAL STATION PROTECTION)?**

20 **A.**   No it has not. In its June 20, 1997, revised filing of its Georgia Cost Study,

21   BellSouth changed all building entrance terminals from cross boxes to a costing

22   formula based on multiple 100 pair units of its average building entrance station

23   protector at $█ per 100 pair unit. Station protection is required on metallic

24   cable pairs entering a building to provide a safe path to ground in case of an

25   electrical fault in the OSP. I have four major issues with respect to BellSouth's

1   new building entrance terminal assumptions which I believe add unreasonable

2   costs into BellSouth's local loop model:

3   ● BellSouth has assumed that all building entrance cables in urban areas require

4   costly station protection. In urban areas where buildings are close and

5   sufficiently high to provide cone-of-protection shielding, and where extensive

6   underground metallic piping systems exist to dissipate large currents, building

7   entrance terminals do not require costly station protectors.[39]

8   ● BellSouth has improperly placed station protected terminals on some of

9   BellSouth's existing loops and redesigned loops which have non-metallic fiber

10   feeder into the building (e.g. FL # 23). The derived feeder pairs from the DLC

11   remote terminal fed by the fiber cable do not require station protection as

12   assumed by Ms. Caldwell.[40]

13   ● In some cases, the costing for building entrance terminals has been

14   exaggerated because station protectors have been modeled on the cable pairs

15   that distribute within the building (e.g. FL # 23).[41]

16   ● In BellSouth's Cost Study assumptions prior to its June 20th revision in

17   Georgia, when building entrance terminals were treated as cross-connect

18   boxes, BellSouth had divided the cost of the building entrance terminal

19   between feeder and distribution. In BellSouth's current Cost Study, the full

20   cost of multiple 100 pair station protected terminals has been double counted

21   for both feeder and distribution in some building entrance facilities (e.g. FL #

22   23) in contradiction to Ms. Caldwell's statements in deposition.[42]

23

24   Q.   **HOW COULD BELLSOUTH'S BUILDING ENTRANCE TERMINALS BE**

25   **MORE ACCURATELY COSTED?**

1   A.   The material portion of the hypothetical representative loop for field reporting

2   code FRC 12C, which includes the Building Entrance Terminals, is typically

3   relatively minor (BellSouth did not file the data in this proceeding) because these

4   exaggerated costs are converted to a per DSO equivalent. An accurate re-costing

5   of the building entrance terminals would require access to BellSouth's plats for all

6   the affected loop samples in order to determine the number of feeder and

7   distribution pairs per building entrance terminal and whether any unexposed

8   feeder pairs were terminated and thus would not be worth the effort. However,

9   correction of the rather obvious deficiencies in BellSouth's Cost Study of placing

10   station protection on fiber building entrance cables and distribution pairs within a

11   building can and should be done.

12

13 E.   **OTHER OSP COST STUDYING ASSUMPTIONS**

14 Q.   **WHAT OTHER ISSUES AND RECOMMENDATIONS DO YOU HAVE**

15   **CONCERNING BELLSOUTH'S ASSUMPTIONS FOR ITS LOCAL LOOP**

16   **COST STUDYING?**

17 A.   There are three other miscellaneous issues:

18   1. Circuit Level Copper Cable Material Costs,

19   2. Structure Sharing and

20   3. Errors in BellSouth's Tables, etc.

21

22 Q.   **WHAT ARE YOUR CONCERNS REGARDING BELLSOUTH'S**

23   **MODELING OF CIRCUIT LEVEL COPPER MATERIAL COSTS?**

24 A.   In converting its hypothetical representative loop to TELRIC Calculator inputs,

25   BellSouth converts copper cable material costs into circuit level costs per foot by

1   dividing the cost per sheath foot by the number of pairs in the cable and the

2   utilization factor. Exhibit JWW3 shows that the cost of copper cable by circuit-

3   foot (i.e., pair-foot) decreases significantly as the pair size of the cable increases

4   through 600 pairs before leveling off.

5

6   This is a example of convoluted modeling logic in BellSouth's Cost Study in that

7   larger cables, which actually add more to BellSouth's network investment,

8   produces a lower average loop cost. Thus, the least cost local loop output

9   employing BellSouth's Cost Study would be obtained by redesigning each cable

10 to its maximum size. For example, all 25 pair buried cables redesigned to 2400

11 pair cables would illogically produce the "least cost" solution using BellSouth's

12 Cost Study. However, such a modeling approach does not produce the "most

13 efficient" solution, as evidenced by BellSouth's low utilization rates. In contrast,

14 other bottoms up cost models size each cable appropriately, and smaller cables

15 contribute smaller amounts of investment to the network solution.

16

17 BellSouth has determined its single hypothetical representative loop by compiling

18 the actual cable sizes by type for each segment of its 349 samples of existing

19 loops. BellSouth has stated that, "Cables are appropriately sized in the BellSouth

20 studies." The cables in BellSouth's loop survey are its existing cables, and

21 nothing has been done to substantiate that they have been "appropriately sized."[43]

22

23 On the contrary, BellSouth's low utilization factors and current deployment

24 directives support a conclusion that, in general, BellSouth's cables are oversized.

25 There are two types of cases where the inefficiencies of BellSouth's existing

1   network result in smaller size cables at higher per circuit-foot costs being included

2   in its Cost Study.

3

4   The first case is where there is a cost inefficient tapering in BellSouth's embedded

5   feeder route. This seemingly minor cost inefficiency gets compounded numerous

6   times throughout BellSouth's Cost Study as it is magnified by utilization,

7   inflation, material loading and conduit loading factors.

8

9   My second issue regarding BellSouth's conversion to cost per circuit-foot is that

10 many of BellSouth's embedded cable cross sections contain multiple sheaths from

11 years of reinforcement projects. Therefore, many of the cables included in

12 BellSouth's hypothetical representative loop do not reflect the proper sizing that

13 would be achieved if the least cost, most efficient cable were placed to serve the

14 requirements of each cross section.

15

16 When multiple cables of less than 600 pairs parallel each other, there are

17 significant cost inefficiencies on a per circuit-foot basis as shown in Exhibit

18 JWW3. These cost inefficiencies in the basic cable material costing get

19 compounded over and over throughout BellSouth's Cost Study via its subsequent

20 loading factors.

21

22 By comparison, other cost models appropriately taper each cable section and uses

23 the most economically efficient cable to serve the requirements. Short of

24 redesigning BellSouth's sampled loops with a set of its plats to eliminate these

25 two cost inefficiencies, it can only be estimated as to how much BellSouth's

41

1 copper cable circuit level material costs are overstated. Based on Exhibit JWW3,

2 my estimate is 25%, which translates directly into a 20% reduction in the copper

3 cable investment amounts.

4

5 Q. **WHAT ARE YOUR CONCERNS WITH BELLSOUTH'S MODELING**

6 **ASSUMPTIONS REGARDING STRUCTURE SHARING?**

7 A. BellSouth's Cost Study does not incorporate a forward looking view of structure

8 sharing in a competitive environment where there will be greater opportunities

9 and incentive for telecommunications companies to share pole lines, trenches and

10 conduit runs. Mr. Baeza grossly misrepresents the structure sharing assumptions

11 of other cost study models when he claims that they assume sharing of structures

12 such as poles, conduit and trenches 100% of the time.[44] Other cost models utilize

13 a weighted percentage of structure sharing that varies depending upon the type of

14 plant and density zone.

15

16 Q. **WHAT CONCERNS DO YOU HAVE IN REGARDS TO BELLSOUTH'S**

17 **TABLES, ETC.?**

18 Cost models evolve, particularly when reviewed by third parties, and BellSouth's

19 Cost Study is certainly no exception. In addition to the modeling issues detailed

20 above, a short list of items that still appear to need correction include:

21 • In the Cable Material Table, the investment for 25 pair buried cable is listed as

22 $▮ per foot. It should be $▮ per foot. Similarly, 1800 pair aerial cable is

23 listed as $▮ per foot when it should be $▮ per foot.[45]

24 • The weighted costs for the 50 pair building entrance and intrabuilding cables

25 include ▮% of BKTS-50, a self-supporting cable code which includes the

1   cost of strand. However, strand is not required in building entrance and

2   intrabuilding cables.

3

4   BellSouth's Cost Study is at a relatively early stage in the rigorous process of

5   critical review and improvement. Several corrections have been made; however,

6   other cost models are much further along.

7

8   **OSP LOADING FACTORS**

9   Q.   **HAS BELLSOUTH MADE REASONABLE ASSUMPTIONS FOR OSP**

10   **LOADING FACTORS IN ITS LOCAL LOOP COST STUDYING?**

11   A.   No it has not. BellSouth's OSP loadings are not forward looking and, instead,

12   are utilized to recover the costs of BellSouth's past methods of operation.

13   Numerous loadings have been developed based on BellSouth's embedded

14   investment and its 1995 costs and investments. These loadings typically comprise

15   an enormous ██% - ██% of the total investment in the 2-wire analog voice grade

16   loop (BellSouth did not file the information required to accurately determine the

17   loading on it hypothetical representative loop in this proceeding). To paraphrase

18   the analogy employed by Ms. Caldwell, that is a awful lot of "nuts, bolts and

19   screws" compared to the amount of "lumber" being used to build this "house."

20

21   Q.   **WHAT CHANGES, IF ANY, DO YOU RECOMMEND TO BELLSOUTH'S**

22   **OSP LOADING FACTORS?**

23   A.   All of the loadings in the BellSouth Cost Study that are applied to the average

24   material cost of BellSouth's single hypothetical representative loop for the entire

25   state should first be adjusted to eliminate any embedded costs that are not forward

1   looking. I am incapable of deciphering the details of BellSouth's accounting, but

2   examples of such embedded costs in BellSouth's loading factors could include:

3   load coils in its material costs, historical conduit investment based on large,

4   coarse gauge copper cables to serve long loops, maintenance of buried air core

5   PIC cables, etc.

6

7   Q.   **WHAT LOADING FACTORS DO YOU BELIEVE BELLSOUTH HAS**

8   **OVERSTATED, AND UPON WHAT DO YOU BASE YOUR**

9   **CONCLUSIONS?**

10   A.   I believe that BellSouth has overstated its cable material and conduit loading

11   factors.

12

13   Q.   **WHY DO YOU BELIEVE THAT BELLSOUTH'S COST STUDY**

14   **OVERSTATES ITS CABLE MATERIAL LOADING FACTORS?**

15   A.   My initial concern is with BellSouth's cost modeling methodology of its loadings.

16   BellSouth applies a material loading factor to the inflated direct material cost for

17   copper and fiber cables in its Outside Plant (OSP) Field Reporting Codes (FRC).

18   These material loading factors are modeled primarily to recover

19   telecommunications engineering and labor, vendor engineering and installation,

20   exempt (i.e., minor) material, and sales tax. BellSouth's methodology is to

21   calculate a ratio of these associated expenses to its non-exempt (i.e., major)

22   material investments for the year ▮▮▮, and then multiply this ratio by the direct

23   material associated with its single hypothetical representative loop for the state.

24

44

1   I do not believe that BellSouth's ratio of material loading expenses to cable

2   investment in ▮ should be considered least cost, most efficient, or forward

3   looking based on currently available technology.   Mr. William Zarakas,

4   BellSouth's Cost Modeling Witness, stated in his deposition that, "our assumption

5   there would be that the cost of installing a pole in the future would basically be

6   the same as it was in the past, because we see no change in the technology. And

7   we did that for each individual factor or loading (emphasis supplied)."[46]

8

9   Going beyond the fundamental methodology question and looking into the data

10 provided on the material loading factors raises additional questions.   These

11 material loading factors for cable are huge contributors to the total loop

12 investment as follows: aerial - ▮ , buried - ▮ , underground - ▮ and

13 building - ▮ . Thus, for example, BellSouth is saying via its cost study that for

14 every $1.00 of aerial copper cable material that it puts into its network, it loads in

15 additional costs of $▮ in in-plant material loadings, which does not even

16 include the costs of poles, which is another loading of $▮ per each $1.00 of

17 aerial cable material.

18

19 A more familiar way of expressing this relationship is to say that in BellSouth's

20 modeling of cable investment, ▮% - ▮% of the cost is in the cable and ▮% -

21 ▮% is in the loadings for engineering, construction, etc. This far exceeds a

22 generally accepted ratio in the industry of 40% cable material to 60% in loadings.

23 In BellSouth's Cost Study the focus is predominantly on the material, but the "big

24 dollars" are in the loading factors which are an accounting mystery of embedded

25 investments and operating practices.

1   Clearly, BellSouth's current practice and forward looking policy directive is to

2   build more cost efficient fiber plant,[47] but its cost study is "overloaded" with the

3   embedded cost inefficiencies of its copper cable in-plant loadings. Lacking the

4   accounting details or expertise to challenge the specific expenses and investments

5   underlying these material factor ratios, my recommendation is that they be

6   reduced significantly. This would bring the average ratio of material loadings to

7   non-exempt material from BellSouth's exorbitant level down to a ratio of 1.5,

8   which is consistent with the assumptions of the AT&T/MCI sponsored cost

9   model.

10

11 **Q.   WHY DO YOU BELIEVE THAT BELLSOUTH'S COST STUDY**

12 **OVERSTATES ITS CONDUIT LOADING FACTOR?**

13 A.   BellSouth uses a conduit loading factor applied to underground cable investment

14 to determine the amount of conduit investment to add to the total 2-wire analog

15 voice grade loop investment. This factor results in $▓ in associated conduit

16 costs for each $1.00 in underground copper and fiber cable after the cable material

17 costs have been inflated and had the previously described material loadings added.

18 This conduit loading factor is derived from the ratio of BellSouth's embedded

19 conduit and underground cable investment accounts, which have been adjusted to

20 current costs and inflated.

21

22 I have three issues with BellSouth's conduit loading factor. First, BellSouth's

23 cost modeling methodology is seriously flawed, in that it assumes that the cost of

24 conduit is proportional to the material cost of the cable that is placed in the

25 conduit. This is a terribly oversimplified and incorrect assumption. Mr. Zarakas

1   states that "the cost of installing poles and conduit will similar in the future as it is

2   today."[48] What Mr. Zarakas fails to understand and model is that the ratio of those

3   costs to the material costs of the cables that they support has changed dramatically

4   from BellSouth's historical cost ratio.

5

6   The cost of a duct does not vary based on whether a 600 pair or 3600 pair copper

7   cable is pulled into it. BellSouth's conduit loading factor does not take into

8   account that a 4-inch duct is typically used to support only one copper cable but

9   three fiber cables. Neither does the BellSouth Cost Study account for such cost

10   variables as the number of ducts in a conduit run nor the cost to cut and restore the

11   trench based on its particular location.

12

13   Second, the historical ratio of conduit to underground cable investment is a

14   dreadfully inappropriate forward looking ratio, due to the dramatic shift from

15   large, heavy gauge copper cables to fiber cables for interoffice trunking and for

16   feeder routes over 9,000 feet. Conduit systems of 4-inch ducts that were sized to

17   accommodate a single large copper cable in the past now easily accommodate

18   three fiber cables per 4-inch duct, with each of these fiber cables having far more

19   circuit capacity than the single copper cable. Yet the BellSouth Cost Study

20   applies the same conduit loading factor to both copper and fiber underground

21   cable investments. Existing underground copper cables are being replaced by

22   fiber cables, as corroborated by BellSouth's declining underground cable - metal

23   investment account. Thus, BellSouth's future requirements for conduit will be

24   far less. Also, because of this transition to fiber cables and removal of copper

25   feeder cables,[49] existing conduit runs will not likely have to be reinforced in the

47

1   future. A significant portion of BellSouth's historical conduit investment account

2   is attributable to projects it undertook to reinforced existing conduit runs. Such

3   conduit investments will simply no longer be required as they were in the past.

4

5   Third, BellSouth's embedded ratio for conduit loading includes conduit

6   investments that have been sized for a ▮ year service life (and will not likely ever

7   have to be reinforced) divided by underground cable investments that are sized to

8   be relieved in less than ten years. Furthermore, the most efficient, least cost,

9   forward looking practice will require most of BellSouth's future underground

10 cables to be placed in existing ducts, which will require no additional conduit

11 investment.

12

13 BellSouth's conduit loading factor typically accounts for an considerable ▮% - ▮%

14 of the total investment in BellSouth's representative 2-wire analog voice grade

15 loop (BellSouth did not file the data to determine this exactly for this proceeding).

16 Applying least cost, most efficient, forward looking assumptions clearly

17 demonstrates that BellSouth's conduit loading factor is egregiously overstated. I

18 estimate that it should be reduced from ▮ to .250. In contrast, other cost

19 models place new conduit runs to support the underground cables designed for

20 each unique feeder route in each unique wire center in the entire state.

21

22 **VI.   SUMMARY AND CONCLUSION**

23 **Q.   HOW WOULD YOU SUMMARIZE YOUR TESTIMONY CONCERNING**

24 **BELLSOUTH'S COST STUDYING OF OUTSIDE PLANT FOR THE**

25 **LOCAL LOOP?**

1   A.   While BellSouth's Cost Study reflects an improvement over the inefficiencies of

2   BellSouth's current network design, my analysis concludes that it is certainly not

3   the least cost, most efficient, forward looking set of assumptions for a local loop

4   model, particularly when compared to the other bottoms up cost models currently

5   available. Moreover, I believe that further analysis and more information would

6   uncover additional deficiencies in the OSP component of BellSouth's local loop

7   Cost Study.

8

9   Nevertheless, identification and correction of all of the known and yet to be

10   determined deficiencies in the OSP portion of BellSouth's Cost Study will not

11   resolve the fact that BellSouth's OSP cost modeling methodology, which is based

12   on a single hypothetical representative loop for the entire state of Florida, is

13   fundamentally unsound. I base this conclusion on the fact that the OSP portion of

14   local loop investment varies greatly depending upon a number of factors, but

15   primarily determined by loop length and the density of customers. BellSouth's

16   Cost Study cannot be applied to determine an accurate estimate of the local loop

17   cost for any customer's loop or grouping of loops below the total state level, and

18   therefore is fundamentally unsound for costing local loops in a competitive

19   environment.

20

21   It is rather obvious that BellSouth's intent in modeling local loop cost with a

22   single hypothetical representative loop is to create an barrier to market entry for

23   potential Competitive Local Exchange Carriers. BellSouth's Cost Study achieves

24   this objective by costing the shorter loops in customer dense areas which have the

25   most revenue potential at cost levels far in excess of BellSouth's own costs. In

1   sharp contrast, BellSouth has employed a much lower cost basis for its ESSX

2   loops, which face a competitive alternative. It is also noteworthy that BellSouth

3   has excluded ESSX loops from it sample for determining UNE costs.

4

5   For all of these reasons, my final recommendation is that if it has already been

6   decided that the BellSouth Cost Study will be the basis for determining local loop

7   costs in Florida that BellSouth's OSP modeling assumptions and input values be

8   modified based on the recommendations in my testimony.

9

10   **Q.   DOES THIS CONCLUDE YOUR TESTIMONY?**

11   A.   Yes.

1 <u>Endnotes:</u>

[1] Direct Testimony of BellSouth's Cost Witness, Ms. Daonne Caldwell, before the Florida Public Service Commission, Docket Nos. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 25, line 11.

[2] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 14, line 15 - page 15, line 10.

[3] Input Values for BCPM 2.0 before the Kentucky Public Service Commission, Administrative Case No. 360, October 15, 1997.

[4] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 10, line 24 - page 15, line 15.

[5] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 15, line 22 - page 18, line 4.

[6] Former Bell System Practice 901-350-250, Task 4, Step 1.

[7] BellSouth RL: 96-02-026BT Attachment A limits any single bridged tap to 2,000 feet.

[8] Rebuttal Testimony of BellSouth's Cost Witness, Ms. Daonne Caldwell, in Louisiana Cost Docket U-22022/U-22093 on September 6, 1997, page 25, line 20 through page 26, line 6.

[9] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 15, lines 2 - 3.

[10] Rebuttal Testimony of BellSouth's Cost Witness, Mr. Daniel Baeza, in Louisiana Cost Docket U-22022/U-22093 on September 5, 1997, page 6, lines 7-17.

[11] The judicious deployment of DAML if spare cable pairs are exhausted is supported by BellSouth's DAML Deployment Directive RL:97-03-012BT.

[12] Deposition of BellSouth's Network Infrastructure Planning Witness, Mr. Wayne Gray, in Georgia Cost Docket No. 7061-U on August 13, 1997, page 149, line 23 through page 152, line 10.

[13] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 15, lines 18 - 20.

[14] Deposition of BellSouth's Network Infrastructure Planning Witness, Mr. Wayne Gray, in Georgia Cost Docket No. 7061-U on August 13, 1997, page 101, lines 12-23.

Rebuttal Testimony of BellSouth's Cost Witness, Ms. Daonne Caldwell, in Louisiana Cost Docket U-22022/U-22093 on September 6, 1997, page 21, lines 9-13.

[15]   BellSouth's Loop Technology Deployment Directive RL: 96-09-026BT ("BellSouth RL: 96-09-026BT"), Paragraph 6.05.

[16]   BellSouth's response to MCI's 1st Set of Data Requests in Georgia Cost Docket No. 7061-U, Item No. 1-43.

[17]   BellSouth's Response to AT&T's 2nd Set of Interrogatories in Georgia Cost Docket No. 7061-U, Item No. 30.

[18]   Deposition of BellSouth's Cost Witness, Ms. Daonne Caldwell, in Louisiana Cost Docket No. U-22022/U-22093 on August 19, 1997, page 87, line 1 through page 89, line 15.

[19]   RL:97-03-012BT, Section 3.1(a).

[20]   Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 11, lines 18 - 19 and page 12, line 2.

[21]   BellSouth RL: 96-09-026BT, Executive Summary, page 2.

[22]   Deposition of BellSouth's Network Infrastructure Planning Witness, Mr. Wayne Gray, in Georgia Cost Docket No. 7061-U on August 13, 1997, page 53, line 18 through page 54, line 3.

[23]   Direct Testimony of Mr. Wayne Gray, BellSouth's Network Infrastructure Planning Witness, before the Tennessee Regulatory Authority Docket No. 97-01262, October 10, 1997, page 9, lines 4-5.

[24]   Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Wayne Gray, before the Public Service Commission of South Carolina, Docket No. 97-374-C on November 3, 1997, page 11, lines 11 - 12.

[25]   Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 12, line 11 - 16.

[26]   Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 12, line 24.

[27]   BellSouth's web site at http://www//bellsouthcorp.com/investor/annualreport95/docs/southeast.html states:

[28]   See Rebuttal Testimony of BellSouth's Cost Witness, Mr. Daniel Baeza, in Louisiana Cost Docket U-22022/U-22093 on September 6, 1997, page 7, line 20 through page 8 line 3.

[29]   Direct Testimony of Dr. Richard Cabe, AT&T/MCI's Economic Witness, before the Georgia Public Service Commission, Docket 7061-U, April 30, 1997, page 16 line 20 - page 19 line 16.

[30]   BellSouth's Response to Staff's Third Data Request to BellSouth in Georgia PSC Docket 7061-U, Item No. STF-3-11.

[31] BellSouth's Response to TCTA's (Tennessee Cable Telecommunications Association) First Data Requests, Item No. 8 in Tennessee Regulatory Authority Docket No. 97-01262, document RL: 96-09-026BT, "Loop Technology Deployment Directives, Table P1.

[32] BellSouth's Response to AT&T's First Data Requests in Tennessee Docket 97-01262, Item No. 29.

[33] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 10, lines 11 - 13.

[34] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 19, lines 23 -25.

[35] Deposition of BellSouth's Network Infrastructure Planning Witness, Mr. Wayne Gray, in Georgia Cost Docket No. 7061-U on August 13, 1997, page 110, line 15 through page 111, line 13.

[36] Deposition of BellSouth's Network Infrastructure Planning Witness, Mr. Wayne Gray, in Georgia Cost Docket No. 7061-U on August 13, 1997, page 125 line 24 through page 127, line 15 .

[37] BOC Notes on the LEC Networks 1994, page 12-9.

[38] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 19, lines 10 - 20.

[39] Deposition of BellSouth's Cost Witness, Ms. Daonne Caldwell, in Louisiana Cost Docket No. U-22022/U-22093 on August 19, 1997, page 86, lines 17-25.

[40] Deposition of BellSouth's Cost Witness, Ms. Daonne Caldwell, in Louisiana Cost Docket No. U-22022/U-22093 on August 19, 1997, page 85, lines 10-15.

[41] Deposition of BellSouth's Cost Witness, Ms. Daonne Caldwell, in Louisiana Cost Docket No. U-22022/U-22093 on August 19, 1997, page 85, lines 16-21.

[42] Deposition of BellSouth's Cost Witness, Ms. Daonne Caldwell, in Louisiana Cost Docket No. U-22022/U-22093 on August 19, 1997, page 83, line 25 through page 84, line 7.

[43] Rebuttal Testimony of BellSouth's Cost Witness, Ms, Daonne Caldwell, in Louisiana Cost Docket U-22022/U-22093 on September 6, 1997, page 25, lines 22-23.

[44] Direct Testimony of BellSouth's Network Infrastructure Planning Witness, Mr. Daniel Baeza, before the Florida Public Service Commission, Docket No. 960833-TP/960846-TP/960757-TP/960916-TP/971140-TP, November 13, 1997, page 21, lines 1-3.

[45] Refer to the BellSouth Cost Study spreadsheet CABALT1, cells P387 and U654.

[46] Deposition of BellSouth's Cost Model Witness, Mr. William Zarakas, in Louisiana Cost Docket No. U-22022/U-22093 on August 19, 1997, page 110, lines 12-23.

[47] BellSouth's RL: 96-09-026BT.

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[48]   Direct Testimony of BellSouth's Cost Model Witness, Mr. William P. Zarakas, before the
Tennessee Regulatory Authority Docket No. 97-01262, October 10, 1997, page 37, lines 10-22.

[49]   BellSouth RL:96-09-026BT, Paragraph 4.08.

Liv Units Served	Prs. Reqd @ 1.5/LU	Cable Size	Liv Units Served	Prs. Reqd @ 1.5/LU	Cable Size	Liv Units Served	Prs. Reqd @ 1.5/LU	Cable Size
1	1.5	6	47	70.5	100	93	139.5	200
2	3.0	6	48	72.0	100	94	141.0	200
3	4.5	6	49	73.5	100	95	142.5	200
4	6.0	6	50	75.0	100	96	144.0	200
5	7.5	12	51	76.5	100	97	145.5	200
6	9.0	12	52	78.0	100	98	147.0	200
7	10.5	12	53	79.5	100	99	148.5	200
8	12.0	12	54	81.0	100	100	150.0	200
9	13.5	25	55	82.5	100	101	151.5	200
10	15.0	25	56	84.0	100	102	153.0	200
11	16.5	25	57	85.5	100	103	154.5	200
12	18.0	25	58	87.0	100	104	156.0	200
13	19.5	25	59	88.5	100	105	157.5	200
14	21.0	25	60	90.0	100	106	159.0	200
15	22.5	25	61	91.5	100	107	160.5	200
16	24.0	25	62	93.0	100	108	162.0	200
17	25.5	50	63	94.5	100	109	163.5	200
18	27.0	50	64	96.0	100	110	165.0	200
19	28.5	50	65	97.5	100	111	166.5	200
20	30.0	50	66	99.0	100	112	168.0	200
21	31.5	50	67	100.5	200	113	169.5	200
22	33.0	50	68	102.0	200	114	171.0	200
23	34.5	50	69	103.5	200	115	172.5	200
24	36.0	50	70	105.0	200	116	174.0	200
25	37.5	50	71	106.5	200	117	175.5	200
26	39.0	50	72	108.0	200	118	177.0	200
27	40.5	50	73	109.5	200	119	178.5	200
28	42.0	50	74	111.0	200	120	180.0	200
29	43.5	50	75	112.5	200	121	181.5	200
30	45.0	50	76	114.0	200	122	183.0	200
31	46.5	50	77	115.5	200	123	184.5	200
32	48.0	50	78	117.0	200	124	186.0	200
33	49.5	50	79	118.5	200	125	187.5	200
34	51.0	100	80	120.0	200	126	189.0	200
35	52.5	100	81	121.5	200	127	190.5	200
36	54.0	100	82	123.0	200	128	192.0	200
37	55.5	100	83	124.5	200	129	193.5	200
38	57.0	100	84	126.0	200	130	195.0	200
39	58.5	100	85	127.5	200	131	196.5	200
40	60.0	100	86	129.0	200	132	198.0	200
41	61.5	100	87	130.5	200	133	199.5	200
42	63.0	100	88	132.0	200			
43	64.5	100	89	133.5	200	8,911	13,366.5	17,822

44	66.0	100	90	135.0	200		
45	67.5	100	91	136.5	200	Initial Utilization =	50.00%
46	69.0	100	92	138.0	200	Ultimate Utilization =	75.00%

	A	B	C	D	E	F	G	H	I	J	K	L
1		DROP WIRE / NID INPUTS (REVISED)										
2												
3		STATE		Florida								
4												
5												
6		Item		Source		FRC		Sub-FRC		Amount		Comments
7												
8		I&M - POTS Labor Rate		Cost Factors								
9		Job Function Code		Network								
10		Average # of Loops - Residence		CRIS								
11		Average # of Loops - Business 2pr		MKIS								
12		Average # of Loops - Business 5pr		MKIS								
13		Drop Material (Buried, 2-Pr., Res)										
14		Drop Material (Aerial, 2-Pr, Bus & Res)		Network		22C		01				
15		Drop Material (Buried, 5-Pr., Bus)		Network		45C		01				
16		NID Material (Interface Only)		Network		22C & 45C		01				
17		NID Material (Bridge & Protector) 2pr		Network		22C & 45C		01				
18		NID Material (Bridge & Protector) 5pr		Network		22C & 45C		01				
19		Exempt Material - Aerial		Network		22C		01				
20												
21		Contractor Labor (0-500 ft) - Buried		Network		45C		01				
22		Telco Labor - Travel		Network		22C & 45C		01				
23		Telco Labor - Install NID		Network		22C & 45C		01				
24		Telco Labor - Aerial Install&Term. Drop		Network		22C		01				
25		Telco Labor - Buried Install&Term. Drop		Network		45C		01				
26												
27		Sales Tax		Cost Factors								
28												
29		% Investment Aerial		Sample Calculation								
30		% Investment Buried		Sample Calculation								
31		% Residence Loops With Drop		Sample Calculation								
32		% Business Loops With Drop		Sample Calculation								
33												

A	B	C	D	E	F	G	H	I	J	K	L
34	Assumptions / Notes:										
35											
36											
37											
38											

	A	B	C	D	E	F	G	H	I	J
1				DROP WIRE / NID MATERIAL (REVISED)						
2										
3		STATE		Florida						
4										
5										
6		Item		Source		FRC		Sub-FRC		Amount
7				u3						
8		Residence - 2wire Aerial								
9		Material - Drop		(+InputsJ14*InputsJ27) /InputsJ10		22C		01		
10		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ10		22C		01		
11		Material - NID Prot/Bridge		+InputsJ17*InputsJ27		22C		01		
12		Exempt Material		(+InputsJ19*InputsJ27)/InputsJ10		22C		01		
13		Contractor Labor		N/A		22C		01		
14		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ10		22C		01		
15		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ10		22C		01		
16		Telco - Install & Term. Drop Labor		(+InputsJ8*InputsJ24) /InputsJ10		22C		01		
17										
18		% Investment Aerial		+InputsJ29		22C		01		
19		% Residence Loops With Drop		+InputsJ31		22C		01		
20										
21		Weighted Material ==>		Sum(J9-J16)*J18*J19		22C		01		
22										
23		Residence - 2wire Buried								
24		Material - Drop (2-Pair)		(+InputsJ13*InputsJ27)/InputsJ10		45C		01		
25		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ10		45C		01		
26		Material - NID Prot/Bridge		+InputsJ17*InputsJ27		45C		01		
27		Exempt Material		N/A		45C		01		
28		Contractor Labor		+InputsJ21/InputsJ10		45C		01		
29		Telco - Travel Labor		+(InputsJ8*InputsJ22)/InputsJ10		45C		01		
30		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ10		45C		01		
31		Telco - Install & Term. Drop Labor		(+InputsJ8*InputsJ25) /InputsJ10		45C		01		
32										
33		% Investment Buried		+InputsJ30		45C		01		
34		% Residence Loops With Drop		+InputsJ31		45C		01		
35										
36		Weighted Material ==>		Sum(J24-J31)*J33*J34		45C		01		
37										
38		Business - 2wire Aerial								
39		Material - Drop		(+InputsJ14*InputsJ27)/InputsJ11		22C		01		
40		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ11		22C		01		
41		Material - NID Prot/Bridge		+InputsJ17*InputsJ27		22C		01		
42		Exempt Material		+(InputsJ19*InputsJ27)/InputsJ11		22C		01		
43		Contractor Labor		N/A		22C		01		
44		Telco - Travel Labor		+(InputsJ8*InputsJ22)/InputsJ11		22C		01		
45		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ11		22C		01		
46		Telco - Install & Term. Drop Labor		(+InputsJ8*InputsJ24)/InputsJ11		22C		01		
47										
48		% Investment Aerial		+InputsJ29		22C		01		
49		% Business Loops With Drop		+InputsJ32		22C		01		
50										
51		Weighted Investment ==>		Sum(J39-J46)*J48*J49		22C		01		
52										
53		Business - 2wire Buried								
54		Material - Drop (5-pair)		(+InputsJ15*InputsJ27)/InputsJ11		45C		01		
55		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ11		45C		01		
56		Material - NID Prot/Bridge		+InputsJ17*InputsJ27		45C		01		
57		Exempt Material		N/A		45C		01		
58		Contractor Labor		+InputsJ21/InputsJ11		45C		01		
59		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ11		45C		01		
60		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ11		45C		01		
61		Telco - Install & Term. Drop Labor		(+InputsJ8*InputsJ25)/InputsJ11		45C		01		
62										
63		% Investment Buried		+InputsJ30		45C		01		
64		% Business Loops With Drop		+InputsJ32		45C		01		
65										
66		Weighted Material ==>		Sum(J54-J61)*J63*J64		45C		01		

	A	B	C	D	E	F	G	H	I	J
67										
68										
69										
70										
71										
72										
73										
74										
75										
76										

	A	B	C	D	E	F	G	H	I	J
1				DROP WIRE / NID MATERIAL (REVISED)						
2										
3		STATE		Florida						
4										
5										
6		Item		Source		FRC		Sub-FRC		Amount
7										
8		Business - 4wire Aerial								
9		Material - Drop		(+InputsJ14*InputsJ27) / InputsJ12		22C		01		
10		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ12		22C		01		
11		Material - NID Prot/Bridge		+InputsJ18*InputsJ27		22C		01		
12		Exempt Material		(+InputsJ19*InputsJ27)/InputsJ12		22C		01		
13		Contractor Labor		N/A		22C		01		
14		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ12		22C		01		
15		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ12		22C		01		
16		Telco - Install & Term. Drop Labor		(+InputsJ8*InputsJ24)/InputsJ12		22C		01		
17										
18		% Investment Buried		+InputsJ29		45C		01		
19		% Business Loops With Drop		+InputsJ32		22C		01		
20										
21		Weighted Material ==>		Sum(J9-J16)*J18*J19		22C		01		
22										
23		Business - 4wire Buried								
24		Material - Drop (5-Pair)		(+InputsJ15*InputsJ27)/InputsJ12		45C		01		
25		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ12		45C		01		
26		Material - NID Prot/Bridge		+InputsJ18*InputsJ27		45C		01		
27		Exempt Material		N/A		45C		01		
28		Contractor Labor		+InputsJ21/InputsJ12		45C		01		
29		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ12		45C		01		
30		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ12		45C		01		
31		Telco - Install & Term. Drop Labor		(+InputsJ8*InputsJ25)/InputsJ12		45C		01		
32										
33		% Investment Buried		+InputsJ30		45C		01		
34		% Business Loops With Drop		+InputsJ32		45C		01		
35										
36		Weighted Material ==>		Sum(J24-J31)*J33*J34		45C		01		

	A	B	C	D	E	F	G	H	I	J
1		NID INVESTMENTS (REVISED)								
2										
3		STATE		Florida						
4										
5										
6		Item		Source		FRC		Sub-FRC		Amount
7										
8		2-Wire - Residence - Aerial								
9		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ10		22C		01		
10		Material - NID Prot/Bridge		+InputsJ17*InputsJ27		22C		01		
11		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ10		22C		01		
12		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ10		22C		01		
13		% Investment Aerial		+InputsJ29		22C		01		
14		Weighted Investment ==>		SUM(J9.J12)*J13		22C		01		
15										
16		2-Wire - Residence - Buried								
17		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ10		45C		01		
18		Material - NID Prot/Bridge		+InputsJ17*InputsJ27		45C		01		
19		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ10		45C		01		
20		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ10		45C		01		
21		% Investment Buried		+InputsJ30		45C		01		
22		Weighted Investment ==>		SUM(J17.J20)*J21		45C		01		
23										
24		2-Wire - Business - Aerial								
25		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ11		22C		01		
26		Material - NID Prot/Bridge		+InputsJ17*InputsJ27		22C		01		
27		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ11		22C		01		
28		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ11		22C		01		
29		% Investment Aerial		+InputsJ29		22C		01		
30		Weighted Investment ==>		SUM(J25.J28)*J29		22C		01		
31										
32		2-Wire - Business - Buried								
33		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ11		45C		01		
34		Material - NID Prot/Bridge		+InputsJ17*InputsJ27		45C		01		
35		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ11		45C		01		
36		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ11		45C		01		
37		% Investment Buried		+InputsJ30		45C		01		
38		Weighted Investment ==>		SUM(J33.J36)*J37		45C		01		
39										
40		4-Wire - Business - Aerial								
41		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ12		22C		01		
42		Material - NID Prot/Bridge		+InputsJ18*InputsJ27		22C		01		
43		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ12		22C		01		
44		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ12		22C		01		
45		% Investment Aerial		+InputsJ29		22C		01		
46		Weighted Material ==>		SUM(J41.J44)*J45		22C		01		
47										
48		4-Wire - Business - Buried								
49		Material - NID Interface		(+InputsJ16*InputsJ27)/InputsJ12		45C		01		
50		Material - NID Prot/Bridge		+InputsJ18*InputsJ27		45C		01		
51		Telco - Travel Labor		(+InputsJ8*InputsJ22)/InputsJ12		45C		01		
52		Telco - Install NID Labor		(+InputsJ8*InputsJ23)/InputsJ12		45C		01		
53		% Investment Buried		+InputsJ30		45C		01		
54		Weighted Material ==>		SUM(J49.J52)*J53		45C		01		
55										
56										

COMPARISON OF COOPER CABLE COSTS PER PAIR - FOOT

SIZE (PAIRS)	AERIAL ($/FT)	AERIAL ($/PR-FT)	BURIED ($/FT)	BURIED ($/PR-FT)	UNDERGROUND ($/FT)	UNDERGROUND ($/PR-FT)
25						
50						
100						
200						
300						
400						
600						
900						
1200						
1500						
1800						
2100						
2400						
2700						
3000						
3600						

WORST

1 / 2
25/50
50/100
100/200
200/400
300/600
600/1200
900/1800
1200/2400
1500/3000
1800/3600

PLAUSIBLE