such an overstatement of costs as to make the model unusable for determining an appropriate Universal Service Fund. In addition, BellSouth has submitted default input values that are far too high, and are unreasonable based on my outside plant experience. In particular, their application of "in-place factors" as a multiplier of material price is illogical, and excessive. I will demonstrate how many typical in-place costs are so absurdly out of line that the model inputs should be rejected in this proceeding.

IV. ANALYSIS OF BCPM TECHNICAL ASSUMPTIONS:

Q. WHAT TECHNICAL ERRORS HAVE THE PROPONENTS OF BCPM MADE IN THEIR MODEL REGARDING LINE POWERING AND SUPERVISION?

A. The requirements of a successful copper loop include sufficient power to ring a customer's telephone, and to provide sufficient current that can be adequately changed by a vibrating microphone in the customer's telephone set, to transmit voice. The standard for that current is 20 milliamperes into a 430-ohm station set[1]. In addition, those same standards state that no loop will exceed the office signaling range. That signaling, or supervision range, dictates the maximum amount of dc (direct current) resistance that can be tolerated in the copper wires to the station set. Since the central office switch senses that the receiver has gone "off-hook" by the application of a short circuit at the station set, if the resistance of the wire is

[1] See *Bellcore Notes on the Network*, SR-2275, Issue 3, Bellcore 1997, p. 7-68.

extremely high, the switch will never sense the "off-hook" condition. Telephones will continue to ring without stopping, even though a handset is lifted, and the switch will not know enough to send dial tone. Although digital switches currently being deployed operate at 1600 to 2000 ohms[2], the general "rule of thumb" is to design copper loops for a maximum of 1500 ohms. BCPM proponents agree that 1500 ohms is the maximum resistance design limit. They state, "12,000 ft of 26 gauge copper has a resistance value of 999.6 ohms" ... "...well within the 1500 ohm supervisory limit of today's digital switches."[3] While correctly stated that 12,000 feet of 26 gauge copper equates to 999.6 ohms, they fail to cite why that is a benchmark for anything. In fact, 1000 ohms is a benchmark for nothing in telecommunications standards.

BCPM proponents also state, "The 26/24 gauging used in the distribution takes into account the 900 ohm powering limitations of DLC line cards, without going to the considerably more expensive extended range line cards." The BCPM and HM 5.0 models base their Integrated Digital Loop Carrier systems on two specific vendor products. Large size DLCs are based on the DSC Communications Litespan-2000 product, and the small size DLCs are based on Advanced Fiber Communication's (AFC's) UMC 1000 product line. The Specifications and Data Sheet from DSC Communications lists the loop resistance limit of their regular

[2] Bellcore, *Bellcore Notes on the Network*, SR-2275, Issue 3, 1997, p. 7-29.

[3] *BCPM 3.1 Model Methodology*, p. 17.

POTS line cards as 1500 ohms[4] (see Exhibit JCD-1). The Specifications and Data Sheet from AFC lists the loop resistance limit of their regular POTS line cards as 1500 ohms[5] (see Exhibit JCD-2). The supervisory range for the cards modeled in BCPM should be 1500 ohms, not 900 ohms. This would allow for larger Distribution Serving Areas than BCPM uses.

BCPM uses 24-gauge cable for any copper pairs extending beyond 11,100 feet. This is not justified by BCPM proponents by any technical references. They agree that digital switch limits are 1500 ohms (BCPM 3.1 Model Methodology at 17), and as discussed above, BCPM proponents are wrong regarding DLC powering limits being less than 1500 ohms. Therefore, the correct calculation is 1500 ohms at 83.3 ohms per thousand feet, or 18,007.2 feet as the maximum range for 26-gauge copper cable[6]. Since 24-gauge cable has approximately 50 percent more copper, by weight, than 26-gauge cable (see Exhibit JCD-3); and, since the cost of copper cable is primarily a function of the weight of copper, the BCPM 3.1 model significantly overstates material costs for loops with more than 11,100 feet of copper.

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[4] Note, 430 ohms normally reserved for the station equipment (see Bellcore cite earlier) should be subtracted from the 1930 ohms shown on the Specification Sheet to obtain the correct outside plant maximum copper loss of 1500 ohms.

[5] Note, 430 ohms normally reserved for the station equipment (see Bellcore cite earlier) should be subtracted from the 1930 ohms shown on the Specification Sheet to obtain the correct outside plant maximum copper loss of 1500 ohms.

[6] HM 5.0 uses 24-gauge cable for all copper cables less than 400 pairs. This provides an additional transmission margin of lower resistance.

Q. ARE THERE OTHER DESIGN CONSIDERATIONS FOR THE LOCAL LOOP, AND DOES BCPM MEET THOSE TECHNICAL REQUIREMENTS?

A. Besides resistance design, the other criteria that should be met by copper loops is dB attenuation loss. Attenuation loss is different from dc resistance loss, in that it measures losses at various frequencies. The local loop standard calls for a minimum frequency response of 300 to 3,000 Hz (cycles)[7]. The POTS loop loss standard is measured at 1004 Hz. Although some tariffs allow for more lenient (higher) losses, the generally accepted standard loss for loops is 8.5 dB, including an allowance of 0.5 dB within the central office for central office wiring[8]. Therefore, the copper loop design should be 8.0 dB from a central office Main Distribution Frame (MDF), or 8.5 dB from a DLC Remote Terminal site.

BCPM misstates the facts, which are these. The DSC Litespan-2000 RPOTS cards utilized by both BCPM and HM 5.0 employ a fixed 2-dB loss pad.[9] The RPOTS cards are, in fact, adequate to a distance of 17.6 kft. This is illustrated in Exhibit JCD-4, which is an excerpt from the DSC Litespan-2000 practices. This exhibit shows that the copper loop distance available at 6.5 dB loss is 17.6 kft.[10]

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[7] See Federal –State Joint Board on Universal Service, *Fourth Order on Reconsideration*, CC Docket No. 96-45, FCC 97-420 (rel. December 30, 1997), §16.

[8] Bellcore, *Telecommunications Transmission Engineering*, 1990, p. 103.

[9] DSA Communications, OSP 363-205-110 *Narrowband Services Application Guide*, Issue 5A, December 1996. p. 3-6. The reason for this loss pad is that the deployment of fiber fed DLC has so shortened the copper loop for distant subscribers that they complain of volume being too high.

[10] Although proponents of BCPM have claimed that loops should be designed for 6.0 dB of loss rather than 6.5 dB, this appears to be based on their neglect of the fact that the 0.5 dB loss reserved for central office wiring losses in an 8.0 dB loop will not occur in an IDLC environment. See, "...the maximum

HM 5.0 actually limits the maximum copper loop length to approximately 17,700 feet[11]. For those cases involving the rare circumstance of the last 100 ft. between 17.6 kft. and 17.7 kft. using DLC, the proper replacement for the RPOTS card, according to the manufacturer, is the RUVG2 card, which auto-adjusts between 8-dB loss and 1.6 dB gain.[12]

The BCPM model uses extended range line cards for distribution distances over 13,600 feet of 24-gauge copper cable[13]. This is incorrect

In addition, the Extended Range Line Card referenced by BCPM is the Litespan REUVG card. The **R**emote **E**qualized **U**niversal **V**oice **G**rade card advocated by BCPM proponents beyond 13,600 feet is a DLC line card normally reserved for unusual conditions involving special services for long loops in the embedded base. The REUVG card is twice as expensive as the RPOTS card, and provides more features than necessary, including an auto adjusting loss/gain pad of 6-dB loss to 6-dB gain.[14]

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insertion loss is limited to 8 dB (8.5 dB with office loss included)." Bellcore, *Telecommunications Transmission Engineering*, Vol. 3 p. 103.

[11] Hatfield Model Release 5.0 Model Description, p. 28, footnote 33 states, "Because the rasterization into 150 foot square cells may cause customer locations that actually are in the farthest corner of a cell to be considered at the cell's center, the clustering algorithm will actually check to ensure that no cells added to a cluster exceed 17,700 (=18,000 – 2*150) feet from the cluster's centroid.

[12] DSC Communications, OSP 363-205-110 *Narrowband Services Application Guide*, Issue 5A, December 1996, p. 3-19.

[13] *BCPM 3.1 Model Methodology*, p. 17.

[14] DSC Communications, OSP 363-205-110 *Narrowband Services Application Guide*, Issue 5A, December 1996, p. 3-24.

The card recommended by DSC for applications between 17,600 feet and 18,000 feet is the RUVG2 (Remote Universal Voice Grade ver. 2) card. This card is approximately 25 percent more expensive than the RPOTS card, and provides for automatically adjusting the gain required. Exhibit JCD-4 indicates the RUVG2 as the appropriate card to use (see "Exceeds RT POTS Loss – use RUVG2 Zone"). This was substantiated by DSC's national product manager.

Q. HOW DO BCPM'S TECHNICAL ERRORS AFFECT THE MODEL'S OUTCOME FOR COPPER CABLE?

A. Costs are significantly overstated for loops over 11,100 feet in BCPM 3.1 because 24-gauge copper is used where 26-gauge would be sufficient. In fact, once a loop is longer than 11,100 feet, BCPM changes the entire loop from 26-gauge to 24-gauge.

Q. DOES THIS MEAN THAT THE INSTALLED COPPER CABLE COSTS ARE OVERSTATED FOR LOOPS OVER 11,100 FEET?

A. Yes. The default values used by BellSouth are based on applying in-place cost factors to the material price. Since material prices are artificially inflated by the unnecessary use of 24-gauge cable, technically, all of those in-place cost factors compound the error even more. Because of this heavier gauge copper, I believe an

overstatement of up to 50 percent of total installed copper cable costs for loops over 11,100 feet would be a conservative estimate.

Q. ARE THE COSTS FROM BCPM 3.1 ALSO INFLATED BECAUSE THE WRONG DLC CARD HAS BEEN CHOSEN?

A. Yes, in two ways. First, the RPOTS card is adequate out to 17,600 feet, and neither model proposes analog copper beyond 18,000 feet[15]. However, BCPM inputs the cost of a card that is twice as expensive as an RPOTS card for copper distribution beyond 13,600 feet. This is the inappropriate card, according to the manufacturer. The correct card costs only 25 percent more, and is only needed in those extremely rare cases involving the last 100 feet.

V. BCPM 3.1 CLAIMS THAT ADHERENCE TO THE 18 YEAR OLD CARRIER SERVING AREA (CSA) CONCEPT IS REQUIRED, AND THAT THEY ADHERE TO THE CSA CONCEPT IN THEIR MODEL.

Q. WHAT IS THE CSA CONCEPT, WHAT WAS IT INTENDED TO DO, AND IS IT NECESSARY IN TODAY'S ENVIRONMENT?

A. Adherence to the 18-year-old CSA criteria is no longer required to meet the advanced services requirement. Ways that are more efficient have been found to provide such services using better echo cancellation algorithms, digital signal

[15] However, BCPM does not perform an explicit check to ensure this. HM 5.0 does perform such a check.

processing, and other breakthroughs. Therefore, telephone companies can provide ISDN and ADSL services to anyone within 18 kft. of their serving central office.[16]

When considering "advanced services", it is always important to note the latest breaking news. As I mentioned in my Direct Testimony, the latest technology is not the 28.8 kbps modem as Dr. Bowman asserts. 28.8 kbps is not even the current technology since the advent of 33.6 kbps modem. Before the end of this year, I predict that the Intel-Compaq-Microsoft-RBOC consortium will sweep the market by storm with their ADSL modems that are 30 times faster than today's fastest analog modems. I have included two articles as Exhibit JCD-5 and Exhibit JCD-6, that provide an interesting insight as to what is "advanced services".

It is also contradictory for BCPM to claim that adherence to CSA guidelines is necessary to provide advanced services, when at the same time the BCPM fails to adhere to these guidelines.[17]

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[16] "The DSL for ISDN Basic Rate Access (BRA) transmits 160 kbps in both directions simultaneously on a nonloaded cable pair." ... "Almost all loops designed to resistance design criteria, whether RRD or its predecessors, will transmit a DSL signal out to 18 kft." See, [16] Bellcore, *Bellcore Notes on the Network*, SR-2275, Issue 3, 1997, p. 7-71.

I believe it is interesting to note that Dr. Bowman's Direct Testimony is replete with references to the AT&T Outside Plant Handbook, but has no Bellcore references. I would consider AT&T material regarding local loop engineering to be secondary to other material, since AT&T has been out of the local loop business for over 14 years.

[17] These guidelines state that the maximum length of 26-gauge cable can only be 9 kft., and the maximum length of 24, 22, or 19-gauge cable can only be 12 kft. See, Bellcore, *Bellcore Notes on the Networks*, SR-2275 Issue 3, December 1997, pg. 7-70. See also, Bellcore, *Telecommunication Transmission Engineering*, 3rd Edition, 1990, p. 94. BCPM, however, specifies use of 26-gauge cable out to 12 kft., and use of 24 gauge out to 18 kft, and beyond.

Q. DR. BOWMAN CLAIMS THAT BELLCORE TECHNICAL MEMORANDUM TM-25704 (HIS EXHIBIT RMB-2) SUPPORTS HIS CASE AGAINST THE HATFIELD MODEL REGARDING 28.8 KBPS MODEMS. DO YOU AGREE?

A. No I do not. I was so puzzled by some of the items in this Technical Memorandum that I called the author, Rick Perez, at Bellcore. He stated that this Technical Memorandum has never been submitted to any "standards bodies", nor obviously approved by any, and that there has been no interest in doing so.

In general, he reiterated the opinions that he expressed in the TM that analog modem performance is not an exact science, and that manufacturers have discovered "hidden bandwidth" that go beyond copper design guidelines, because extra allowances were sometimes built into copper plant. Because the manufacturers know they cannot count on always getting that bandwidth, the modems send out a "white noise" signal, and then dynamically adjust their frequency response to boost some frequencies, kind of like a tone control on a stereo.

What really puzzled me about Rick Perez's study was the losses in his test loops. The sampled loops are shown in the table on page 12 of TM-25704. The standard for measuring a local loop is a signal at 1004 Hz. When I pointed out to Mr. Perez that his loops ranged from 11.4 dB to 14.3 dB, and that the standard was no more

than 3.5 dB, he agreed and was at a loss to explain why. He stated that he used Bellcore test loops built with reels of cable to "stress-test" ISDN modems under worst case conditions. He said these were actually many reels of cable in the Bellcore yard that were spliced together with lots of copper gauge changes. He agreed that copper gauge changes create "reflection loss", that many such gauge changes could explain his excessive reflection loss results, and that could be an explanation why the test loops exceeded maximum allowable loop design losses.

In my opinion, the study supporting TM-25704 is completely invalid, since the loops examined do not meet the acceptable maximum loss requirements of any local loop, and are between 34 percent and 68 percent greater in loss than the maximum allowable by the BCPM or Hatfield Models.

To summarize this portion of my rebuttal testimony, the Hatfield Model aggregates reasonable amounts of demand, transports it in cost effectively designed copper or fiber feeder systems, and meets the advanced services that will support 30 times higher speeds than current analog modems.

VI. BCPM 3.1'S LAYOUT OF THE NETWORK IS WRONG.

1 **Q. DOES BCPM STILL DETERMINE THE AMOUNT OF LAND AREA**
2 **OCCUPIED BY CUSTOMER LOCATIONS AND THEN FORM THEM**
3 **INTO SQUARE LOTS?**
4 A. Yes. As I explained in my direct testimony, we in the telecommunications industry
5 do not determine lot sizes and shapes, we observe them. BellSouth's latest
6 submission still has the BCPM model using "square lots", which for a customer
7 means a rectangular "plot", with the rectangle turned the wrong way. An example
8 has been prepared and included as Exhibit JCD-7, wherein a one square mile area
9 has been divided into 640 developer lots. In that example, it can be observed that
10 use of BCPM's square lot assumption would cost a developer approximately $10.6
11 million in additional paving and grass median costs, while reducing perceived
12 customer plot area by 4.14 percent.
13
14 **Q. DO YOU BELIEVE THAT CABLE DISTANCE SHOULD EQUAL ROAD**
15 **DISTANCE, AS BCPM CLAIMS?**
16 A. No. Although it is enticing to believe such a simplifying assumption, such is not
17 the case. While we would argue that very rural areas would easily show that
18 running cable on every single road for its full length is not appropriate, I will
19 present a more difficult example. The example shown in Exhibit JCD-8 represents
20 a housing development with homogeneous spacing of households. This would
21 seem to be the easiest example to show that road distance equals cable distance.
22 Yet the example shows that cable distance is 77.3 percent of road distance (note

the correct assumption of rectangular lots). Therefore, I conclude that although there is some correlation between road distance and cable distance, it is not the 100 percent correlation that BCPM claims.

Q. DOES BCPM REALLY ABANDON THE EVEN DISTRIBUTION OF HOUSEHOLDS THROUGHOUT AN AREA, AND INSTEAD PLACE THEM ALONG ROADS AS THEY CLAIM?

A. A very careful reading of the BCPM Model Description wording does **not** say that, exactly.[18] What the model does do is synthesize the area assumed to be in customer lots by multiplying the total road length by 1,000 feet (500 ft. to each side of the road). If that much area does not fit within the grid, then the model makes it fit the grid by reducing it to the area of the grid. BCPM then assumes uniform distribution of customer locations on square lots within that calculated area.

HM 5.0 plots actual latitude and longitude for all customer locations, both business and residence. The model then forms natural clusters of locations, without regard to the artificial constraints of census blocks, which were not created to enhance outside plant planning. Where customer locations are not geocoded, HM 5.0 conservatively disperses those customers along the edge of the appropriate Census Block, because CBs are normally enclosed by the nearest road. I therefore

[18] "BCPM 3.1 has abandoned the assumption that all customers are uniformly distributed throughout the CBG." See *BCPM 3.1 Model Methodology*, p. 7.

conclude that in HM 5.0's worst case, it does a better job than BCPM in laying out customer locations and cabling.

Q. DOES BCPM OVERSIZE CABLES BY DOUBLING UP ON CABLE SIZING FILL FACTORS?

A. Yes. First, BCPM assumes a cable-sizing factor of 1.6 lines per household. This equates to a cable-sizing factor of 62.5%. BCPM then applies a similar cable-sizing factor to that number. Therefore, as could be expected mathematically, they average a distribution fill in the upper 30 percent range (e.g., 0.60 x 0.60 = 0.36). BCPM should be held to only one cable sizing fill factor.

Q. DOES YOUR CRITICISM ALWAYS CENTER ON THE FACT THAT BCPM OVERSTATES COSTS?

A. No. My critique of BCPM also includes an example of where BCPM underestimates costs. For example, in workshops BCPM proponents have stated that Building Riser Cable is not included in the model because it is deregulated, and not part of the rate base.

That is a misstatement of the facts. Although building riser cable has been "deregulated", it is in a carefully worded construct. The normal application of that guideline is that if a building owner wishes to own the building cable, the ILEC cannot refuse to let the building owner own the riser cable. However, if the

building owner refuses to own the building cable, then the ILEC must own the cable in a multi-tenant building as the "provider of last resort".

I am surprised that BellSouth is advocating such a position, since it stated otherwise in its response to the FCC's data request to large ILECs last summer. An excerpt of that response is available on the FCC's Common Carrier Bureau website, and is included as Exhibit JCD-9.

VII. BELLSOUTH'S DEFAULT VALUES ARE UNREALISTICALLY HIGH, PRIMARILY THROUGH THEIR APPLICATION OF UNREALISTIC IN-PLACE COST FACTORS.

Q. DOES BELLSOUTH USE THE BCPM INPUT DEFAULT VALUES IN THE BCPM MODEL IT HAS SUBMITTED IN THIS PROCEEDING?

A. No. BellSouth has elected to submit their own values for most of the local loop defaults, and I have analyzed that work.

Q. WHAT IS THE RESULT OF YOUR ANALYSIS?

A. My conclusions are that although a number of BellSouth's material prices may not be out of line by an order of magnitude, their in-place cost factors are extensively flawed by the assumption that Supply Cost, Engineering, Placing, and Splicing are all directly proportional to investment. A thorough review reveals that such an

1 assumption is grounded on traditional embedded base thinking, and only works for
2 example, when one divides $1 Billion by 1 Million lines to compute an average of
3 $1,000 per access line, and has no place in a TELRIC proceeding.
4
5 **Q. WHAT IS INCLUDED IN SUPPLY COST?**
6 A. Supply expense normally includes the cost of negotiating contracts with suppliers
7 and vendors, ordering those supplies, and performing the logistics functions of
8 delivery, receiving, and billing. In the Louisiana proceeding, BellSouth witnesses
9 stated that their categorization of "Supply Cost" also includes exempt material.
10 Exempt material includes the "nuts and bolts" that are not retirement units tracked
11 individually in the books of accounts.
12
13 **Q. IS SUPPLY EXPENSE PROPORTIONAL TO INVESTMENT?**
14 A. Not usually. Some items are more complex to procure than others are. For
15 example, procurement of high technology may involve extensive analysis and
16 negotiations. However, procurement and logistics functions are normally a stable
17 cost, and handled as a corporate entity. To the extent they should be distributed to
18 final accounts based on investment markup is questionable. Within a particular
19 product item of different sizes, there is little correlation between cost and supply
20 expense. For example, a cable costing $12 per foot should not incur a supply
21 expense 12 times higher than a cable with a material cost of $1 per foot. There are
22 several glaring instances where this relationship is abused beyond common sense in

the input values submitted by BellSouth. In particular, I point to the supply expense associated with Cable Costs, 24-gauge Cable, Underground-Copper [BellSouth BCPM 3.1 submission at BATES Stamp 000218]. The Supply expense for this cable is 59% as much as the material cost, whether for a 12 pair cable, or a 4200 pair cable.[19] Having a 59 percent supply cost markup is completely unreasonable.

Q. IS COPPER SPLICING COST PROPORTIONAL TO COPPER MATERIAL COST?

A. I believe in large part it is, with the exception that it takes no longer to splice 24-gauge cable than 26-gauge cable, yet the premium charged for 24-gauge cable because of additional copper weight drives greater splicing costs.

Q. IS CABLE PLACING COST PROPORTIONAL TO INVESTMENT?

A. No. While I could make the obvious statement that it does not take 42 times as long to place a 4200 pair cable as a 100 pair cable – admittedly it takes a bit longer, I would point to fiber optic cable costing in the BellSouth submission as an example.

[19] It is interesting to note that BellSouth claims to base these costs on actual cables procured. Yet 24-gauge cable is not manufactured in sizes larger than 2400 pairs. BellSouth has 24-gauge cable costs for 3000 pair, 3600 pair and 4200 pair cables that do not exist. See Lucent Technologies, *Outside Plant Engineering Handbook*, 1994, Section 14 – Cable & Wire. [Exhibit JCD-3]

The diameter of fiber optic cable varies between 0.45 inches to 0.75 inches, and from 76 lbs./1000 ft. to 211 lbs./1000 ft.[20] Yet BellSouth claims that it takes almost 8 times as long to place an aerial 144 fiber cable than to place a 12 fiber cable. They double that time yet again for a 288-fiber cable. This is completely contrary to logic, and to my experience. Recent Rural Utility Service Contract data that is under analysis reveals that BellSouth's 12 fiber placing cost is a reasonable surrogate across all fiber cable sizes.[21]

Q. HAVE YOU PERFORMED QUANTITATIVE REASONABLENESS TESTS ON BELLSOUTH'S CABLE PLACING COSTS?

A. Yes. I performed a simple reasonableness test. BATES Page 000230 shows Fiber Costs – Underground. The "Placing" costs for one foot of 288 fiber cable is shown as $5.40. In response to AT&T's Data Request, Item No. 5, BellSouth responded under Item No. 5a, Attachment No. 1, Page 1 of 1, with a Regional Labor Rate of $40.80. A quick calculation of 8 hrs./day * $40.80/hr. divided by $5.40/ft. reveals that this cost equates to only 60 feet of fiber cable placed per workday. I have been personally involved in placing fiber cable 35,000 feet long without a splice. Since there are hundreds of feet between manholes in BCPM, it

[20] Comparison of 2 fiber to 144 fiber single jacket fiber optic cable. See Lucent Technologies, *Outside Plant Engineering Handbook*, 1994, p. 14-79.

[21] Rural Utilities Service Contract data analysis submitted by Dr. David Gabel in Maine PUC Docket 97-505, November 25, 1997.

would take two workweeks to even run fiber cable between two manholes. This is typical of the over-costed default values in BCPM.[22]

Q. IS FIBER SPLICING COST PROPORTIONAL TO FIBER MATERIAL COST?

A. Actually, there should be no fiber splicing costs in the fiber cable portion of the BCPM model. Those costs are covered in the installation cost of the Remote Terminal and Central Office Terminal for Digital Loop Carrier. Therefore, those costs should be excluded from fiber cable placing input values.

Q. WHAT IS YOUR OPINION ON THE INSTALLED COST OF AN SAI AS PROPOSED BY BELLSOUTH?

A. For Indoor SAIs [at 000238], the supply cost is more than 3 times the material cost, and runs into the tens of thousands of dollars for a single 4200 pair indoor SAI.

Similar to the exercise that I did to test the reasonableness of fiber placing, I examined the 4200 pair indoor SAI. An indoor SAI is a very simple thing. I have included a picture of one as Exhibit JCD-10 This SAI was engineered and built under my supervision as part of a project that involved several thousands of lines in 22 different building locations in Manhattan. The jobs were completed and in

[22] Aerial fiber cable would only be at a rate of 43 feet per day for a 288 fiber cable, while distances between poles are as long as 250 feet.

service in just under 7 weeks. The SAI pictured in the Exhibit is a 4200 pair SAI, although the same or similar terminal blocks could be configured as an 8400 pair SAI. As can be observed, this installation requires simple engineering, five 4 ft. by 8 ft. pieces of ¾ inch plywood, blue back panels, screw down brackets, and what are known as 66-blocks (some shown with orange covers) that snap into the brackets. Using a "punch down" tool, a technician terminates hundreds of pairs per hour. However, according to BellSouth's BCPM 4200 pair indoor SAI input values, the engineering operation equates to 170 hours, or 21 days (if I assume an engineering rate twice the technician rate of $40.80); the placing operation equates to 515 hours, or 64 days of work, and the splicing operation equates to 28 hours, or a rate of 148 pairs spliced per hour.

I also looked at the splicing cost for a 3600 pair outdoor SAI on the same page. I chose a 3600 pair outdoor SAI, because I have personally spliced one. Myself and another person spliced a 3600 pair outdoor SAI, in 95 degree weather, without shade, involving filled buried cable (affectionately known as "icky-PIC"), and completed the job in 8 hours (16 technician hours). The BellSouth splicing cost of $6,947.82 equates to 170.3 splicing hours. In addition, the placing operation for this same outdoor SAI is shown as $8,293.27 which equates to 203 hours. The placing of an outdoor SAI is even simpler than the placement of an outdoor Digital Loop Carrier Cabinet, which I will describe next.

1 **Q. DOES BELLSOUTH PROPOSE APPROPRIATE DIGITAL LOOP**

2 **CARRIER REMOTE TERMINAL SIZES?**

3 A. The BCPM model caps the maximum size IDLC Remote Terminal cabinet at 1344

4 lines, claiming in their workshops and before the FCC that no cabinet exists for a

5 2016 line RT. Such is not the case. Exhibit JCD-11 is a copy of material from

6 RELTEC that explicitly indicates that their MESA-6 cabinet is capable of housing

7 up to 2016 lines of DSC Lightspan-2000 equipment, and that their line of cabinets

8 is approved in several large companies, including BellSouth. In addition, Exhibit

9 JCD-12 shows a picture of an equivalently sized box. I am standing in that picture

10 to give an idea of relative size.

11

12 **Q. DOES BELLSOUTH PROPOSE APPROPRIATE COSTS FOR DIGITAL**

13 **LOOP CARRIER EQUIPMENT?**

14 A. No, their Digital Loop Carrier Engineer, Furnish, and Install costs are many times

15 higher than what they should be. The members of the engineering team supporting

16 the Hatfield Model have extensive experience in deploying this type of technology.

17 In my last RBOC employment, I was responsible for an organization that

18 purchased over $1 million per day in electronic equipment. I know that the costs

19 claimed in the BCPM model are unrealistic, especially for their larger installations.

20 I recommend that HM 5.0 values are the appropriate costs that should be used in

21 this proceeding.

22

1 **Q. HAVE YOU ANALYZED WHY THE DEFAULT VALUES ARE SO HIGH**

2 **FOR DIGITAL LOOP CARRIER SYSTEMS IN BCPM?**

3 A. Yes. The input values for DLC are shown on BATES Stamp page 000247. I have

4 analyzed the costs using data supplied by BellSouth in response to AT&T's Data

5 Request Item 6, Attachment B. The costs used in this docket are identical to those

6 filed in a similar docket in Louisiana, where I was present as a witness. At that

7 proceeding Ms. Daonne Caldwell, witness for BellSouth, stated that the values

8 used (at BATES 000247) were the BCPM default values; that they were examined

9 by BellSouth experts and deemed reasonable; and, were therefore used in the

10 filing. I mention this because the response to AT&T Data Request Item 6 are

11 somewhat different that the values filed and are therefore different than Ms.

12 Caldwell's Louisiana testimony. Since this is the only information that I have that

13 outlines a finer breakdown than total DLC installed cost, and because I believe the

14 results of analysis are representative, I will proceed. I have included pages 1 and 2

15 of the Data Request Response from BellSouth as Exhibit JCD-13.

16

17 The first page of Exhibit JCD-13 shows the installed costs for Central Office

18 Terminals and Remote Terminals. The column of numbers is the equipment price,

19 and the second column is the installation price. Page 2 of this exhibit shows the

20 cost of a 1344 line system as $82,211.40 of material and $18,088.97 in installation

21 cost. In addition, POTS cards serve 4 lines each, cost $256.56 in material and

22 $49.75 for installing one card. At a regional labor rate of $40.80, the installation

cost of $18,088.97 equates to 443.4 hours. I believe it is important to know what is involved in installing a Digital Loop Carrier Remote Terminal. When properly engineered, it is a "cookie-cutter" operation involving standard templates and placing methods. I have provided as Exhibit JCD-14 a portion of the DSC Litespan practice that shows how simple it is to install this cabinet which is pre-assembled in the DSC factory.

Q. HOW LONG DOES IT TAKE TO INSTALL A POTS CARD INTO A DLC REMOTE TERMINAL CABINET?

A. A fraction of a minute. Digital Loop Carrier line cards are installed as quickly as one can slide them into a slot in the unit. When a DLC cabinet is initially turned up for service, card sets are quickly inserted into slots in the unit. The DLC equipment automatically senses the presence of a card, tests it, and places in on-line, with no human intervention, other than the card insertion step.

At a BellSouth DLC card installation cost of $49.75, BellSouth is claiming that it takes over an hour to slide one of many cards into a slot. If that were true, it would take over 504 hours (63 work-days) to slide 504 cards into slots of a 2016-line DLC cabinet. Applying such a cost to a TELRIC model is absurd.

IX SUMMARY

1

2 **Q. PLEASE SUMMARIZE YOUR REBUTTAL TESTIMONY?**

3 A. In my opinion, BCPM is a model filled with errors. Technically, BCPM incorrectly
4 uses a 900 ohm limit for their DLC line cards that really support 1500 ohms; they
5 claim a 1000 ohm limit for copper when no such limit exists in technical
6 requirements; they cap use of 26-gauge cable at 11,100 feet when such cable will
7 work at much longer distances; they incorrectly subtract an extra 0.5 dB of central
8 office wiring loss at the DLC site; they over-gauge cable by switching from all 26-
9 gauge cable at 11,100 feet to all 24-gauge cable; they price the wrong DLC
10 Universal Voice Grade Card when the dB loss of the POTS card is exhausted; and
11 then apply that incorrect card, at twice the cost, at 13,600 feet, rather than at
12 17,600 feet. BCPM claims that adherence to an 18-year-old CSA concept is
13 necessary, and then violates it. BCPM uses "square lots" that are really
14 rectangular plots turned the wrong way, despite data available to demonstrate how
15 uneconomical such a construct would be for developers. BCPM claims that road
16 distance equals cable distance, but that is neither true nor logical. BCPM sizes
17 occupied area based on a 1000-foot swath along roads, yet has provided no
18 empirical data to support that claim. They then squeeze that area into a square in
19 the center of their artificially created grid, rather than running cable along the roads
20 they portend describe cable distance. BCPM doubles up on cable sizing fill factors
21 by using two factors multiplied together, when only one is necessary. BCPM
22 excludes building riser cables, even though they reported to the FCC in August

1997 that BellSouth constructs building riser cables, and the investment for such cables are in their regulated cable account. BellSouth has submitted BCPM input values that are illogical in their price, their application of across-the-board in-place factors, and the size of those factors. BellSouth advocates Digital Loop Carrier prices that are far too high. Many small DLCs are placed, when more lines could be aggregated into more economical large DLCs. They also claim that Remote Terminal cabinets do not exist for 2016 DLC POTS lines, when they have approved the use of such a cabinet in their network. Lastly, all of their input values raise serious questions, especially in regards to their "in-place cost factors".

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes, it does.

Litespan®-2000 Specifications

TYPES OF SERVICES

4-Wire
800 Service Line
800 Service Trunk
AIOD
Centrex Lines
Consolidation of SLC-96 Mode 1
Consolidation of SLC-96 Mode 3
Consolidation of SLC Series
5-Feature Package B
Dial Tone First Coin
DID
Digital Data Services (DDS)
DLC Transport
Fractional T1
FX Lines and Trunks
Hi-Cap T-1 Transport
Inter-office T-1
Intra-office T-1
ISDN
Off-Premises Extension
Off-Premises Station
P-Phone (Meridian Business Set)
PBX Tie Line
PBX Trunking
POTS
Private Network T1 Transport
Secretarial Line
Voice Data Type 1
Voice Data Type 2
Voice Data Type 3
WATS Line 2-Way
WATS Line Out
WATS Trunk 2-Way
WATS Trunk Out
Private Line Automatic Ring Down (PLAR)
DC Alarms

ENVIRONMENTAL CONDITIONS (PER TR-057)

Temperature	
CO & RT	-40° to +65°C (-40° to +150°F)

PHYSICAL MEASUREMENTS

Rack Assembly		
	Height	213 cm. (7 ft.)
	Width	66.7 cm. (26 in.)
	Depth	30.8 cm. (12 in.)
Outdoor Cabinet		
	Height	152.4 cm. (60 in.)
	Width	203.2 cm. (26 in.)
	Depth	104.2 cm. (41 in.)

BELLCORE COMPLIANT

The Litespan-2000 and Starspan systems are designed in compliance with the following major Bellcore Standards:

Operations Technology Generic Requirements (OTGR)
TR-TSY-000008
TR-TSY-000057
TR-TSY-000253
TR-TSY-000303
TR-TSY-000496
TR-TSY-000909

OPTICAL INTERFACE

Fiber	Single-Mode
Connectors	FC/PC, or Customer-Specified
Wavelength	1310 ± 30nm
Format	SONET

DS1 INTERFACE

DSX-1	Up to 56 DS1 positions available per channel bank
Line Code	B8ZS, 2CS
Framing Formats	SF (D4, SLC-96), ESF
Alarm Monitoring	RCV frame slips, AIS, ESF, CRC, Yellow, BPVs

T1 INTERFACE

T1 SPAN	Up to 56 T1 positions available per channel bank
Line Code	B8ZS
Framing Formats	SF (D4, SLC-96), ESF
Alarm Monitoring	RCV frame slips, AIS, ESF, CRC, Yellow, BOVs
Line Powering of Span Voltage	-130 Vdc
Current	60 mA
Line Build Out (XMT)	7.5, 15, 22.5 dB @ 772 kHz
Line Build Out (RCV)	ALBO

POTS

Capacity	Up to 224 lines per channel bank 4 lines per POTS Card
Loop Resistance	1930 ohms (including set)

COIN

Capacity	Up to 224 lines per channel bank 4 lines per Coin Card
Loop Resistance	1730 ohms (including telephone set) Dial Tone First/Coin First

UVG (UNIVERSAL 2-WIRE)

Capacity	Up to 224 lines per channel bank 4 lines per UVG Card
Loop Design	Carrier Serving Area Rules Loop Start/Ground Start Loop Reverse Battery

EQUALIZED UNIVERSAL VOICE GRADE (EUVG)

Characteristic	Impedance	Min. (dB)	Max. (dB)
XMIT TLP	600Ω	-9.0	+1.0
	900Ω	-9.0	+1.0
RCV TLP	600Ω	-6.0	+6.0
	900Ω	-6.0	+6.0

UNIVERSAL 4-WIRE (U4W)

4-Wire Impedance	Provisionable for 150, 600 or 1200 ohms
Programmable Gain	0.1 dB steps over a 24.5 dB range
Signaling Mode	FXS, FXO, DX

4-Wire E & M (EM4)

Signaling Modes	E&M modes I to V Tandem modes I and II PLR (Pulse Link Repeater) Modes I and II
4-Wire Impedance	600 ohms
Provisionable Gain	0.1dB steps over a 24.5 dB range
Signaling Leads	E, M, SG, SB

OFFICE CHANNEL UNIT DATA PORT (OCUDP)

Data Rates	2.4, 4.8, 9.6, 19.2, 56 or 64 kbps
Loopback Types	OCU, CSU, DSU, and customer-controlled far-end loopback
Provisioning Options	Secondary channel, customer data error correction

DSO DATA PORT (DS0DP)

Primary Channel Rates	Secondary Channel Rates
2400	133.3
4800	266.6
9600	533.3
19200	1066.6
56000	2666.6
64000	Sec. Chan. Not Available

BASIC RATE INTERFACE UNIT (BRIU)

Data Formats	2B+D, B1+D, B2+D, or D only
DSL Data formats	2B1Q
Bit Error Rate	$<10^{-8}$ for loops 0 and 2-15 with all impairments

ASYNCHRONOUS DS1U (ADS1U)

Framing Formats	N/A (transparent)
Line Coding	AMI
Zero Suppression	B8ZS
Equalization	1 to 655 feet (distance from cross-connect), 5 steps

ASYNCHRONOUS T1U (AT1U)

Framing Formats	N/A (transparent)
Line Coding	AMI
Zero Suppression	B8ZS
Equalization	
Receive	Automatic Line Build-Out (ALBO)
Transmit	0 dB, 7.5 dB, 15 dB, 22.5 dB

ELECTRONIC BUSINESS SET (EBS) (P-PHONE) Ω

Maximum Loop Length For Powered Phones (38 mA max.)	500Ω DC loop resistance or <20 dB @ 8 kHz at the network interface
Maximum Loop Length For Locally Powered Phones (20 mA max.)	500 Ω DC loop resistance or <20 dB @ 8 kHz at the network interface
Battery:	
Loop Powered – Display	38 mA max. per line
Loop Powered – No Display	20 mA max. per line
Locally Powered	20 mA max. per line
Loop Current Detection Threshold	Must detect > 4.5 mA Must not detect < 1.7 mA
Loop Current, 52.0 Ω Volt Battery:	38 mA max. into Telset

DSC™
COMMUNICATIONS

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Rebuttal Exhibit JCD-1

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