BELLSOUTH TELECOMMUNICATIONS, INC.

DIRECT TESTIMONY OF ROBERT C. SCHEYE

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 960916-TP

SEPTEMBER 9, 1996

Q. PLEASE STATE YOUR NAME, ADDRESS AND POSITION WITH BELLSOUTH TELECOMMUNICATIONS, INC. (HEREINAFTER REFERRED TO AS "BELLSOUTH" OR "THE COMPANY").

A. My name is Robert C. Scheye and I am employed by BellSouth as a Senior Director in Strategic Management. My business address is 675 West Peachtree Street, Atlanta, Georgia 30375.

Q. PLEASE GIVE A BRIEF DESCRIPTION OF YOUR BACKGROUND AND EXPERIENCE.

A. I began my telecommunications company career in 1967 with the Chesapeake and Potomac Telephone Company (C&P) after graduating from Loyola College with a Bachelor of Science in Economics. After several regulatory positions in C&P, I went to AT&T in 1979, where I was responsible for the Federal Communications Commission ("FCC") Docket dealing with competition in the long distance market. In 1982, with the announcement of divestiture, our organization became responsible for implementing the Modification of Final Judgment (MFJ) requirements related to nondiscriminatory access charges. In 1984, our organization became part of the divested regional companies' staff organization which became known as Bell Communications Research. I joined BellSouth in 1987 as a Division Manager responsible for jurisdictional separations and other FCC related matters. In 1993, I moved to the BellSouth Strategic Management organization where I have been responsible for various issues including local exchange interconnection, unbundling and resale.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. In this testimony, I clarify BellSouth's positions relative to the following three items identified by ACSI in its Petition for Arbitration dated August 13, 1996: 1) prices for unbundled loops; 2) price of the loop cross-connect and, 3) price for loop channelization. I also provide information to support BellSouth's positions relative to these items.

Q. WHAT IS THE CURRENT STATUS OF NEGOTIATIONS WITH ACSI?

A. BellSouth and ACSI successfully negotiated the terms of an interconnection agreement which was signed by both parties on July 25, 1996. The agreement has since been filed with the Florida Public Service Commission ("FPSC" or "Commission") on August 20, 1996. The rates, terms and conditions of interconnection of networks established in the agreement allow ACSI and BellSouth to connect their networks for the exchange of local traffic.

Beyond those items in the agreement, ACSI believes the Commission must decide certain issues related to the price of unbundled loops, a loop cross-connect and loop channelization.

Prices For Unbundled Loops

Q. WHAT ARE THE UNBUNDLED LOOPS ACSI HAS REQUESTED?

A. ACSI has requested that BellSouth provide the following unbundled loops: 2-wire analog, 4-wire analog, 2-wire ISDN, 2-wire Asymmetrical Digital Subscriber Line (ADSL), 2-wire High-bit-rate Digital Subscriber Line (HDSL) and 4-wire HDSL loops. BellSouth is prepared to offer all of these loop types to ACSI at appropriate cost-based prices. BellSouth submitted both long run incremental cost (LRIC) studies for the analog and ISDN loop types on May 28, 1996 and subsequently updated those studies and presented them to the Commission on August 12, 1996. Regarding the ADSL and HDSL loops, once the rate structure is established and the technical specifications of the loops are finalized, cost studies will be conducted and rates will be proposed.

Q. ACSI HAS ALSO INCLUDED INTEGRATED DIGITAL LOOP CARRIER (IDLC) IN ITS EXHIBIT "H" ATTACHED TO ITS PETITION. WHAT IS YOUR UNDERSTANDING OF ACSI'S REQUEST FOR A LOOP WITH IDLC?

A. The requested network element is a complete contiguous loop from the

BellSouth Central Office to the end-user premises, where that loop is provided via IDLC. BellSouth generally has two methods of providing loops: (1) copper loops and (2) loops served by digital loop carrier. BellSouth uses two types of digital loop carrier, universal and integrated. IDLC facilities contain loop feeder interfaces that terminate directly to the digital switch at the DS1 level without the requirement for a central office terminal or other demultiplexing equipment.

Q. WILL BELLSOUTH PROVIDE THE REQUESTED UNBUNDLED NETWORK ELEMENT?

A. BellSouth cannot provide an unbundled loop through integrated facilities in all cases because:

1. Loops served by IDLC do not have an analog (copper) appearance in the central office and therefore cannot be provided to an ALEC. The multiplexed loops are attached directly to the switch without digital to analog conversion.

2. Integrated facilities were designed not to have a copper appearance in the central office and thereby eliminate costly electronics associated with carrier systems. The switch handles the concentration/channelization of the carrier system. Use of integrated facilities results in considerable savings.

3. Converting an integrated DLC system to a universal DLC system (non-integrated) would cause economic penalties in provisioning the switch. Considerable labor is required to convert an integrated carrier system to a non-integrated carrier system.

4. If BellSouth were to be forced to provide loops through integrated systems, the use of integrated systems will decrease causing the cost of providing service to BellSouth's customers to increase.

Q. WHAT ALTERNATIVES CAN BELLSOUTH OFFER FOR THIS FUNCTIONALITY?

A. BellSouth has identified two alternatives for providing access to those loops served by IDLC. The following describes those alternatives:

Alternative 1: Reassign the loop from an integrated carrier system and use a physical copper pair. This is a technically feasible alternative in cases where sufficient physical copper pair facilities are available. If sufficient physical copper pairs are available, BellSouth will "roll" the unbundled loop to a physical copper pair. Available facilities are those that are generally available for use rather than those specifically placed there for other reasons. Such cases could include but are not limited to the following: Unloaded pairs in a loaded area reserved for digital services, or limited physical pairs placed in a Carrier Serving Area (CSA) for services that cannot be integrated.

Alternative 2: In the case of Next Generation Digital Loop Carrier (NGDLC) systems, "groom" the integrated loops to form a virtual Remote Terminal (RT) set up for universal service. In this context, "groom" means to assign certain loops (in the input stage of the NGDLC) in such a way that discrete combinations of multiplexed loops may be assigned to transmission facilities (in the output stage of the NGDLC).

This is a technically feasible alternative in cases where NGDLC facilities are available. Both of the NGDLC systems currently approved for use in the BellSouth network have "grooming" capabilities. However, the availability of this option is limited. Given that NGDLC is still a relatively new technical capability, currently there is an insufficient amount of NGDLC in the BellSouth network to meet ACSI's total demand. Availability will be limited due to the fact that the universal portion of a NGDLC system is sized only for those special service circuits that cannot be integrated that were forecast for a given site. This option is available only where fully approved NGDLC systems are operating. As in the case of Alternative 1 described above, available facilities are those that are generally spare and available for use rather than those specifically placed there to meet other specific needs.

Q. WITH RESPECT TO THE UNBUNDLED LOOPS ACSI HAS REQUESTED, WHAT DOES BELLSOUTH PROPOSE AS THE APPROPRIATE UNBUNDLED LOOP?

A. BellSouth proposes the currently tariffed special access line as the appropriate unbundled loop. Unbundled loop facilities do not terminate at the BellSouth switch. Rather, they are provisioned and maintained in a manner that is more analogous to a Special Access dedicated line than to a regular switched exchange line. As far as BellSouth's network is concerned, these are non-switched facilities. In addition, companies such as ACSI have indicated the desire for a detailed record of each circuit used as an unbundled loop. Currently, this record, known as a Design Layout Record (DLR) can only be provided when the loop is provisioned as a special access line and handled through the Carrier Access Billing System (CABS).

Further, special access or private line facilities such as a 2-wire analog line are used for a variety of purposes, e.g., voice, data and alarm service. While the use of the facility can vary, the actual cost and resulting price would not necessarily vary. This flexibility makes the special access line the appropriate candidate for an unbundled loop.

Q. HAS ACSI CORRECTLY CHARACTERIZED BELLSOUTH'S POSITION REGARDING PRICING OF THE UNBUNDLED LOOP?

A. No. In its Petition at page seven, ACSI states that "BellSouth's position during the negotiations was that negotiated rates need not be cost-based." This statement is not at all correct. It has been and continues to be BellSouth's position that its proposed loop rates are cost-based and meet the pricing standards of the Telecommunications Act of 1996 (the "Act"). What appears to be in dispute is exactly what one means by cost-based. BellSouth derives its definition of cost-based interconnection and network elements directly from Section 252(d)(1) of the Act dealing with the pricing standards for interconnection and network elements which states that the rates shall be just and reasonable and:

> "(A) shall be --
>
> "(i) based on the cost (determined without reference to a rate-of-return or other rate-based proceeding) of providing the interconnection or network element (whichever is applicable), and
>
> "(ii)nondiscriminatory, and
>
> ("B) may include a reasonable profit."

BellSouth's proposed rates cover incremental costs, provide a minimal contribution to shared and common costs, and are nondiscriminatory. These same rates are available to other providers who request these unbundled elements.

Q. WHAT PRICES DOES BELLSOUTH PROPOSE FOR ITS UNBUNDLED LOOPS?

A. BellSouth proposes the rates listed below for the 2-wire and 4-wire analog and 2-wire ISDN unbundled loops requested by ACSI. As stated, the ADSL and HDSL specifications have not yet been fully determined, therefore, cost studies and prices for these unbundled loops are not yet available.

Loop	Recurring Price	Nonrecurring Price
2-wire analog voice grade loop	$17.00 per mo.	$140.00 (1st) 45.00 (add'l)
4-wire analog voice grade loop	$31.90 per mo.	$140.00 (1st) 45.00 (add'l)
2-wire ISDN digital grade loop	$43.00 per mo.	$360.00 (1st) 325.00 (add'l)

Q. WHY ARE BELLSOUTH'S PROPOSED RATES APPROPRIATE?

A. BellSouth proposed the tariffed special access line rates for the 2-wire voice grade analog loop in the unbundling Docket No. 950984-TP. The Commission established the recurring rate for this unbundled loop at $17.00. Therefore, BellSouth has proposed and offered this $17.00 rate to ACSI. This rate covers the incremental cost of providing the 2-wire voice grade analog loop, as well as some contribution to shared and common costs. This rate is below the special access rate and has been negotiated and agreed to by such local competitors as Intermedia Communications, Inc., and Teleport Communications Group.

BellSouth proposes using the existing tariffed recurring special access rates for the unbundled 4-wire voice grade analog loop. BellSouth filed cost studies for these unbundled loops on May 28, 1996 and filed updated cost studies on August 12, 1996. The proposed rates cover the cost of the loops and provide a minimal amount of contribution to shared and common costs.

BellSouth does not currently offer a service comparable to the requested unbundled 2-wire ISDN loop. BellSouth provided a cost study for the 2-wire ISDN loop at the same time it provided studies for the 2-wire and 4-wire analog loops. The proposed rate covers the cost of this service and provides some contribution to shared and common costs.

Q. YOU HAVE STATED THAT BELLSOUTH'S PROPOSED PRICES MEET THE STANDARDS OF THE ACT. DO BELLSOUTH'S PROPOSED PRICES ALSO MEET THE STANDARDS OF THE FLORIDA STATUTES?

A. Yes. The above proposed prices cover direct costs as required by Florida Statute 364.051(6)(c). The statute requires that services offered to consumers cover their direct costs. To the extent that such rates must cover costs for services offered to consumers, the same standard should be applied to unbundled network elements which will eventually be sold to consumers. Further, Florida Statute 364.161(1) states that local exchange companies are not required to offer unbundled services, network features, functions or capabilities or unbundled loops at prices that are below cost.

Q. WHAT IS BELLSOUTH'S POSITION REGARDING THE LOOP PRICES PROPOSED BY ACSI IN EXHIBIT "H" ATTACHED TO ITS PETITION?

A. First, ACSI proposes interim rates using the Hatfield Model as the basis for establishing the total element long run incremental cost (TELRIC) for an unbundled loop. TELRIC, a concept introduced in the FCC's August 8, 1996 Order, will be discussed later in this testimony. The Hatfield Model is not an appropriate model even as a surrogate for TELRIC or any other type of actual cost methodology. Attached to my testimony as Exhibit RCS-1 are BellSouth's Comments in FCC Docket No. 96-45 which provide an analysis of the Hatfield Model and the Benchmark Cost Model and demonstrate that neither model is appropriate as a surrogate for actual unbundled loop costs. In addition, BellSouth witness Dr. Richard Emmerson discusses these cost models in his testimony filed in this proceeding.

Second, ACSI fails to recognize variances in the costs and the resulting prices of different kinds of loops. ACSI proposes to price 2-wire and 4-wire analog, ISDN, ADSL and HDSL loops at the same rate, an unbelievable $9.11 per loop. BellSouth's cost studies, however, for such elements as the 2-wire and 4-wire analog loops, show that costs vary depending on the type of loop provisioned. The prices resulting from these cost studies also reflect these differences. What is particularly surprising about ACSI's position is that Mr. Robertson's testimony strongly demonstrates that these loops are different. Mr. Robertson explains that ACSI requires the 4-wire analog, 2-wire ISDN, ADSL and HDSL compatible loops because they meet the needs of more sophisticated end users that require advanced technology. These loops are indeed more sophisticated and require more involved provisioning than a standard 2-wire voice grade analog loop. Their costs and prices, therefore, reflect these differences.

Third, ACSI proposes deaveraged pricing of unbundled loops. This has very serious implications that are well beyond the scope of this proceeding. It is inconsistent with the existing pricing practices for retail rates for local exchange service established by this Commission. The present rate structure in Florida incorporates long standing policies of intentionally pricing some services markedly above incremental costs in order to price other services at or below cost. Further, basic local exchange rates have been based on statewide average rates according to the number of lines in a particular exchange -- the greater the number of lines in an exchange, the higher the price. As a result of these two policies, Florida currently has some of the lowest residential rates in the nation, around $9 per month.

Unbundled loops are the primary component of basic local exchange service. Pricing these loops based on density and usage would be contrary to the pricing practices for basic local exchange service. While BellSouth believes that rate rebalancing and economic pricing should be implemented for all services in the long run, the Commission should not require such pricing of unbundled loops until such time as the Commission provides for the pricing of retail services in the same manner.

Finally, since ACSI did not dispute the charges proposed by BellSouth as outlined in ACSI's Exhibit "I" relating to fixed and mileage sensitive interoffice channel charges, BellSouth assumes that ACSI accepts these charges as proposed.

Q. ON AUGUST 8, 1996, THE FCC RELEASED ITS FIRST REPORT AND ORDER IN DOCKET NO. 96-98. WHAT IS BELLSOUTH'S POSITION ON THE ORDER AS IT RELATES TO THE ISSUES IN THIS CASE?

BellSouth strongly disagrees with specific aspects of the FCC's Order. In fact, BellSouth filed its Notice of Appeal with the Court on September 6, 1996. It is BellSouth's expectation that soon several other interested parties will either file court appeals or Petitions for Reconsideration with the FCC. BellSouth understands that GTE and Southern New England Telephone filed for a stay of the Order on August, 28, 1996, and the National Association of Regulatory Utility Commissioners (NARUC) filed its appeal with the Court also on August 28, 1996.

Specifically, BellSouth disagrees with the FCC's proposed pricing requirement that unbundled elements be priced equal to TELRIC. Rather, prices should reflect costs, contribution to joint and common costs, plus a reasonable profit. Assuming that the FCC's decision is upheld and implemented, however, its methodology allows for the recovery of joint and common costs plus other changes in methodology which would increase, not decrease, the level of cost as compared to a LRIC or total service long run incremental cost (TSLRIC) study. The Company has conducted and filed with this Commission multiple LRIC and TSLRIC studies for unbundled elements requested by local providers. As Ms. Caldwell states in her testimony, BellSouth is currently developing the methodology to support a TELRIC study.

For illustrative purposes only, BellSouth has prepared under proprietary protection a comparison of its LRIC results, hypothetical TELRIC results reflecting joint and common costs, BellSouth's prices for unbundled loops and loop channelization, and ACSI's proposed prices for unbundled loops. This comparison is attached as Exhibit No. RCS-2. The point of this comparison is to illustrate that a TELRIC study would yield higher costs than a TSLRIC/LRIC study and that BellSouth's proposed prices are reasonable and may not be high enough based on this comparison. In contrast, ACSI's proposed prices do not even cover LRIC, much less the increased level of a TELRIC study. BellSouth's proposed prices cover LRIC plus a contribution to joint and common costs. These prices reflect a more reasonable level than ACSI's proposed interim prices. Therefore, BellSouth recommends the Commission set interim rates based on the previously submitted LRIC/TSLRIC studies and subsequently amend those rates for any changes that result from TELRIC studies when completed.

Q. HOW DO BELLSOUTH'S PROPOSED PRICES COMPARE TO THE FCC'S PROXY LEVEL PRICES?

A. BellSouth's proposed prices are reasonable because they are based on the actual costs of providing service in Florida. The FCC's proxy level of an average rate of $13.68 for an unbundled loop in Florida is unreasonable because there is no relationship between the proxy rate and the actual cost of providing the unbundled loop in Florida. This proxy rate is lower than the LRIC results that the Commission used to determine its $17.00 price for the two-wire local loop. Again, assuming logically that the addition of joint and common costs recommended by the FCC for a TELRIC study would increase rather than decrease the level of costs, BellSouth's proposed rates and LRIC studies provide a much more reasonable approximation of costs than do the FCC's proposed proxy rates or ACSI's proposed rates. Therefore, BellSouth recommends that the Commission adopt its proposed prices. BellSouth, however, is investigating a method by which rates could be deaveraged should the FCC's Order stand as written. In this case, the situation involving the current social pricing concept for basic local exchange service discussed earlier <u>must</u> be addressed.

Q. PLEASE RESPOND TO ACSI'S SUGGESTION THAT AN APPROPRIATE MARK-UP TO RECOVER JOINT AND COMMON COSTS SHOULD BE THE SAME AS LEC COMPETITIVE SERVICES SUCH AS CENTREX.

A. ACSI seems to be confusing two distinct concepts. The FCC has developed a cost formula consisting of incremental costs plus a share of joint and common costs to be used to price services that the FCC perceives are <u>not</u> competitive. If a service is competitive, then market pricing is appropriate. Therefore, ACSI is attempting to apply a market-based pricing formula for competitive services to services that the FCC has indicated are not competitive. BellSouth does not believe it is appropriate to mix these concepts, and therefore, does not agree that the pricing methodology used for services such as Centrex should apply to elements such as the unbundled loop.

Q. MR. ROBERTSON, ON PAGE 18 OF HIS TESTIMONY, INDICATES THAT BELLSOUTH'S PROPOSED NONRECURRING RATES FOR UNBUNDLED LOOPS ARE EXCESSIVE. IN YOUR OPINION, ARE BELLSOUTH'S NONRECURRING CHARGES FOR UNBUNDLED LOOPS APPROPRIATE?

A. Yes. The nonrecurring rates for each unbundled loop are based on the cost to provision and install that particular loop. The nonrecurring rates BellSouth charges are only slightly above the cost to initiate the service. The cost studies attached to Ms. Caldwell's testimony demonstrate that nonrecurring prices are reasonable based on the Company's actually incurred costs.

Price For Loop Cross-Connect

Q. IN ITS PETITION (PAGE 4) AND ITS EXHIBIT "H", ACSI MENTIONS THE LOOP CROSS-CONNECT AND SUGGESTS IT SHOULD BE PRICED AT TELRIC. WHAT IS BELLSOUTH'S POSITION ON THE PROVISION AND PRICE OF THE LOOP CROSS-CONNECT?

A. Typically, an end user's line is connected to a BellSouth central office switch. In a competitive environment, however, the loop cross-connect will be used to link the unbundled loop once it enters the central office with the new entrant's collocated space. BellSouth agrees that a loop cross-connect is a necessary element in order to properly hand-off an unbundled loop to a new entrant. Because this is a new unbundled element, cost studies and associated prices are not yet available. BellSouth intends to produce an incremental cost study that reflects an appropriate share of joint and common costs. A reasonable profit may be added to the resulting cost in order to set an appropriate price.

Loop Channelization

Q. WHAT IS BELLSOUTH'S POSITION REGARDING LOOP CHANNELIZATION?

A. BellSouth is uncertain as to ACSI's request for channelization. If ACSI is proposing that the loop channelization that occurs in the Remote Terminal be included in the loop rate, BellSouth agrees. If, however, ACSI is proposing that any channelization (also referred to as multiplexing or concentration) that occurs in the central office, in the hand-off of unbundled loops to ACSI be included in the loop rate, BellSouth absolutely disagrees with such a proposal.

Loop channelization in the central office is not a function that BellSouth provides today within its central offices. It represents a new capability that BellSouth would be required to purchase solely for the use of ACSI. It is this function of channelization that ACSI appears to expect BellSouth to provide at no additional cost to ACSI. There are, however, substantial costs for providing such a service and those costs are reflected in the rates ACSI has correctly included in its Exhibit "I". Those rates are $555.00 per month and $490.00 for system installation, and $1.70 per month per circuit with installation on each circuit of $7.00. Should ACSI find BellSouth's rates for loop channelization unacceptable, ACSI could purchase and install its own channelization equipment within its collocated space to provide the desired function.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. ACSI has requested that the Commission arbitrate the prices for unbundled loops, the price of an unbundled loop cross-connect and the price of loop channelization. BellSouth believes that special access lines are the appropriate facilities to provide the unbundled analog loops requested by ACSI. BellSouth also believes its proposed rates for the 2-wire analog, 4-wire analog and 2-wire ISDN loops are reasonable, are cost-based and meet the pricing requirements of the Act. Once TELRIC studies are complete, they should reflect a higher cost than BellSouth's LRIC study results. Further, BellSouth disagrees with the pricing methodology and proxy rates put forth by the FCC in its recent Order and disagrees with ACSI's proposed interim rates. BellSouth requests the Commission approve, instead, its proposed rates on an interim basis until TELRIC studies are available.

BellSouth is developing a cost study for the loop cross-connect element and will propose a rate upon completion of the study. Finally, BellSouth requests the Commission approve its rates for loop channelization as proposed.

Q. DOES THIS COMPLETE YOUR TESTIMONY?

A. Yes.

BellSouth Telecommunications, Inc.
FPSC Docket No. 960916-TP
Exhibit No. RCS - 1

BELLSOUTH'S COMMENTS IN FCC DOCKET 96-45

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of

Federal-State Joint Board on Universal Service

CC Docket No. 96-45

FURTHER COMMENTS

BellSouth Corporation and BellSouth Telecommunications, Inc. ("BellSouth") in response to the Public Notice (DA 96-1094), released July 10, 1996, hereby submit further comments on the cost models filed in CC Docket No. 96-45.

I. INTRODUCTION

As pointed out in the Public Notice, two cost models were submitted with the initial round of comments in this proceeding, the Cost Proxy Model ("CPM") and the Benchmark Cost Model ("BCM"). Subsequently, the BCM model has been revised and the new version, Benchmark Cost Model 2 ("BCM2") has been filed with the Commission. In addition to the CPM model and the two BCM models, a model developed by Hatfield Associates, Inc. ("Hatfield Model") has been filed for consideration by the Federal-State Joint Board in formulating recommendations on Universal Service. In issuing the public notice, the Common Carrier Bureau invites interested parties to comment on these models. While BellSouth discusses each of these models below, at the outset it should be reiterated that in determining universal service support, embedded costs of the incumbent local exchange carrier should be used. Such costs reflect the costs of the network that is in place and used to provide universal service. In contrast, the cost models are proxies for the actual costs local exchange carriers incur in providing universal service and yield costs that are theoretical in nature and that are based on a hypothetical network.[1]

If the Joint Board were to recommend the use of a proxy model, it should follow the guidelines outlined in BellSouth's August 2, 1996, comments in this proceeding. The essential corollary to implementing a proxy cost model is that it be accomplished in a revenue neutral manner. Keeping this principle in mind, some models are better than others. These comments identify the relative strengths and weaknesses of the four cost proxy models.

II. DISCUSSION

A. BCM

The purpose of the original BCM was to provide a model that would identify areas that were, in comparison to other areas, relatively high cost to serve.[2] The BCM was never intended to estimate the actual costs of providing universal service. Apart from its limited purpose, BellSouth has pointed out to the Commission the flaws in the BCM that

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[1] On July 8, 1996, in connection with CC Docket 96-98, BellSouth submitted a paper prepared by Strategic Policy Research that included a description of a top-down approach to cost estimation. An important characteristic of the top-down approach is that it reflects network costs as they actually exist. See John Haring, Calvin S. Monson and Jeffrey H. Rohlfs, "Comments on FCC's Industry Demand and Supply Simulation Model," attached to BellSouth's Comments, CC docket 96-98, July 8, 1996.

[2] See e.g., Joint Submission by MCI Telecommunications Corporation, NYNEX Corporation, Sprint Corporation, and US West, Inc., in CC Docket 80-286, September 12, 1995 at 3.

diminish the model's usefulness even for the limited purpose of identifying areas whose costs are high in a relative sense.[3] The flaws in the BCM include:

1. The model's results are biased toward very sparsely populated areas. It estimates very high costs in areas such as National Parks, mountainous areas, deserts and other lightly populated areas.[4] This result is due to the model's assumption that all households are evenly distributed throughout the census block group in which they are contained. The fact, however, is that households in these areas tend to be clustered in relatively small parts of the census block group.

2. The model fails to include drop wire and terminal expenses resulting in a tendency in the model to underestimate the cost of local exchange service.

3. The BCM uses census block groups as the area within which it calculates local exchange costs. Local exchange networks, however, were constructed and, hence, costs incurred, on a wire center basis. There is no relationship between wire centers and census block groups. Often a census block group will contain areas from several different wire centers.

4. The BCM assigns a census block group to the wire center closest to the centroid of the census block group. This approach results in many census block groups being assigned to the wrong wire center. For example, BCM assigns approximately 16-20% of the census block groups to the wrong wire center in BellSouth states.

5. The BCM did not include business lines in sizing plant.

B. **BCM2**

BCM2 was developed in response to the criticisms of the original BCM. Overall the modifications reflected in BCM2 improve the model considerably and bring the proxy costs for each state more in line with each states actual costs. Nationwide, the net effect of the modifications was an average increase in cost of $6.94 per line, per month. In

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[3] See, Comments of BellSouth Telecommunications Inc., CC Docket No. 80-286, filed October 10, 1995.

[4] On the other hand, the model tends to produce costs that are lower than actual book costs in urban, suburban and even some rural areas.

addition, these modifications changed the relative cost relationships between urban and sparsely populated areas and between regions of the country.[5]

The principle modifications reflected in BCM2 are:

1. BCM2 makes an adjustment in determining the location of households in sparsely populated areas (less than 20 households per square mile). It assumes that inhabitants live within 500 feet of established roads instead of assuming that households are evenly distributed throughout the area. Because density is a key cost driver, BCM2 reduces the cost estimate of sparsely populated areas and brings the estimated cost more in line with actual costs.

2. BCM2 includes dropwire and terminal investment, which averages approximately $200 per access line, that was mistakenly excluded from the original BCM model.

3. BCM2 estimates expenses with greater granularity. The original BCM estimated annual costs by applying a single factor to investment. Such an approach incorrectly assumes that all expenses are a function of investment. It misses the fact that some expenses are incurred on a per line basis. BCM2 takes into account the relationship between lines and expenses. In addition, it employs three annual cost factors: (1) a cable and wire factor; (2) a circuit equipment factor; and (3) a switching equipment factor.

4. BCM2 takes into account economies of scale that arise from providing business lines in a given area and thereby improves the model's estimating quality.

C. CPM

To assist the Joint Board in its evaluation of the CPM model, BellSouth estimated results for Georgia and Florida based on the CPM methodology.[6] In order to estimate results for Georgia and Florida, the investment and engineering data resident within the

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[5] These changes are shown on Map 1 contained in Attachment 1.

[6] Specifically, BellSouth contracted with INDETEC to perform the calculations. INDETEC is the consulting firm that assisted Pacific Bell with the development of CPM.

model was used in conjunction with mapping and terrain data that are specific to Georgia and Florida. This analysis produced the following results:

STATE	BELLSOUTH AVERAGE COST	STATEWIDE AVERAGE COST
FLA	$29.69	$31.45
GA	$32.03	$36.23

There are several positive features associated with the CPM model that are not found in the BCM2 model. The first is that CPM uses grid cells as its geographic area. A grid cell, which is about a 3000 by 3000 foot square, represents a uniform and relatively small geographic area. This reduces the magnitude of the problem of a grid cell crossing wire center boundaries. Further, a grid cell can be assigned to the wire center that actually serves the centroid of the grid cell rather than having to assign the geographic area to the nearest wire center as is the case for BCM2. Lastly, grid cells lend themselves to considerable cost disaggregation.

BellSouth has also compared the results of the CPM and BCM2 models for Florida. While generally, the CPM model produces higher results (See Attachment 2),[7] when the two models are compared on a wire center basis, there is a similarity between the two models (See Attachment 1, Map 2). For approximately 77 percent of BellSouth's wire centers in Florida, the CPM and BCM2 models produce results that are within 15 percent of each other.[8] The comparability of the results between the two models is an

[7] Attachment 2 also shows the results of the original BCM, Hatfield model and BellSouth's embedded cost approach for Florida and Georgia.

[8] For approximately 95 percent of the wire centers, the CPM and BCM2 results are within 30 percent of each other.

encouraging factor, particularly in urban wire centers that have a relatively high percentage of access lines.

D. **Hatfield Model**

Despite its continuous revisions, the Hatfield model still suffers from numerous deficiencies. Attachment 3 is a paper prepared by Dr. William Taylor and Dr. Aniruddha Banerjee that discusses these deficiencies from an economic perspective.

Because the Hatfield model is in a state of constant change and that many of the algorithms have not been disclosed, it is difficult to fully evaluate and analyze the model. BellSouth has compared the 1994 study with the 1996 study. As shown on Attachment 4, the 1996 study produces lower local service costs than the 1994 study for every population density range.[9] The cost reductions are the most dramatic in densely populated zones. For the zone of 1000-5000 people per square kilometer, the cost decreased from $14.19 in 1994 to $9.16 in 1996. This represents a 35 percent change in two years. For the zone of greater than 5000 people per square kilometer, the 1996 model produces a cost result that is 55 percent lower.[10] It would appear that the revisions to the Hatfield model are result driven and the model can be adjusted to produce whatever cost answer its sponsors desire.

[9] Both the 1994 and 1996 studies employed the same six density ranges.

[10] In 1994, the cost produced by the Hatfield model was $18.32, in 1996, the cost decreased to $8.26.

III. CONCLUSION

BellSouth continues to believe that universal service support should be based on book costs. In the event, however, the Joint Board were to recommend the use of a proxy model, then it should select a model that is sound from engineering and economic perspectives. In this regard, both the BCM2 and CPM models are superior to the original BCM model or the Hatfield model. BellSouth believes the best aspects of the BCM2 model and the CPM model can be merged into a single model and is participating with an industry group to achieve such a result.

No model will be perfect. Accordingly, it is imperative that if a proxy approach is used, it must be implemented in a revenue neutral manner. Local exchange carriers must be afforded the opportunity to recover their actual costs. A proxy model approach cannot be used to substitute the model's results for a carrier's actual costs, nor can they be used to arbitrarily reduce rates beyond the support received through the new universal service fund.

Respectfully submitted,

BELLSOUTH CORPORATION and
BELLSOUTH TELECOMMUNICATIONS, INC.

Their Attorneys

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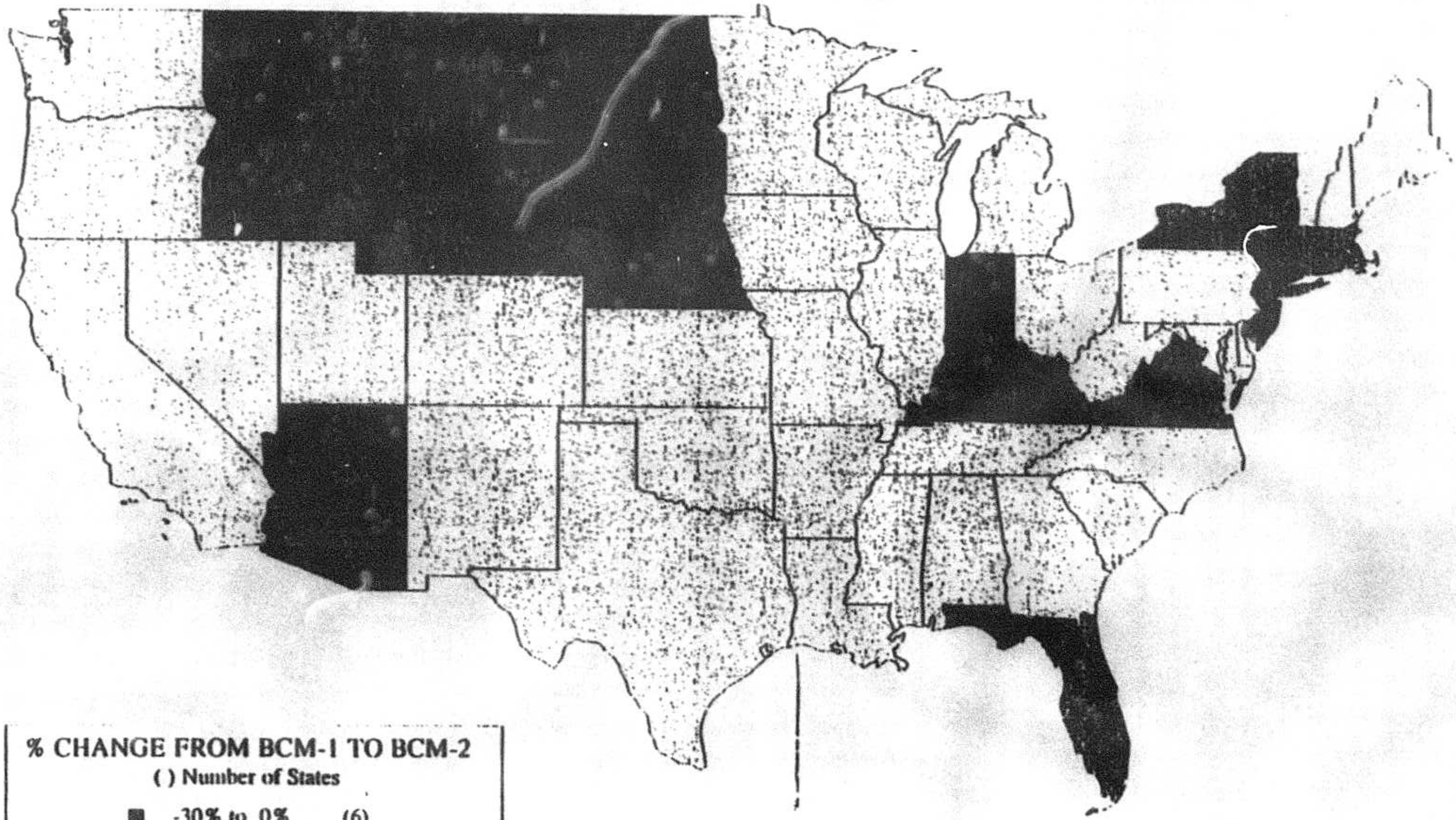
DATE: August 9, 1996

ATTACHMENT 1

State Comparison of Change From BCM-1 (ACF#1) to BCM-2

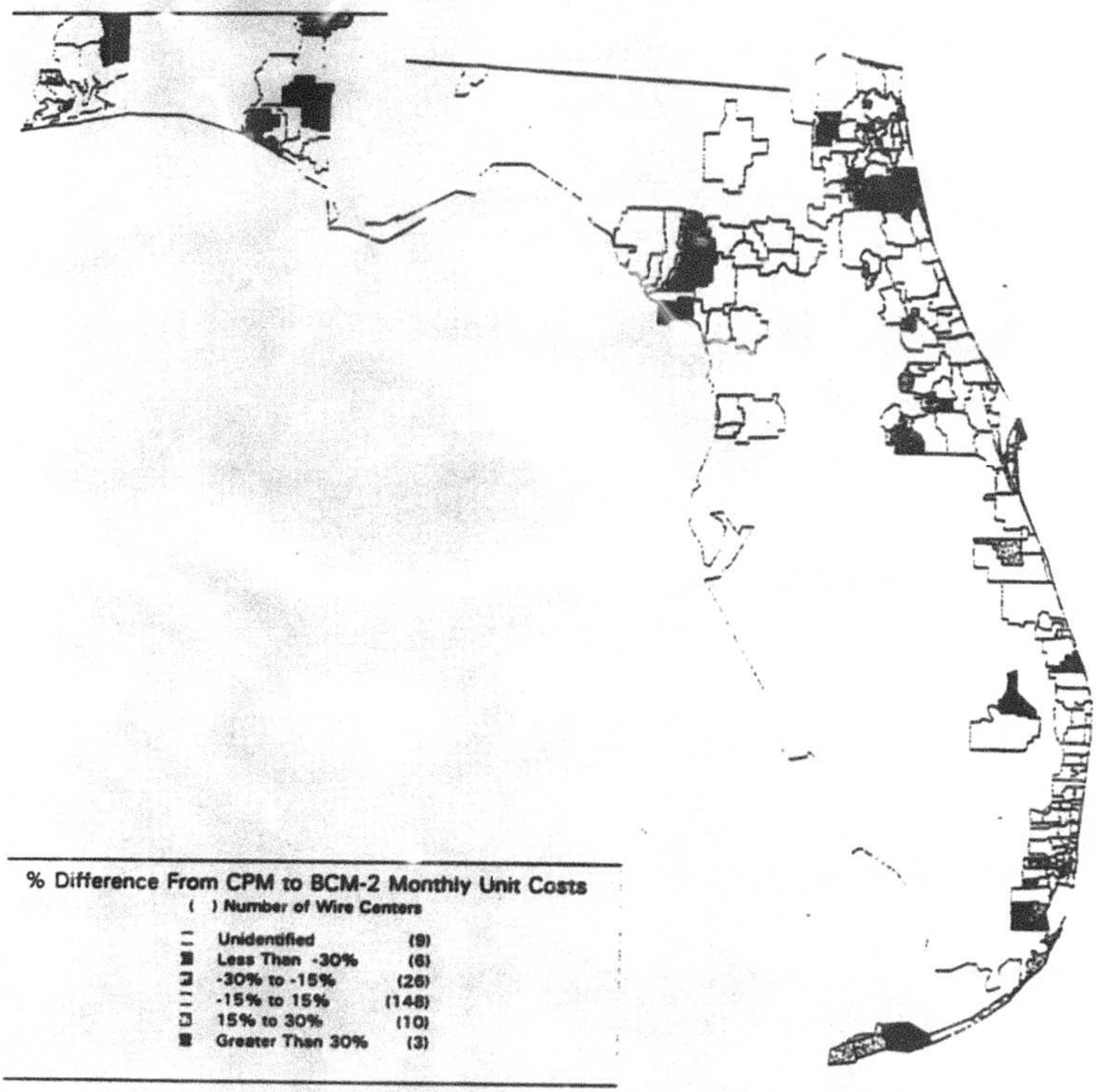


% CHANGE FROM BCM-1 TO BCM-2
( ) Number of States

- -30% to 0% (6)
- 0% to 30% (32)
- 30% or Greater (11)

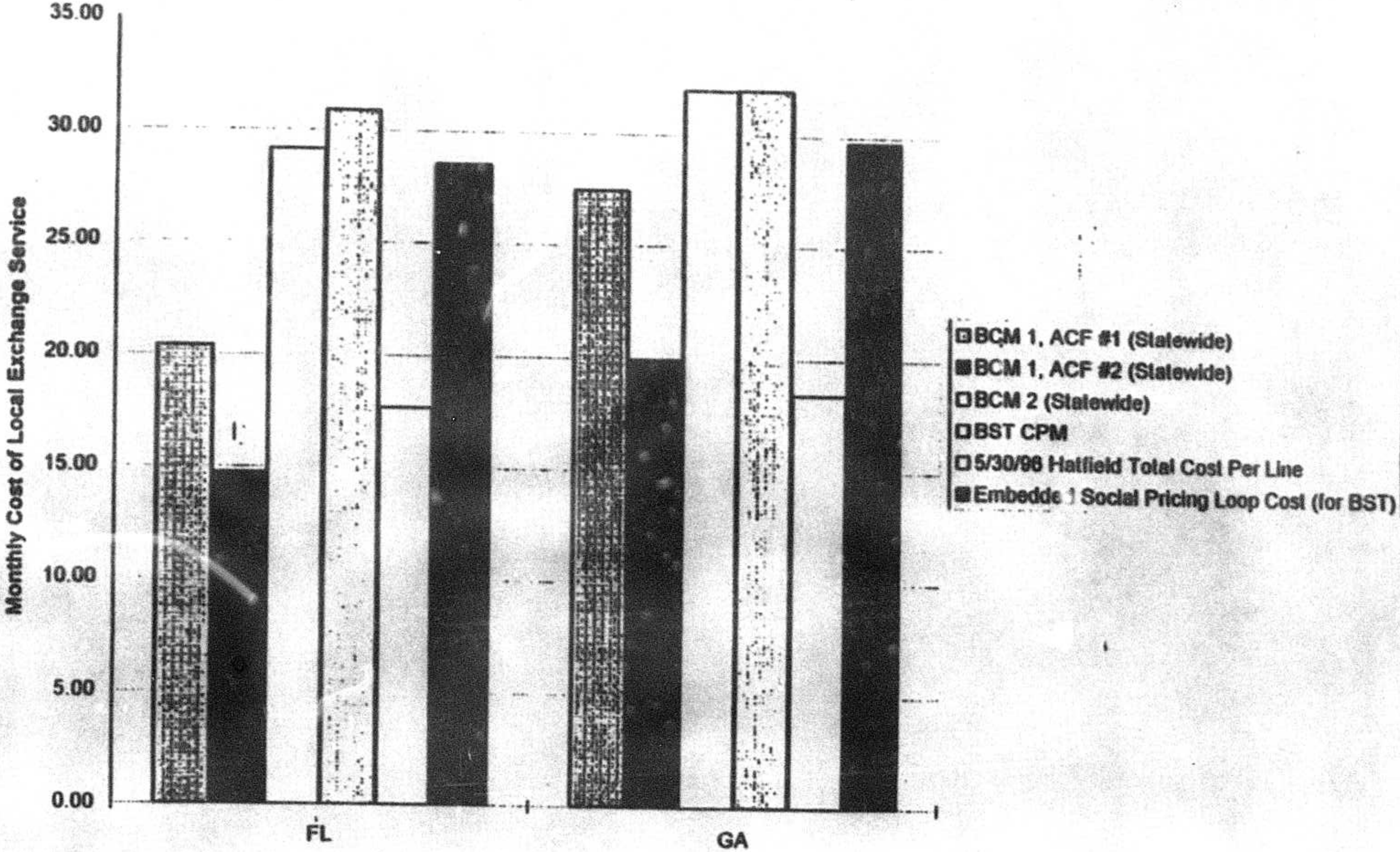
Comparison of CPM & BCM-2

BellSouth - Florida Wire Centers



ATTACHMENT 2

COMPARISON OF COST RESULTS



ATTACHMENT 3

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COMMENTS OF

WILLIAM E. TAYLOR AND ANIRUDDHA BANERJEE

Before the Federal Communications Commission

CC Docket No. 96-45

August 9, 1996

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COMMENTS OF
WILLIAM F. TAYLOR, PH.D., AND ANIRUDDHA BANERJEE, PH.D.

I. INTRODUCTION AND SUMMARY.

We are William E. Taylor, Senior Vice President of National Economic Research Associates, Inc. (NERA), head of its telecommunications economics practice and head of its Cambridge office, and Aniruddha Banerjee, Senior Consultant at NERA. Our business address is One Main Street, Cambridge, Massachusetts 02142.

Dr. Taylor has been an economist for over twenty years. He received a B.A. degree in economics (Magna Cum Laude) from Harvard College in 1968, a master's degree in statistics from the University of California at Berkeley in 1970, and a Ph.D. in Economics from Berkeley in 1974, specializing in industrial organization and econometrics. He has taught and published research in the areas of microeconomics, theoretical and applied econometrics, and telecommunications policy at academic institutions (including the economics departments of Cornell University, the Catholic University of Louvain in Belgium, and the Massachusetts Institute of Technology) and at research organizations in the telecommunications industry (including Bell Laboratories and Bell Communications Research, Inc.). Dr. Taylor has participated in telecommunications regulatory proceedings before state public service commissions and the Federal Communications Commission ("FCC" or the "Commission") concerning competition, incentive regulation, price cap regulation, productivity, access charges, pricing for economic efficiency, and cost allocation methods for joint supply of video, voice and data services on broadband networks.

Dr. Banerjee received B.A. (with Honors) and M.A. degrees in Economics from Delhi University, New Delhi, India, and a Ph.D. in Agricultural Economics from the Pennsylvania State University in 1985. He has taught undergraduate and graduate Economics courses in microeconomics, industrial organization, public finance, and statistics and econometrics. He has published papers on futures markets and has made several presentations on demand and cost analysis, and regulatory and competition policy in telecommunications. Prior to his present appointment at NERA, Dr. Banerjee has held positions with AT&T, Bell Communications Research, and BellSouth Telecommunications. He has participated in or contributed to several state and federal regulatory proceedings in the U.S. and Canada.

We have prepared our comments at the request of BellSouth Telecommunications, Inc., to appraise the Hatfield 2.2, Release 1, economic cost model ("Hatfield model" or "model") submitted by MCI Communications Corporation and AT&T Corporation on July 5, 1996, in CC Docket 96-45. This follows publication of the FCC's Public Notice on July 10, 1996, seeking comments on the Hatfield model and the Benchmark Cost Model 2.

Our primary conclusion from an appraisal of the Hatfield model is that it is fundamentally flawed and ill-suited to the task of determining a carrier's cost of supplying basic residential service. Because of this, we recommend that the model — as presently constructed — not be used for the purpose of determining the true costs of the universal service program or the size of the support fund being contemplated under universal service reform. At present, there are just too many questionable assumptions embedded in, or results derived from, the model to render it of any value for that task.[1]

II. Background

As the Commission has turned its attention to universal service reform — an important component of changes contemplated by Section 254 of the Telecommunications Act of 1996 — it has sought specifically to address the task of sizing the amount of support needed to administer the universal service program under local exchange competition. Comments and Reply Comments in CC Docket 96-45 brought forward submissions from various parties of engineering models intended to measure the economic cost of providing basic residential

[1] Essentially the same conclusions have been reached by Timothy J. Tardiff in *Economic Evaluation of Version 2.2 of the Hatfield Model*, prepared for GTE, July 9, 1996.

exchange service. These models include the Benchmark Cost Model ("BCM"), originally submitted in CC Docket 80-286 by its sponsors (MCI Communications Corporation, NYNEX Corporation, Sprint Corporation, and US West, Inc.), the Cost Proxy Model ("CPM") submitted by Pacific Bell, the Benchmark Cost Model 2 ("BCM2") submitted by Sprint Corporation and US West, Inc., and the Hatfield Model (Version 2.2, Release 1) submitted by MCI Communications Corporation and AT&T Corporation.

To understand how these models compare for the purpose of generating benchmark cost ranges for network functions and services, in general, and basic residential exchange service, in particular, the FCC, on July 10, 1996, issued a Public Notice in CC Docket 96-45, asking interested parties to comment on the models. At the request of BellSouth Telecommunications, Inc., we provide below our analysis of the Hatfield model (and of the BCM, to the extent necessary) and our conclusions regarding that model's usefulness.

III. General Summary of Issues

Our analysis of the Hatfield model begins with its set of underlying assumptions and postulates. Some of those assumptions are explicit. For example, the model assumes that existing networks respond to increases in demand in a "scorched node" fashion, i.e., their existing wire center locations remain fixed even as the networks are otherwise reconstructed to serve new demand.[2] The model also makes several assumptions about technical or engineering parameters that drive estimates of cost. These include, for example, "fill factors" (or, utilization rates), placement of feeder and distribution plant, density zones, and the distribution of businesses or households within the density zones.[3] The model also makes some important

[2] *Documentation of the Hatfield Model, Version 2.2, Release 1*, ("Hatfield Document"), Boulder, CO: Hatfield Associates, Inc., May 16, 1996, filed in CC Docket 96-45 on July 5, 1996, on behalf of MCI Communications Corporation and AT&T Corporation. See, especially, p. 3.

[3] In fact, some of these assumptions are borrowed by the Hatfield model from the BCM where they first appeared. This is because the Hatfield model relies substantially on the BCM for calculating the costs associated with loop investments.

— and, as we argue below, disputable — assumptions about financial parameters such as those involved in calculating the weighted cost of capital or for converting capital expenditures into annualized expenses.

The model's results also appears to make several implicit assumptions that are significant influences on the model's cost outcomes. Even if those assumptions were never intended to be made, it is safe to say that the cost outcomes only make sense if those assumptions are indeed made. A significant part of our critique of the Hatfield model focuses on these unstated assumptions and the extent to which they are responsible for cost estimates that we believe to be neither credible nor acceptable.

By construction, every model is an abstraction of reality, and assumptions about the model are frequently made to keep the necessary calculations tractable. The Hatfield model's assumptions or premises, however, often appear untenable for both engineering and economic reasons. Specifically, several of its technical assumptions (regarding engineering parameters) are flawed in light of current best engineering practices and have the effect of biasing cost estimates significantly downwards. The model's hidden economic assumptions — which also lead to understated costs — are particularly questionable. Some of these economic assumptions appear to be as follows:

1. Costs estimated for the so-called *average* or hypothetical network (that presently does not exist) are sufficient to inform public policy deliberations about the pricing of an *actual* network's unbundled services or the *actual* costs of the universal service program. Any departure of an incumbent LEC's costs from the "benchmark" costs of a hypothetical network must be regarded as *prima facie* evidence of inefficiencies in the LEC's operations.

2. Incumbent and entrant LECs alike will pursue identical strategies and technology choices despite their very different starting points under competition. For example, an incumbent and an entrant — both in pursuit of the most efficient, forward-looking network for serving future demand — will somehow opt for the same choice of technology and architecture. If those choices differ, then the *incumbent's* preferences regarding technology and network upgrades must be considered suspect and inefficient.

3. The local exchange market in which entrant firms will compete with incumbent local exchange carriers (LECs) will retain many vestiges of its monopoly past. For example, the low regulatorily-prescribed depreciation rates will continue to remain relevant under

> competition, and so will cost-of-capital or hurdle rates that reflect the considerably lower risks associated with regulated monopoly markets. Also, the scale economies which accrue to regulated monopolies as single providers of service will continue to be available to multiple, competing LECs who (in the process of sharing the market) may only serve demand segments that are smaller than the entire market.

We explain below how these assumptions taint fundamentally the usefulness of the Hatfield model for the purposes of implementing universal service reform as contemplated in Section 254 of the Telecommunications Act of 1996 and the present docket.

IV. ANALYSIS OF SPECIFIC ISSUES/ASSUMPTIONS IN THE HATFIELD MODEL

A. The Hatfield Model's Approach to Cost Estimation

The Hatfield model is primarily an engineering model of cost. It is a "bottoms-up" model that builds to service- or function-level cost by making several assumptions and specifications about the elements and piece parts that make up the service or function. It contains cost modules that calculate the investment costs of loop plant and wire center operations (switching, signaling, operator, and inter-office facilities). To costs of total plant investments the model adds annual service expenses related to the provision of services and unbundled functions. It reports the compiled investment requirements and expenses at the summary level desired, e.g., for individual functions like loop distribution, end-office switching, or signaling links, or for services like basic residential exchange service.

While such an engineering approach to estimating cost is necessary to account for the several hundreds, or even thousands, of components that make up a network, it often has to rely on facilitating assumptions (such as the use of multiplicative "factors" or ratios) to account for several *non*-network related and non-investment costs. Second, the engineering approach must make several assumptions about the prices at which network components would be purchased, or even the pricing structures (discounts, etc.) themselves. Third, that approach must postulate the utilization rate past which the network would consider expanding capacity despite having spare capacity on hand. Fourth, the engineering approach must make assumptions about the distribution of customers (by density zones, by proximity to the serving wire center, etc.) in order to construct the most efficient network layout needed to serve those customers. In the process, assumptions must be made about the type and configuration of outside plant (copper or fiber cable, aerial or buried cable, feeder and distribution loops, loop concentrators, etc.) and end-office equipment (digital or analog switches, signaling systems, operator systems, transport, etc.). Finally, assumptions would be needed for the physical, topographical, and climatic features of the geographic areas that are served by the network. For example, the Hatfield model — as the BCM before it — contains assumptions about rock hardness, surface conditions, water table depth, etc., all of which have implications for the mix and type of structures (poles, trenches, conduit, etc.) used for housing outside plant.

A cost model that depends on assumptions about so many crucial parameters must be judged by two criteria: (i) how well can its assumptions and cost estimates represent or reproduce those of an *actual* network? and (ii) how easily can it be modified to accommodate a network's historical circumstances and future technology and operational choices, given the increasing uncertainty about demand engendered by greater market competition and reduced regulation?

The first criterion recognizes that engineering estimates of economic costs are, at best, hypothetical, namely, the costs that would be realized were the network, in reality, to conform exactly to the assumptions made for it. Differences between engineering costs and actual (or, *booked*) costs are natural and should be expected. Given that engineering costs are usually lower than booked costs, the model must be capable of being modified in order to reconcile or explain the discrepancy between hypothetical and actual costs. The second criterion tests the model's flexibility on its economic merits, i.e., primarily its ability to produce cost estimates that reflect the changing market and regulatory environment, rather than just the setting initially assumed for it.

B. The Hatfield Model Does Not Produce Costs for an Actual Network

1. Model Design Skewed Toward Hypothetical Network

Because of its numerous assumptions about technical parameters, the engineering approach has a built-in potential to mis-estimate a network's actual costs. This problem is likely to be aggravated when the technical parameters entered as model inputs represent *not* the specific network being modeled but rather an entirely hypothetical or "average" network. The sponsors of the model openly acknowledge its orientation toward a hypothetical network.

> The Hatfield Model develops estimates of the economic costs (TSLRIC) of providing local telephone services by determining the specifications of a local network, using most efficient practices and best forward-looking technologies, to meet the total demand for local narrowband telephone services. By doing this, *the model simulates the construction and operations decision-making of an efficient local service provider that must create and operate a new network to meet current and reasonably forecasted demand levels* for narrowband telephone services. In simulating the construction of these *hypothetical* networks, the model incorporates realistic assumptions concerning the LECs' ability to adopt and implement efficient, cost minimizing production techniques.[4]

The model sponsors add:

> The technologies considered in the Model are forward-looking. As such, they are those an efficient LEC *would* adopt if it were to *begin today to rebuild its telephone service network from the bottom up.*[5]

Despite its sponsors' claims that the Hatfield model incorporates "realistic assumptions" about (presumably, incumbent) LECs' networks and their abilities to implement new, more efficient production techniques, it is abundantly clear that the model is intended for no such purpose. First, the Hatfield model depends in substantial part on outputs of the BCM model for which *its* sponsors had the following goal:

[4] Hatfield Document, p. 2. Emphasis added.

[5] Hatfield Document, pp. 2-3. Emphasis added.

> The BCM does *not* define the *actual* cost of any telephone company, nor the embedded cost that a company might experience in providing telephone service today. Rather, the BCM provides a benchmark measurement of the relative costs of serving customers residing in given areas, i.e., the [Census Block Groups].[6]

Second, among other things, the Hatfield model's sponsors (i) freely admit to not using LECs' actual fill factors,[7] (ii) make arbitrary and uniform assumptions about "line multipliers" meant to account for business and other lines that the BCM leaves out,[8] (iii) input into the model not actual prices paid by LECs for local network components but those constructed by the model developers themselves,[9] and (iv) use an AT&T report on *inter*-exchange capacity expansion costs to calculate a *LEC's* tandem switching investments.[10]

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[6] *Benchmark Cost Model.* A Joint Submission by MCI Telecommunications Corporation, NYNEX Corporation, Sprint Corporation, and US West, Inc., in CC Docket 80-286, September 12, 1995. See, especially, p. 3. Emphasis added.

[7] Hatfield Document, p. 3, wherein the now-familiar but unproven assertion is made that LECs' actual fill factors reflect built-in LEC inefficiencies.

[8] Hatfield Document, p. 12. It is noteworthy that no attempt whatsoever is made to base the line multipliers on actual data for a LEC from a representative sample of its CBGs. Instead, the Hatfield model uses an iterative fitting technique that produces a uniform ratio of business-residence lines across all CBGs. This is justified by claiming that "... although specific CBGs may exhibit exceptions from ... trend, at higher levels of aggregation (e.g., the wire center or LATA level), the mix of services will progressively approach the total company mix reported in ARMIS data." Ironically, its sponsors have no intention of modifying the model to use *actual* data on business lines instead of the arbitrary multipliers (see pp. 132-133 of the Transcript of the Pre-Hearing Conference before Administrative Law Judge Kirk McKenzie, Case R. 93-04-003, P.U.C., California, July 12, 1996). This position is taken even though a public source for such data has been identified and employed by a new version of the BCM model called "BCM2" (see Executive Summary of a press release, *Sprint & US West Refine Previous Benchmark Cost Model and Deliver to FCC*, Washington D.C., July 11, 1996).

[9] Hatfield Document, p. 24. The sponsors state: "While actual prices paid for these components and their network characteristics may vary from carrier to carrier, [Hatfield Associates, Inc.] has developed a set of standard input values, based on public data sources and *the informed judgments of its engineers and other industry experts.*" Emphasis added.

[10] Hatfield Document, p. 38.

2. BCM's Deficiencies are Shared by the Hatfield Model

In adopting the BCM virtually in its totality for calculating loop investments, the Hatfield model also retains the BCM's infirmities. The BCM often assigns Census Block Groups (CBGs) to the wrong wire center, a clear demonstration that the hypothetical network constructed by the BCM does not correspond to the actual, physical network. This problem is, in principle, correctable if intervening topographical features such as rivers, lakes, and mountains are taken into account when mapping a CBG to a wire center. When such intervening features are present, sheer proximity alone of a CBG to a wire center may not be sufficient reason for assigning it to that wire center. Where geography requires that a CBG be assigned to a more distant wire center, the actual cost of loop plant will likely exceed that calculated for an assignment based purely on proximity. Neither the BCM nor the Hatfield model adjusts for these topographical features.

For calculating the placement of feeder and distribution plant, the BCM assumes that loop feeders and sub-feeders emanate from the wire center only up to the edge of a square-shaped CBG. Within the CBG, the BCM assumes a uniform distribution of households and the placement only of distribution plant. These assumptions may often be untenable and produce average loop lengths and investment costs that are quite different in reality. The Hatfield model's sponsors recognize this limitation but fail to explore its full ramifications. The model sponsors claim that "[b]ecause populations tend to cluster in towns and subdivisions, the BCM assumption of uniform population distribution tends to overstate distribution distance and thus the required loop investment."[11] This implies that the error in the estimated cost is only one way — toward *over*-estimation. In fact, under-estimation of cost could occur, in principle, for a large CBG in a low-density zone where the population clustering occurs not at the geometrical center of that CBG, but in several spots more widely dispersed from the center than would be assumed under a uniform distribution.

[11] Hatfield Document, p. 16.

In addition, the Hatfield model documentation reports that there are economies of scale (i.e., falling unit costs) in the deployment of copper or fiber cables. For example, the unit cost declines from 1.26¢ to 1.14¢ to 0.61¢ per foot of buried copper cable for cable sizes of 100, 400, and 4,200 (the presumed maximum deployment within a CBG), respectively.[12] Similarly, the unit cost declines from 6.58¢ to 4.13¢ to 3.86¢ per foot of buried fiber cable for cable sizes of 12, 48, and the maximum 144, respectively. Similar economies are observed for aerial copper or fiber cable. Since the BCM works with CBGs, rather than the actual distribution areas employed by LECs, it is quite possible for the BCM (and the Hatfield model) to assign larger cable sizes (and, therefore, to experience greater economies of scale) to a densely-populated CBG than the cable sizes actually deployed by LECs in their largest distribution areas. For example, while the BCM's maximum deployments are 4,200 feeder cable pairs and 3,600 distribution cable pairs, the largest actual deployments in California are 3,600 feeder and 1,800 distribution cable pairs by Pacific Bell and 3,000 feeder pairs by GTE.[13] Under these circumstances, the BCM assumptions would tend to overstate the economies of scale and, hence, to understate the true costs of LECs' actual loop plant.

Finally, the BCM assumes that each CBG is served by four equal distribution legs.[14] This can be problematic for calculating the cost of support structures used for housing the deployed cables. The BCM's (and the Hatfield model's) current practice is to calculate that cost by applying a multiplier or "factor" to the price of cable. As demonstrated by an example provided by Timothy Tardiff, if the actual number of distribution routes in fact exceeds four, the BCM will understate the component of the cost of structures that varies with route miles.[15]

[12] Hatfield Document, p. 28. All unit costs are computed from Tables 17 and 18.

[13] Tardiff, *op cit.*, pp. 8-9.

[14] *Benchmark Cost Model*, p. 11.

[15] Tardiff, *op cit.*, pp. 8-9. Tardiff also reports that GTE estimated that doubling the number of distribution routes raises installation and structure costs by 49 per cent, rather than the 17 per cent predicted by the BCM. This and other discrepancies between BCM-reported and actual costs loom even larger when it is realized that roughly half of a switched network's total cost arises from its distribution plant.

3. Other Problems With the Hatfield Model's Cost Estimates

There are several other problems with the Hatfield model that can cause an understatement of a LEC's actual costs.

First, the Hatfield model's calculation of switching costs contains several inaccuracies and anomalies. As pointed out by Tardiff, the model matches a 1994 forecasted switch price with a 1993 average embedded switch size. The model assumes three switch sizes: small, medium, and large, and assembles prices and average sizes for them from numerous sources. While independent LECs *excluding* GTE are used for the small switch price, the model nevertheless includes GTE in estimating the average small switch size. Also, the model equates the average size of an *installed* switch with the average size of a *new* switch, a dubious assumption at best.[16]

Second, the Hatfield model's relationship between the cost of switching per line and the size of the switch is developed from only three data points. It also produces switching cost estimates that are lower than, and inconsistent with, those produced by the BCM. For example, the Hatfield model takes as a data point that a medium size switch with an average of 11,200 lines would have a switching cost per line of $104. In contrast, the BCM estimates[17] that a switch of size 11,000 lines (closest to the Hatfield number) would have a per line cost of $298. Even though the BCM reports cost for a DMS-100 switch, and it is not immediately clear what switch type the Hatfield model has in mind, the discrepancy in the per line estimate of cost is significant enough to warrant a critical second look at Hatfield's claimed relationship between switch size and per line cost.

Third, the Hatfield model appears to assume that LECs serve new demand only by installing *new* switches. In fact, Tardiff cites a McGraw-Hill report[18] that LECs frequently buy

[16] Tardiff, *op cit.*, pp. 12-13.

[17] *Benchmark Cost Model*, Attachment 1.

[18] Tardiff, *op cit.*, p. 13.

additional lines for their already *installed* switches, and that those additional lines each cost more than lines on new switches. Switch suppliers frequently sell initial lines at deep discounts, but not so the lines added subsequently. By failing to account for the LECs' practice of adding lines to installed switches for serving new demand, the Hatfield model very likely understates actual switching costs. In effect, by assuming that LECs only add capacity by installing new switches, the Hatfield model "builds in" the lowest possible switch prices into its switching cost estimates.

Fourth, the Hatfield model makes no effort to capture the alternative ways that a LEC may choose to expand its switch capacity. Recall that the Hatfield model utilizes fill factors for loop plant and switching equipment that are considerably greater than those actually reported by LECs. In addition, when developing the costs of wire center investments, the model first fixes the maximum effective switch size — the "large" switch — at 80,000 lines (assuming a fill factor of 80% for a 100,000 line switch). Next, it equips a wire center with only one such switch as long as the line count served is between 0 and 80,000. However, if the served line count rises to 90,000, the model recomputes the investment as that required for *two* 45,000-line switches (expressed net of the assumed fill factor). That is, the demand for the last 10,000 lines over the first 80,000 is not assumed to be served by a new switch that is added to the 100,000-line switch already in use. The Hatfield model approach of resizing *all* switches imparts to the LEC the remarkable ability to reconfigure and optimize its network, both instantaneously and without any additional adjustment cost. In the real world, LECs do not add capacity in this manner. Instead of instantly resizing and replacing its existing switch(es), a LEC would more likely respond by either adding lines to the existing switch or adding another switch.

The LEC may decide to add a second 100,000-line switch because it expects significant demand growth. The Hatfield model's instant resizing algorithm does not recognize that, in the real world, investment decisions are often irreversible because of the substantial costs associated with (i) scrapping and disposing of older but functioning equipment and (ii) instantaneous and continual network reconfiguration. Nor, in the face of uncertain market demand, can that model foresee a LEC's reasons for wishing to add a 100,000-line switch instead of a smaller switch. Often, the addition of larger equipment may entail higher *initial* costs (including the cost of spare capacity) as well as higher inventory carrying costs, but such equipment may also produce economies of scale and scope and the ability to respond to quickly surging demand. Every LEC has to confront these trade-offs and choices according to its best forecast of future demand. To be able to account for this, a cost model would need to be far more "intelligent" and adaptable than the Hatfield model currently is.

Finally, the Hatfield model resorts to multiplicative factors to account for the cost of structures used to house copper and fiber cable and for network and non-network operating expenses. In the absence of direct observations on these costs and expenses, the model can only apply these factors to observed entities like cable prices or historical revenues/line demand. The use of such factors can create some important measurement problems. For example, the cost of housing structure for cable is calculated by multiplying the cable price by the appropriate structure factor. The resulting "cost" can easily change as the price of cable changes, even though the real underlying cost of the structure may not. Also, the use of historical investment-expense ratios (developed from ARMIS reports) to calculate forward-looking operating costs is completely contrary to the Hatfield model's basic underpinning — that past costs, based on past technologies, cannot represent the costs of newer, more efficient technologies. It is inconceivable that as technologies change and become cheaper, operating expenses will not follow suit.

4. Conclusion

The Hatfield model is replete with assumptions about technical parameters that do not necessarily resemble a LEC's actual situation. Its sponsors claim that the model is flexible enough to accept non-proprietary LEC-specific inputs. That would suggest that the model itself should remain a valid instrument for calculating a LEC's actual costs, even if the costs it currently reports using hypothetical inputs are disregarded. Our objection to the Hatfield model is at a more fundamental level. While LEC-specific inputs could conceivably bring the model's cost outcomes closer to reality, we believe that a purely engineering model like the Hatfield can never expect to fully reproduce or explain all the actual booked costs reported by a LEC. We discuss the reasons for these below. For now, we conclude that the Hatfield model, powered in large part by the BCM and hypothetical technical parameters that disregard the choices a LEC actually faces cannot possibly expect to produce the actual costs of that LEC.

C. The Hatfield Model Cannot Produce Costs That Reflect Changing Market or Regulatory Environments

1. Hypothetical Efficiency *v.* Reasonably Achievable Efficiency

As we stated earlier, the Hatfield model appears to rely on a set of unstated economic assumptions. If those assumptions were true, not just fictitious networks but actual LECs would experience costs lower than those they actually report. The first problem with those assumptions is that they invoke a perfect and friction-less world where the ideal of perfectly optimized networks is achieved at all times, even in times of sweeping market and regulatory change. While the costs yielded under such assumptions may be closer to those produced by purely engineering models that have embedded in them best engineering and cost-minimizing practices, the real world often produces sources of cost that engineering models cannot predict in advance. Therefore, what is "efficient" from a hypothetical *engineering* and friction-less standpoint may be quite different from the efficiency that can reasonably be achieved by actually operating networks. Unit costs yielded by models such as the BCM or the Hatfield can, at best, provide lower bounds for unit costs of efficient networks in practice.[19] That is why booked costs (that include the consequences of network actions actually undertaken) usually exceed costs derived from a hypothetical bottoms-up approach. Only real costs have real consequences; therefore, public policy deliberations need to be informed by costs as they actually are, not as they could be in a perfect friction-less world.

[19] Actually, the BCM or Hatfield model provides a lower bound for forward-looking costs which, *in turn*, provide lower bounds for actual or booked costs.

The primary economic issues at stake here concern the manner in which the Hatfield model deals with a changing market and regulatory environment. A dynamic environment tests the stability and flexibility of a cost model, and the following discussion examines that issue in depth.

2. Hypothetical Costs in a Dynamic Environment

Local exchange competition and more relaxed regulation of incumbent LECs are expected to alter fundamental and long-standing public policy arrangements regarding universal service, the pricing of regulated services, and access to the networks of incumbent carriers. Given the Telecommunications Act's prescription that the cost of any universal service program should be shared in a competitively neutral way by *all* providers of service, the priority is now to determine the cost of that program as a prelude to determining the burden share of each service provider.

The Hatfield model and its predecessor, the BCM, have been offered as instruments for determining what basic residential exchange service *should* cost in a world of perfectly optimized networks. The implication is that any excess of an incumbent LEC's actual cost over the benchmark or threshold cost established by the Hatfield model should be attributed strictly to the incumbent's inherent inefficiencies and, therefore, be declared ineligible for recovery through the rates for the incumbent's regulated services. Put another way, the incumbent LEC's actual cost should be compared to a hypothetical optimized network's cost, and any excess actual cost should be disallowed for recovery through the universal service funding system.

There are two fundamental problems with this message. First, if the hypothetical optimized network can never be reasonably achieved by the incumbent LEC, then of what value can the comparison be? Even though the present Hatfield model describes itself as a "scorched node" model, its earlier version[20] had been of a "scorched earth" or "greenfield" variety, namely, one that compared the incumbent LEC to a start-up network that had the complete freedom to implement the most efficient forward-looking technologies without-any-regard for the past. While a new entrant LEC could aspire to being that start-up network, it is ludicrous to believe that that could be true of incumbent LECs with long histories in the business.

Second, in view of the fact that unexpected costs do arise under actual operation, even the most "efficient" LEC can expect its actual costs to exceed the costs produced by the engineering bottoms-up approach. This is the real world with friction, one in which not every aspect of a LEC's operations can be predicted, and its consequences evaluated, in advance. Even LECs that adopt cost-minimizing production techniques based on forward-looking technologies must contend with the vagaries of uncertain demand in a changing and competitive marketplace or unexpected developments like political or policy change and catastrophic weather events. Therefore, the Hatfield model's implicit message that any cost in excess of that calculated by the model should be attributed to unproven inefficiencies is overly simplistic and utterly misleading. There is no simple or expedient way to distinguish a LEC's excess actual costs under efficient operation from costs due to inefficiency.

All of these reasons make us skeptical of the benchmark costs produced by models of hypothetical networks. Networks that do not recover their actual costs will, over time, go out of business. With the introduction of competition, LECs — incumbent and entrants alike — will have every incentive to lower their *actual* costs. Those that succeed will survive and qualify for support from the revamped universal service funding system. Such a market solution would be infinitely better than one based on the comparison of a LEC's actual costs to the benchmark costs of a hypothetical network.

[20] Hatfield Associates, Inc., *The Cost of Basic Universal Service*, prepared for MCI Communications Corporation, July 1994.

3. The Hatfield Model Pretends that Incumbent and Entrant LECs Should be Alike

Even with the less extreme scorched node orientation, the Hatfield model ascribes to its cost model the property of producing the least-cost network that "... an efficient LEC would adopt if it were to begin today to rebuild its telephone service network from the bottom up."[21] We interpret this to mean that an efficient LEC, at any given time, would have in place the same network that an entrant might choose to build. However, the direction in which an efficient incumbent LEC may take its existing network need not be the same as that taken by an "equally efficient" entrant LEC. The incumbent is constrained by its past choices that resulted in its present network. Because of this, it is quite probable that the incumbent LEC would make different technology choices than the entrant. Therefore, costs calculated for an efficient start-up LEC may well differ from those of an efficient incumbent LEC that is necessarily constrained by its past. Again, what matters for determining the cost of the universal service program is not the idealized cost of a start-up LEC, but rather the actual costs of LECs participating in that program.

4. The Hatfield Model Takes an Unrealistic View of the Market Environment

The Hatfield model's greatest drawback is that it creates a world in which the best features of both competition and monopoly are magically present. This allows the model to create the illusion that competitive LECs that perforce share the existing market demand can somehow still enjoy the benefits of economies of scale and scope that only monopoly supply can bring. For example, the model uses access line demand data from carriers' 1994 ARMIS 43-08 reports and usage data from other FCC sources as inputs into its investment cost modules. Such an exercise for calculating a LEC's investment costs might be legitimate if it were safe to assume that the level of demand experienced by the LEC under monopoly conditions would remain intact even under competition. If, as we expect, that assumption is not

[21] Hatfield Document, pp. 2-3.

tenable, the cost estimates produced by the Hatfield model for the major LEC in each of 48 states and the District of Columbia[22] also cannot be credible. Furthermore, since the Hatfield model builds in the economies of scale arising from being able to serve the higher levels of demand available under monopoly conditions, it also produces unit cost estimates that understate the true costs of competing LECs (incumbent and entrant alike) that serve smaller demand segments and, hence, do not enjoy the same scale economies.

The Hatfield model's implicit belief that certain regulated monopoly features would persist under competition is apparent in the manner in which it incorporates depreciation rates and the weighted cost of capital into its expense module. First, the Hatfield model appears to choose depreciation rates that are even below the BCM's unrealistically low rate of depreciation (an annual rate of 5.7 per cent) for outside loop plant. In addition, it assigns equally low depreciation rates to end-office switching (an annual rate of 5 per cent). The long depreciation lives implied by these rates were actually prescribed by regulators in the past when incumbent LECs operated as regulated monopolies. Under conditions of market competition, however, such slow depreciation rates are simply unrealistic. By failing to assume depreciation rates more likely to prevail under competition, the Hatfield model produces downward-biased annual costs of plant and wire center investments.[23] The model's failure to use higher depreciation rates that would be true under competition simply does not square with the model's implicit expectation that LECs will move seamlessly to the latest, most cost-reducing technologies as and when they become available. Faced with long depreciation lives on existing plant and equipment, no firm in the real world can be expected to act as envisioned by the model.

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[22] Update of the Hatfield Model, Version 2.2, Release 1, prepared for AT&T Corporation and MCI Telecommunications Corporation by Hatfield Associates, Inc., May 30, 1996.

[23] Tardiff reports that moving from the BCM's assumed 5.7 per cent depreciation rate (corresponding to an 18-year economic life) to the book depreciation rates currently used by Regional Bell Operating Companies (RBOCs) will adjust costs upward by 12.6 per cent. See Tardiff, *op cit.*, p. 16. In addition, if AT&T's own 1994 book depreciation rate of about 11 per cent were used, costs would be adjusted upward by nearly 42 per cent.

Second, the Hatfield model calculates a weighted average cost of capital of 8.91 per cent under the assumption that the cost of debt is 7.46 per cent, the cost of equity is 11.25 per cent, the debt percentage is 61.82, and the equity percentage is 38.18. These assumptions are a marked departure from Hatfield Associates' own 1996 greenfield version of the model[24] in which it assumed the equity percentage to be a more realistic 60, and came up with a cost of capital of 10 per cent. Again, the consequence of the lower cost of capital is a lower annual cost of plant and wire center investments.[25] Professor Jerry Hausman has recently demonstrated that the increased risk and uncertainty associated with competition tends to raise annual costs by a factor of 3 to 7.[26] If the annual costs rise by a factor of 3, then the effective cost of capital or hurdle rate should be over 40%,[27] between four and five times that used by the Hatfield model.[28] Recently, the FCC itself recognized the need for states to establish "... appropriate *risk-adjusted* cost of capital and depreciation rates" for pricing purposes.[29]

V. CONCLUSION

The Hatfield model is an engineering model for estimating economic costs. It is premised on assumptions about technical parameter inputs and the belief that competing

[24] Hatfield Associates, Inc., *The Cost of Basic Network Elements: Theory, Modeling and Policy Implications*, prepared for MCI Telecommunications Corporation, March 29, 1996.

[25] Using the relationship in the 1994 Hatfield report that a 175 basis point difference increases the cost per line by 11 per cent, Tardiff reports that increasing the cost of capital from 8.91 to 10 per cent (as in the 1996 Hatfield greenfield model report) would increase costs by about 7 per cent. And, moving to the 11.25 per cent rate of return currently allowed by the FCC for RBOCs would increase costs by 14.7 per cent over the Hatfield model estimates.

[26] Reply Affidavit of Jerry A. Hausman, CC Docket 96-45, May 30, 1996.

[27] This projection is based on the Hatfield relationship between the cost per line and the cost of capital in note 24, *supra*.

[28] This accords with the finding by Lawrence Summers that for competitive firms the mean and median hurdle rates tend to exceed the cost of capital by a factor of between 2 and 10. See L. Summers, "Investment Incentives and the Discounting of Depreciation Allowances," in M. Feldstein (ed.), *The Effects of Taxation on Capital Accumulation*, Chicago: University of Chicago Press, 1987.

[29] "Commission Adopts Rules to Implement Local Competition Provisions of Telecommunications Act of 1996 (CC Docket No. 96-98)," NEWSReport No. DC 96-75, August 1, 1996.

carriers continually optimize their networks. In the process, it only succeeds at producing the costs of a hypothetical carrier that (i) may never resemble the actual costs of real-world carriers and (ii) seriously underestimate those true costs.

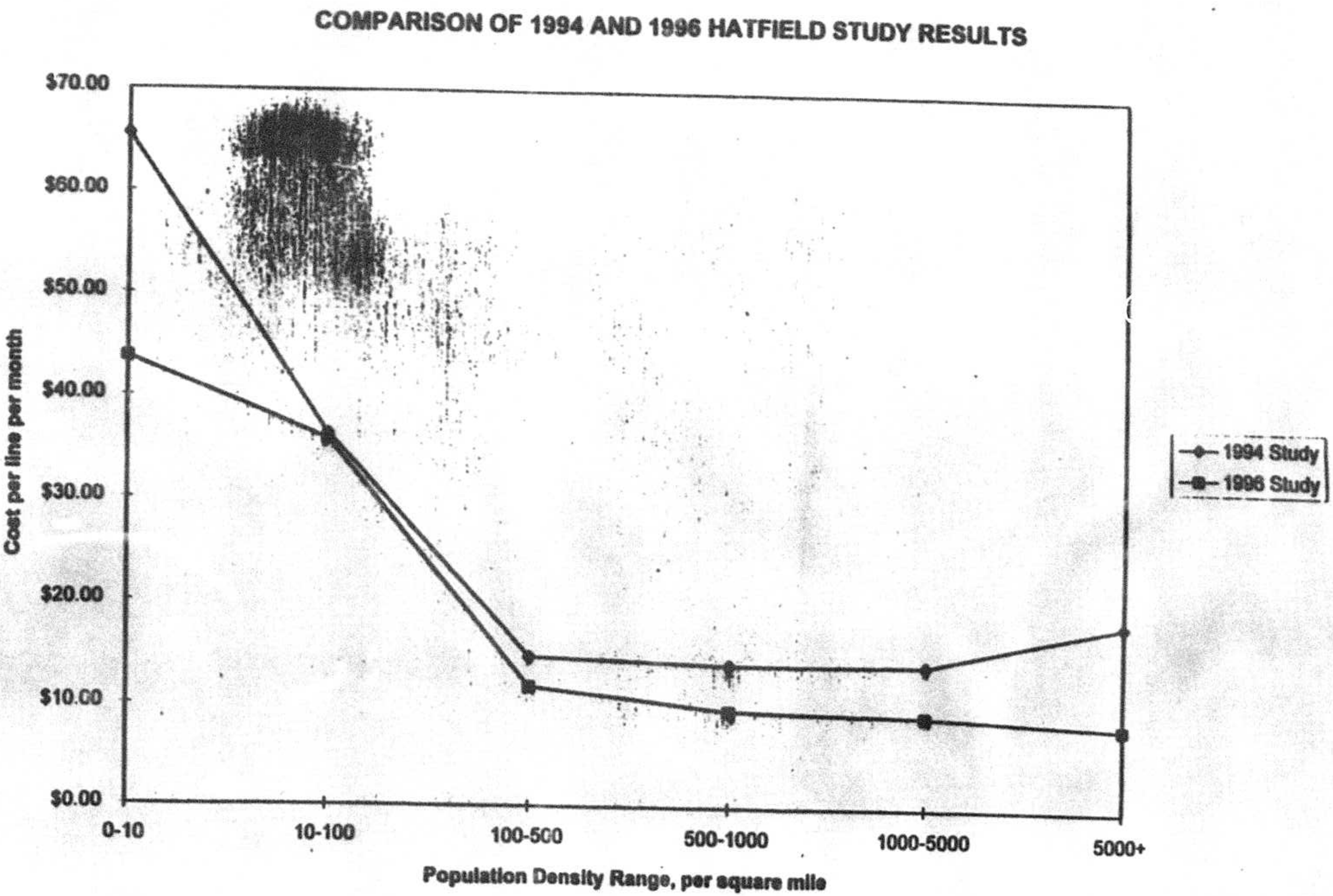
Even the assertion that the model can be populated with LEC-specific data is misleading. First, simply replacing the model sponsors' own parameter inputs by LEC-specific inputs will not release the model from the confining assumption about continual optimization in a scorched node world. As long as real-world carriers behave differently than assumed, even LEC-specific inputs will not produce real costs. Second, no significance whatsoever can or should be attached to the cost outcomes reported in the Hatfield Document and its subsequent update on May 30, 1996. The cost estimates reported in those documents lack even indicative value because the circumstances under which they were calculated are far removed from reality.

While a model that estimates a carrier's cost of providing basic residential exchange and related services is crucial for estimating the size of and implementing a reformed universal service funding system, the Hatfield model cannot and should not be the vehicle for that purpose. Only real costs have consequences: a firm's ability to survive and function in a dynamic, competitive environment depends on its real costs — governed by real-world market and regulatory circumstances — not on hypothetical costs ascribed to it. Because the Hatfield model's basic premises about firm behavior are so far removed from reality, it cannot possibly expect to represent real costs for policy-making purposes.

Public policy on universal service reform has an understandable interest in minimizing the cost of implementing a program in which carriers need to be supported in order that they offer basic services at prices that are below their costs. The proper way to minimize the cost of such a program, however, is to set an initial level of support per line, make the support portable among competing service providers, and then to let competitive forces determine which carriers get to provide service and which do not. For example, if the *initial* level of support is based on the difference between the incumbent LEC's *actual* embedded cost per line and the basic residential service rate, competitive market forces will, over time, ensure that only the carrier with the lowest incremental cost of providing service will be the most successful at finding customers.[30] More importantly, for present purposes, the use of hypothetical and misleading costs generated by the Hatfield model (and others of that ilk) is decidedly *not* the economically correct way for sizing and minimizing the universal service support fund.

[30] The mechanism underlying this is fully described on pp. 9-14 of Kenneth Gordon and William Taylor, *Comments on Universal Service*, in this Docket, filed April 12, 1996. That mechanism eventually ensures competition based on carriers' *actual* incremental costs, and requires minimal intervention by regulators.

ATTACHMENT 4



COMPARISON OF 1994 AND 1996 HATFIELD STUDY RESULTS
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
$0.00
Cost per line per month
0-10
10-100
100-500
500-1000
1000-5000
5000+
Population Density Range, per square mile
1994 Study
1996 Study

CERTIFICATE OF SERVICE

I hereby certify that I have this 9th day of August, 1996 served all parties to this action with a copy of the foregoing FURTHER COMMENTS by placing a true and correct copy of the same in the United States Mail, postage prepaid, addressed to the parties on the attached service list.

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