ORIGINAL

GTE

GTE SERVICE CORPORATION

One Tampa City Center
201 North Franklin Street (33602)
Post Office Box 110, FLTC0007
Tampa, Florida 33601-0110
813-483-2606
813-204-8870 (Facsimile)

Marceil Morrell*
Assistant Vice President &-
Associate General Counsel-East Area

Anthony P. Gillman*
Assistant General Counsel

Florida Region Counsel**
Kimberly Caswell
M. Eric Edgington
Ernesto Mayor, Jr.
Elizabeth Biemer Sanchez

* Certified in Florida as Authorized House Counsel
** Licensed in Florida

PM 4:44

November 2, 1998

Ms. Blanca S. Bayo, Director
Division of Records & Reporting
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Re: Docket No. 980696-TP
Determination of the cost of basic local telecommunications service, pursuant to Section 364.025, Florida Statutes

Dear Ms. Bayo:

Please find enclosed an original and fifteen copies of the Post-Hearing Brief of GTE Florida Incorporated for filing in the above matter. Also enclosed is a diskette with a copy of the Brief in WordPerfect 6.0 format. Service has been made as indicated on the Certificate of Service. If there are any questions regarding this filing, please contact me at (813) 483-2617.

Very truly yours,

Kimberly Caswell |dm

Kimberly Caswell

KC:tas
Enclosures

ACK
2
Kag
CTR
CAG
LEG 2
LIN 5
1
OTH

A part of GTE Corporation

RECEIVED & FILED
FPSC-BUREAU OF RECORDS

12216 NOV-2 98

ORIGINAL

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Determination of the Cost)
of Basic Local Telecommunications)
Service, Pursuant to Section 364.025,)
Florida Statutes.)
)

Docket No. 980696-TP
Filed: November 2, 1998

POST-HEARING STATEMENT AND BRIEF OF GTE FLORIDA INCORPORATED

Kimberly Caswell
GTE FLORIDA INCORPORATED
One Tampa City Center
Tampa, Florida 33601
(813) 483-2617

John B. Williams
Thomas W. Mitchell
COLLIER SHANNON RILL
& SCOTT, PLLC
3050 K Street, N.W., Suite 400
Washington, D.C. 20007
(202) 342-8400

Lewis F. Powell, III
Paul Mirengoff
HUNTON & WILLIAMS
951 East Byrd Street
Richmond, VA 23219
(804) 788-8200

12216 NOV-2 98

TABLE OF CONTENTS

ISSUES AND SUMMARY POSITION STATEMENTS

Issue 1: What is the definition of the basic local telecommunications service referred to in Section 364.025(4)(b), Florida Statutes?

** "Basic local telecommunications service" is defined in Section 364.02(2) of the Florida Statutes.**

Issue 2: For purposes of determining the cost of basic local telecommunications service appropriate for establishing a permanent universal service mechanism, what is the appropriate cost proxy model to determine the total forward-looking cost of providing basic local telecommunications service pursuant to Section 364.025(4)(b), Florida Statutes?

** Company-specific models and inputs, rather than proxies, best determine the forward-looking cost of basic local service. Given the Legislature's directive to choose a proxy, however, BCPM with company-specific inputs is the best choice. The Hatfield Model has severe engineering and other flaws that substantially underestimate costs.**

Issue 3: For purposes of determining the cost of basic local telecommunications service appropriate for establishing a permanent universal service mechanism, should the total forward-looking cost of basic local telecommunications service pursuant to Section 364.025(4)(b), Florida Statutes, be determined by a cost proxy model on a basis smaller than a wire center? If so, on what basis should it be determined?

** Initially, costs should be calculated at a wire center level, but with the long-term objective of moving to a smaller unit of calculation to more accurately reflect cost differences within a wire center. **

Issue 4: For purposes of determining the cost of basic local telecommunications service appropriate for establishing a permanent universal service mechanism, for each of the following categories what input values to the cost proxy model identified in Issue 2 are appropriate for each Florida LEC? (a) Depreciation rates; (b) Cost of money; (c) Tax rates; (d) Supporting structures; (e) Structure sharing factors; (f) Fill factors; (g) Manholes; (h) Fiber cable costs; (i) Copper cable costs; (j) Drops; (k) Network interface devices; (l) Outside plant mix; (m) Digital loop carrier costs; (n) Terminal costs; (o) Switching costs and associated variables; (p) Traffic data; (q) Signaling system costs; (r) Transport system costs and associated variables; (s) Expenses; and (t) Other inputs.

** The Commission should adopt BCPM with each of the GTE-specific inputs presented by GTE witnesses Vander Weide (cost of money), Sovereign (depreciation), Norris (expenses), and Tucek (all other GTE-specific inputs), and the BCPM default values for all remaining inputs.**

Issue 5(a): For purposes of determining the cost of basic local telecommunications service appropriate for establishing a permanent universal service mechanism, for which Florida local exchange companies must the cost of basic local telecommunications service be determined using the cost proxy model identified in Issue 2?

** Costs should be determined for the non-rural incumbent local exchange companies--that is, GTE, BellSouth and Sprint. To GTE's knowledge, no party has stated a contrary position.**

Issue 5(b): For each of the LECs identified in (a), what cost results from using the input values identified in Issue 4 in the cost proxy model identified in Issue 2?

** The BCPM cost results using GTE's inputs are shown in Exhibit 78 (DGT-3R) and Exhibit 54 (MCS-2R at 1). The total per-line, monthly cost, including the directory listing, is $33.35.**

Issue 6(a): For purposes of determining the cost of basic local telecommunications service appropriate for establishing a permanent universal service mechanism, should the cost of basic local telecommunications service for each of the LECs that serve fewer than 100,000 access lines be computed using the cost proxy model identified in Issue 2 with the input values identified in Issue 4?

** GTE takes no position on this issue.**

Issue 6(b): If yes, for each of the LECs that serve fewer than 100,000 access lines, what cost results from using the input values identified in Issue 4 in the cost proxy model identified in Issue 2?

** GTE takes no position on this issue.**

Issue 6(c): If not, for each of the Florida LECs that serve fewer than 100,000 access lines, what approach should be employed to determine the cost of basic local telecommunications service and what is the resulting cost?

** GTE takes no position on this issue.**

I. INTRODUCTION AND BASIC POSITION

This is a proceeding to select a cost proxy model that estimates the total forward-looking cost of providing basic local telecommunications service in Florida. The ultimate purpose of selecting a model is to enable the Legislature to establish a permanent universal service fund that will preserve and advance universal service, as required by section 254 of the Telecommunications Act of 1996 ("Act") and section 364.025 of the Florida Statutes. The Commission's selection of a cost model should be informed by this underlying purpose. It is thus imperative that the model selected by the Commission produce accurate and reliable results, not just low costs.

There are two proxy models before the Commission -- the Benchmark Cost Proxy Model 3.1 ("BCPM"), sponsored by BellSouth Telecommunications, Inc. ("BellSouth") and Sprint-Florida, Incorporated ("Sprint") and recommended by GTE Florida Incorporated ("GTE"), and the HAI Model, Version 5.0a ("HAI 5.0a" or "Hatfield Model"), sponsored by AT&T Communications of the Southern States, Inc. ("AT&T") and MCI Telecommunications Corporation ("MCI"). The models are analyzed in detail below, showing that BCPM is better. Unfortunately, neither will produce a fund large enough to preserve and advance universal service in this State.

The use of any proxy cost model to calculate universal service support levels is problematic. Universal service can be preserved only if support is calculated with reference to the cost that an efficient provider would incur today, as estimated by a company-specific model with company-specific inputs. Cost proxy models do not focus on today's costs. Rather, they examine theoretical long-run costs by estimating what it would cost a hypothetical carrier to provide service using a brand new network, built from scratch. Such models are inherently ill-suited to estimate what it will actually cost an efficient ILEC to provide service now.

Accordingly, regardless of which proxy model the Commission selects, a "reality check" will be needed to ensure that the model serves its intended purpose. To the extent the selected proxy model fails to produce an adequate fund, the Legislature should be advised that adjustments will be required in order to provide the necessary level of support.

Current ILEC revenues provide the requisite reality check. Specifically, the Legislature can determine the level of support needed to preserve universal service by comparing (1) current revenues generated by services that are priced above cost and (2) the revenues those services would produce if they were priced at economic cost. The latter can be calculated using the Commission's own prior findings as to the cost of unbundled network elements ("UNEs") and avoided retail costs.

Using current revenues to calculate support levels is appropriate because the principal purpose of telecommunications regulation has been to ensure that ILEC revenues reflect the actual cost efficiently incurred to provide service. Unless regulation has been a failure in Florida–and there is no reason to believe that it has–comparing current revenues to the revenues generated by pricing at cost is a reliable means of identifying the total amount of universal service support an efficient ILEC needs to provide universal service today.

II. ISSUE 1: SECTION 364.02, FLORIDA STATUTES, DEFINES "BASIC TELECOMMUNICATIONS SERVICE" FOR PURPOSES OF SECTION 364.025(4)(b)

Section 364.02 defines certain terms used in Chapter 364. It says that"*[a]s used in this chapter,*" basic local telecommunications service means "voice-grade, flat-rate residential, and flat-rate single-line business local exchange services which provide dial tone, local usage necessary to place unlimited calls within a local exchange area, dual tone multifrequency dialing, and access to the following: emergency services such as '911,' all locally available interexchange companies, directory assistance, operator services, relay services, and an alphabetical directory listing." (Fla. Stat. 364.02(2). (emphasis added).)

Section 364.025(4)(b) is, of course, part of Chapter 364. Thus, the definition of basic local telecommunications service in section 364.02 applies to section 364.025(4)(b). Any other conclusion would violate: (1) the explicit directive in section 364.02 regarding the scope of its definitions; and (2) the maxim that statutory provisions must be read in relation to one another.

The Commission cannot, as AT&T and the Florida Competitive Carriers Association ("FCCA") have argued, simply make up a definition of basic local telecommunications service for the purpose of this proceeding. These entities urge the Commission to broadly re-define this term to encompass an unspecified array of services beyond the elements listed in section 364.02. (*See* FCCA Prehearing Statement at 16-17). This attempt at statutory manipulation arises from the interexchange carriers' desire to include as many services as possible in the revenue benchmark that will likely be part of the universal service funding scheme. But the Commission is not establishing or even considering the benchmark issue in this proceeding, and the agency cannot, in any event, change the language of the statute to suit the political agenda of AT&T, FCCA, or any other party. It must use the basic local service definition the Legislature set forth in section 364.02(2).

III. ISSUE 2: BCPM IS THE APPROPRIATE COST PROXY MODEL FOR DETERMINING THE TOTAL FORWARD-LOOKING COST OF BASIC LOCAL TELECOMMUNICATION SERVICE IN FLORIDA

A. Introduction

As between BCPM and HAI 5.0a, the Commission should select the model that, based on the evidence in this proceeding, has the better platform, better inputs, and is more open for inspection and verification. As explained in great detail below, BCPM is the better model.

BCPM's platform, technology, and input assumptions are superior to those of the Hatfield Model. The foundation for BCPM's network architecture is the sound principle that telephone plant is located where most customers live and work: along roads, streets, and avenues. This is where telecommunications facilities are placed today, and will continue to be placed in a forward-looking environment. BCPM designs a network with carrier serving areas ("CSAs") to conform to all applicable engineering and design standards, its switching module reflects actual ILEC switching purchases, and its input values are based on current costs of forward-looking technology.

The Hatfield Model, on the other hand, is a failure. It is wholly unreliable in estimating the costs that ILECs reasonably incur in providing today's service because it studiously ignores the real-world constraints faced by ILECs. It uses no road data to locate customers or place plant. Its heralded "geocoding" process for locating customers is virtually useless in universal service proceedings because of its extremely high failure rates in the two lowest density zones -- the very areas in which an accurate location methodology is needed. Even if the success rates could be improved, geocoding is not a reliable modeling methodology because the information on "actual" customer locations is discarded early in the process. No plant is built to any actual "locations." The Hatfield Model designs CSAs by ignoring engineering standards, uses outdated technology to reduce costs, and fails to model network growth. The Hatfield Model's input values are the product of biased opinions and lack empirical support from a methodologically flawed "validation" process. Thus, it should be rejected.

The Commission previously rejected the Hatfield Model because of understated costs and inaccessibility when AT&T and MCI presented it in the arbitrations under the Act, and these problems have only gotten worse in the current version. See, e.g., *Petitions by AT&T Communications of the Southern States, Inc., et al. ("GTE/ATT Arbitration Order")*, Order PSC-97-0064-FOF-TP at 31 (Jan. 17, 1997). Indeed, the present incarnation of the Hatfield Model *reduces* the cost of the loop by $2 from the level generated by the earlier Version 2.2.2. (Tr. 1752-53 (Wood).) Moreover, the forward-looking costs that HAI 5.0a generates are less than half of GTE's current costs. (Tr. 1999 (Tardiff).) Clearly, using HAI 5.0a to calculate costs would jeopardize the continuation of universal service.

Likewise, the Commission should reject FCCA witness Joseph Gillan's recommendation to forego calculating the cost of basic local telecommunications service as defined in Florida Statutes section 364.02, and instead add up the costs of a "family of exchange services" to measure subsidies and thus determine the need for a universal service fund. (Tr. 602-09 (Gillan)). This novel approach is easily dismissed, as accepting it would violate Florida and federal law on several counts. First, as GTE pointed out in response to Issue 1, it impermissibly substitutes a made-up definition of basic local telecommunications service for the one that exists in the statute (Chap. 364.02(2)) and that necessarily governs this proceeding. Second, it ignores the Commission's mandate to choose a cost model to determine just the cost of basic local service (and not the cost of vertical, toll, or other services Mr. Gillan might include in his cost analysis). Third, there is no evidence–let alone the requisite competent and substantial evidence–to justify approving Mr. Gillan's theory. Mr. Gillan never defines exactly what the "family of services" would include and, in any event, no party has presented cost studies here for anything beyond basic local telecommunications service as defined in the Florida Statutes. Fourth, Mr. Gillan's recommendation would violate the Act's requirement to make implicit subsidies explicit. Indeed, his recommendation appears designed specifically to maintain the *status quo* of intercustomer and interservice subsidies.

As GTE witness Carl Danner testified–and as Mr. Gillan readily agreed–loop costs are caused by the customer's decision to have basic telephone service. (Tr. 1439 (Danner)). Both HAI 5.0a and BCPM recognize this fact. As an economist, Mr. Gillan must join with virtually all others in his field in advising against the "fool's errand of cost-assignment," (Tr. 602 (Gillan).) which would advocate allocation of some part of the loop and switch to other than local exchange services. But while Mr. Gillan's family of services theory may be more palatable to him on economic grounds, its failure on multiple legal and policy grounds renders it as unacceptable as the "junk science" alternative of loop cost allocation.

B. <u>The Hatfield Model Fails Several Validity Tests</u>

The bulk of this brief examines the inner workings of BCPM and HAI 5.0a -- their economic and engineering assumptions, algorithms, inputs and empirical support. However, the validity of these models can be first evaluated by comparing their results -- their "output" -- to certain realities. Indeed, GTE submits that the output of any cost model *must* be rigorously tested before determining its overall accuracy and reasonableness. (Tr. 1998-2000 (Tardiff)). Commissioner Johnson recognized the importance of such tests: "The purpose of the model is to estimate -- to accurately estimate the cost to serve customers; and to determine whether the model is accurate in that regard, we need to look at some internal validity tests." (Tr. 1093). Accordingly, GTE subjected BCPM and the HAI Model to three validity tests described below. In each instance, BCPM produced more accurate results than the HAI Model. GTE put HAI 5.0a's switching module to a fourth test, which it also failed.

1. Current Regulated Support Needs vs. Model Results

A comparison of the forward-looking universal service requirement for GTE produced by BCPM and HAI 5.0a with GTE's estimated current implicit support flow is a simple, yet crucial measure of each model's accuracy. Each model is supposed to lead to a universal service fund that replaces today's implicit subsidies with explicit support. AT&T/MCI cannot seriously dispute that regulated, above-cost prices for access, toll and vertical services currently provide substantial implicit support for basic service. Nor can AT&T oppose a mechanism in Florida that shifts those subsidies into a universal service fund. AT&T has admitted elsewhere that the ILECs are entitled to recoup all lost revenues from reductions in access charges from either a universal service fund or rate rebalancing to achieve revenue neutrality: "Either when you lower access, you at the same time receive funds from the universal service [or] ... some rate rebalancing...In other words, we [AT&T] agree that access is an implicit subsidy going to support residential local service. And, no, you shouldn't have that taken away and reduce access independently." (Tr. 1322 (Seaman, quoting G. Blaine Darrah III, Director-Regulatory, AT&T, Generic Inv. of Intrastate Access Charge Reform, Pa. PUC Dkt. I-00960066, Tr. 612-13 (Sept. 11, 1997).)

GTE witness Meade Seaman presented a conservative estimate of the amount of implicit support GTE receives by comparing the total amount of its 1997 revenues from access, toll, and vertical services with their economic costs (using the Commission's prior UNE and avoided cost findings), plus a forward-looking fixed allocator for joint and common cost. (Tr. 1311-13 (Seaman)). This calculation reveals that the amount of implicit support currently flowing from those optional services is approximately $487 million. (*Id.*) Although BCPM's estimate of GTE's support requirement is somewhat lower, at approximately $356 million, BCPM's output is much more reasonable than Hatfield's drastically lower results. (*Id.*)

Mr. Seaman's analysis assumes that GTE's current revenues reflect the efficient cost of providing service today. That assumption should not be controversial. The Commission's regulation of GTE has assured that the company's rates are "fair, just, reasonable, and sufficient." Fla. Stat. sec. 364.03(1).

Indeed, the Legislature has instructed the Commission to "continue its historical role as a *surrogate for competition* for monopoly services provided by local exchange companies." Fla. Stat. 364.01(4)(i) (emphasis added). To this end, the Commission regulates ILECs so as to encourage them to make the same economic decisions they would make in a fully competitive environment. (*Id.*)

If the Commission has successfully performed its function, then GTE's current revenues necessarily reflect the revenues the company would earn in a fully competitive environment, *i.e.*, the total actual cost that an efficient provider would incur in providing full service today, including a reasonable profit. Since there is no reason to doubt that the Commission has done its job, current revenues are the proper basis for calculating the support necessary to preserve and advance universal service–and the appropriate baseline for assessing and adjusting the chosen cost model.

The Hatfield Model, on the other hand, generates support that is only a small fraction of what is needed to replace existing implicit subsidies. The Hatfield Model simply does not bear out what AT&T's own witness admitted—that the difference between forward-looking, cost-based rates and current regulated rates should not be lost by the ILECs, but recouped through the universal service fund.

2. Current Investments And Expenses vs. Model Results

BCPM also performed better than the Hatfield Model in the second validity test GTE conducted. In this test, GTE witness Dr. Timothy Tardiff compared GTE's actual investments and expenses in Florida as reported in ARMIS 43-03, 43-04, 43-07 and 43-08, with those predicted by BCPM and HAI 5.0a.

Table 1
Reported Investment and Expense Comparison
GTE Florida -- BCPM vs. HAI 5.0a

Cost Category	Actual	BCPM	BCPM/ Actual	HAI 5.0a	HAI 5.0a/ Actual
Total Plant In Service	3,785,206	2,442,449	65%	1,498,682	40%
Plant Specific Expenses	228,238	120,350	53%	78,687	34%
Plant Non-Specific Operations	455,574	309,620	68%	137,006	30%
Corporate Operations	161,487	58,022	36%	37,925	23%
Total Operating Expenses	845,299	487,992	58%	253,618	30%

(Tr. 2000 (Tardiff)).

In this analysis, BCPM produces 65% of GTE's total plant in service ("TPIS") and 58% of GTE's total operating expenses. This is much more reasonable than the 40% of reported TPIS and 30% of operating expense produced by the HAI Model. This Commission has never found GTE's investments and expenses to be as imprudent or excessive as HAI 5.0a depicts. While forward-looking costs and current costs may not necessarily match dollar-for-dollar, a model that produces forward-looking costs that are a mere 40% of today's investments and 30% of today's expenses simply is not credible. (Tr. 1990 (Tardiff)).

This is particularly true given that forward-looking unit costs for labor and most telecommunications equipment are greater than historical costs. AT&T's Don Wood admitted this, (Tr. 1778 (Wood)), and AT&T made this very point to the FCC in an access reform proceeding to bolster its argument that the ILECs had no "stranded costs" to recover from above-cost access charges. Specifically, in a sworn affidavit submitted by Lee L. Selwyn and Patricia D. Kratvin on AT&T's behalf, AT&T acknowledged that forward-looking labor and material costs are likely to exceed actual costs for most of the major categories of ILEC plant and equipment:

> [A] large portion of the older (*i.e.*, pre-1990) vintage plant remaining on the ILECs' books consists of physical assets whose economic values may have actually appreciated, in that similar plant is still being acquired at reproduction costs (such as those reflected in T[E]LRIC studies) that in many cases are likely to be *greater* than the original (historic) acquisition cost.

(Ex. 70 at 14).

Despite increasing unit costs, Mr. Wood speculated that the overall effect of a forward-looking environment is a downward adjustment on total costs. (Tr. 1788, 1790 (Wood)). Dr. Tardiff also estimated the reproduction cost of GTE's existing network in Florida by multiplying the historic cost of its components by a factor from the Turner Telephone Plant Index based on cost trends for items such as copper, fiber and switches. (Tr. 2000 (Tardiff)). This analysis shows that BCPM estimates TPIS that is 61% of the reproduction cost of GTE's existing network. (*Id.*) HAI 5.0a, however, builds a forward-looking network that is only 38% of current reproduction cost. (*Id.*) Again, it is simply not credible that investment would drop more than 60% from reproduction costs on a forward-looking basis.

3. MST Distance vs. Model Results

As a third validity test, GTE, BellSouth and Sprint performed a Minimum Spanning Tree ("MST") analysis upon the distribution plant designed by BCPM and HAI 5.0a in their respective serving areas. The MST is the set of line segments connecting a set of points whose total length is the *shortest possible* for that set of points. (Tr. 953 (Duffy-Deno); 1493 (Staihr)). The purpose of the MST analysis is to test whether each model builds the minimum plant needed to connect all customers to the network. In actuality, distribution distances will likely exceed the MST distance because rights-of-way, bodies of water, and other natural obstacles often prevent plant from being placed in the most direct fashion. (Tr. 953 (Duffy-Deno)). MST does, however, serve as a valid measure of the internal consistency of a model, for if a model underbuilds, it cannot work. (Tr. 1493 (Staihr)).

BellSouth witness Dr. Kevin Duffy-Deno presented a detailed MST analysis of both BCPM and HAI 5.0a. His results for BCPM are displayed on page 38-39 of his rebuttal testimony. (Tr. 962-63 (Duffy-Deno)). In summary, he found that BCPM estimates sufficient cable to connect all customers to the network in all but 4% of the grids in BellSouth's serving area. BCPM fell 24% short in the amount of necessary route feet of cable in these grids. (Tr. 997 (Duffy-Deno)). Most of the grids where insufficient plant is modeled are in the lowest two density zones. But, BCPM produces enough route distance for each density zone as a whole.

While not perfect, BCPM's estimate of plant is more sound than that produced by the Hatfield Model. Dr. Duffy-Deno found far greater problems in HAI 5.0a for BellSouth's service area. As depicted in detail below, HAI 5.0a's understatement of plant is the most egregious in the rural areas—precisely where accurate and reliable cost estimates are crucial.

Table 2
MST Analysis of the HAI Model
(MC = Main Clusters)

DZ	MC Shortage	MST for Short MC	% Short	Number of MC Short	Number of MC in DZ	Number of MC Short in DZ (%)
<5	2,784,677	6,569,067	42.39%	136	157	86.62%
5 - 20	4,491,981	15,795,651	28.44%	265	396	66.92%
20 - 100	1,793,590	7,124,473	25.18%	142	415	34.22%
7 Other DZs	784,167	4,264,739	18.39%	181	4,980	3.63%
	9,854,415	**33,753,930**	**29.19%**	**724**	**5,948**	**12.17%**

(Tr. 957-58 (Duffy-Deno)). As Table 2 shows, HAI 5.0a cannot connect all customers to the network in 87% of main clusters in the lowest density zone because it has only 57% of the necessary cable. Sixty-seven percent in the next lowest density zone cannot be connected. HAI 5.0a understates distribution plant for BellSouth alone by 9.9 million feet (1,866 miles) -- enough cable to connect Jacksonville and Rapid City, South Dakota. (*Id.* at 958). In Sprint's low density areas, HAI 5.0a has insufficient plant 90% of the time. (Tr. 1494, 1519 (Staihr)).

Dr. Tardiff performed a MST analysis for GTE's service territory, and likewise determined that 11% of clusters in GTE's service areas would have insufficient cable. (Tr. 2008 (Tardiff)). For GTE, 77 main clusters (3.7%) had less than 50% of the minimum plant necessary. (*Id.*) The costs in rural areas are critical in assessing universal service requirements because the lion's share of support can be attributed to these two density zones. But, the results from the two lowest density zones are a more serious indictment of the Hatfield Model. Specifically, 46 of the Hatfield Model's clusters (92%) in the lowest density zone underestimate plant by at least 43%. (*Id.*) Similarly, 85 clusters (39%) in the second lowest density zone have insufficient cable.

4. Actual Switching Costs From NBI Study vs. Hatfield Model Results

As the final means of testing the external validity of the Hatfield Model, GTE determined the switching investment per line actually produced by HAI 5.0a when run for all GTE operating companies in the United States. (Ex. 70 at 15). This "output" was then compared with an external fact -- the GTE per line switch investment figure upon which the Hatfield Model developers relied to develop switch prices: the Northern Business Information Study ("NBI Study").[1] If the Hatfield Model worked properly, these two figures would be equal.

HAI 5.0a uses the NBI Study as its primary source for accurate, forward-looking switch cost data, and applies this data to calculate a per line vendor switch price. (Ex. 43 (DJW-2 at 57-58)). The NBI Study figure for GTE's per line price is $118. (Ex. 70 at 15). HAI 5.0a then adds an EF&I factor of 10% to derive the installed cost of a switch which, in GTE's case, is $129.80 per line. (Ex. 43 (DJW-2 at 77); Ex. 70 at 16).

The Hatfield Model's investment input spreadsheet for all GTE jurisdictions was then used to divide the national total of GTE switched lines (16,368,115) by the corresponding national switching investment ($1,696,244,010), which produced a national, per line GTE switching investment value of $103.63. (*Id.*)

The $26.17 variation between the computed per line switching cost produced by HAI 5.0a ($103.63) and the publicly available per line switch cost used in the model ($129.80) demonstrates the Hatfield Model's inability to produce reliable results. HAI 5.0a relies upon the NBI Study as representative of the ILECs' forward-looking costs, yet the model's internal computations are incapable of duplicating the very data upon which it relies. When compared with the NBI Study, the Hatfield Model produces a nationwide shortfall of more than $428 million for GTE alone. (*Id.*)

5. The Hatfield Model's Unchanging Bottom Line From Version to Version Destroys Its Credibility as a Valid Cost Model

Aside from the validity tests described above, the evolution of the Hatfield Model vividly illustrates that it is little more than a result-oriented advocacy device designed to produce artificially low estimates of forward-looking costs. This conclusion comports with this Commission's earlier finding that "the Hatfield Model appears to understate costs." (GTE/ATT Arb. Order at 31.)

Over the past two years, AT&T has presented several versions of the Hatfield Model, each significantly different from its predecessor. Mr. Wood proudly claimed that HAI 5.0a is "completely

---

[1] In 1996, the alleged average cost per line for switching incurred by GTE as reported by the NBI Study was $118. (Ex. 70 at 16). GTE does not concede that this figure is correct.

changed" from prior versions. (Tr. 864 (Wood)). Yet, each successive version has been so seriously flawed that a new version was necessary within a few months. What is most troubling about this pattern is that HAI 5.0a shows no sign of progressing toward a better model. Whenever a necessary change increased costs in one part of the model, the modelers simultaneously inserted cost decreases elsewhere, which were always sufficient to prevent any material total cost increase. (Ex. 70 at 17). Despite successive revisions, the bottom line of the Hatfield Model has remained essentially the same. Loop costs and total costs have remained artificially low. This unchanging bottom line destroys the underlying integrity and plausibility of the model.

Table 3, which focuses on the Hatfield Model's outputs for GTE California, shows that significant increases from version to version in route miles have had little effect upon the model's outputs.

Table 3
The Evolution of the HAI Model -- GTE California

Version	**2.2.2**	**3.0**	**3.1**	**3.1 Update**	**4.0 Prelim**	**4.0**	**5.0a**
Release Date	9/4/96	2/7/97	2/28/97	4/12/97	7/1/9	8/1/97	12/11/97
Total Loop	$11.12	$12.64	$12.08	$11.24	$9.46	$9.50	$8.43
Cost of Switched Network Elements	$15.93	$16.59	$17.40	$16.59	$14.12	$14.16	$12.99
Route Miles	17,492	46,821	50,792	37,485	27,407	27,371	24,412

(Ex. 70 at 17).

First, consider the change of the 170% increase in route miles that took place between Versions 2.2.2 and 3.0. One would expect a $250 million cost increase based on the Hatfield Model's inputs for the structures needed to support 29,329 new route miles of cable. (Ex. 70 at 18). However, no significant increase was *ever* reflected in the Hatfield Model's bottom line. Version 3.0 generated a loop cost estimate that was only $1.50 greater than in Version 2.2.2. A comparison for GTE in Florida would likely be no different. Indeed, Mr. Wood conceded that HAI 5.0a's loop costs ($9.81) are almost $2 less than those in Version 2.2.2 ($11.44), which this Commission previously rejected as too low. (Tr. 881, 1752-53 (Wood)).

The reason for this seeming anomaly is that new, largely unsupported cost reductions offset any cost increases. For example, significant cost reductions were created by hypothetical efficiency gains. (Ex. 70 at 18). The "network operations factor" was reduced for no apparent reason from 70% to 50%. Structure sharing factors, costs due to plant mix, and the cost for buried and underground structures in most density zones were all lowered dramatically. (*Id.*)

Second, consider the changes between Version 3.1 and Version 3.1 (Update). Version 3.1 contained a series of irrefutable algorithmic errors. Sensitivity analyses indicated that the correction of these errors would result in a cost *increase*. (*Id.*) However, when the model sponsors filed Version 3.1 (Update), total loop and total switched network element costs actually *decreased*. Although the modelers made five corrections that led to increased costs, they simultaneously introduced a new database and a new algorithm for backbone tapering that offset those cost increases. (*Id.* at 19).

A more recent example can be seen by a change in Version 4.0 which carried into HAI 5.0a. HAI 5.0a now contains sub-feeder plant for every Census Block Group ("CBG"). Previously, sub-feeder existed only when the main feeder did not intersect the CBG. (*Id.*) Thus, one could reasonably expect that total cable investment in HAI 5.0a would exceed total cable investment in Version 3.1 (Update). However, HAI 5.0a actually shows a decrease in total cable investment over Version 3.1 (Update). This decrease is caused by significantly reduced cable prices, which leads to a substantial *decrease* in loop investment. (*Id.*) Careful analysis of the effects of these reductions shows that the material cost for distribution and feeder cables with 1,200 pairs or more has actually been driven to *negative* values. (*Id.*)

The pattern is clear: whenever a version of the Hatfield Model has been impeached with hard evidence of inadequate plant or insufficient costs, AT&T has responded by implementing downward adjustments in the model's theoretical and speculative assumptions -- opinions that are less subject to empirical contradiction. The low loop costs exhibited in Table 3 are less the product of an accurate, unbiased methodology, and more the result of an AT&T/MCI consensus regarding the amount they are willing to pay to enter the market. This result-oriented process has poisoned HAI 5.0a, just as it poisoned Hatfield Version 2.2.2, which the Commission previously rejected.

C. BCPM's Customer Location Method, CSA Design and Selection of Technology Leads to A Platform That Is Superior to the Hatfield Model

A cost model can accurately and reliably estimate forward-looking costs only if it is based on a network "platform" that implements the proper engineering assumptions and mathematical algorithms and deploys proper technology. The platform must do several things correctly. First, it must accurately locate the customers that the network will serve, and must use those locations to the greatest extent possible when building the network. (Tr. 1473 (Staihr)). Second, the platform must properly design carrier serving areas in accordance with generally accepted engineering guidelines, thereby resulting in telephone plant that will serve customers efficiently and in a least cost manner. Finally, the platform must utilize forward-looking technology that will provide all customers with comparable levels of acceptable service.

1. Customer Location Methodology

The proponents of BCPM and the Hatfield Model devoted significant effort to establish that their respective models deploy the more accurate customer location methodology. Not only is the customer location methodology the first task undertaken by both models, it is critical to their ability to accurately estimate costs. (Tr. 977 (Duffy-Deno)). Customer locations affect costs because they drive (or should drive) the design of the network's loop: its CSAs, where the outside plant must go, how many miles of cable are needed to reach all customers, how many poles are needed, etc. (Tr. 991 (Duffy-Deno); 1472 (Staihr)). Getting the loop design right is important because the loop comprises approximately 75-90% of the network's cost. (Tr. 990 (Duffy-Deno); 1472 Staihr)). Locating customers in rural and insular areas is essential to developing reliable cost estimates on a geographically deaveraged basis because the two lowest density zones in Florida—where universal service support is most needed — make up 69% of its populated land area. (Tr. 977 (Duffy-Deno)).

BCPM designs carrier serving areas based on the premise that customers are located near and along roads. (Tr. 992 (Duffy-Deno)). Empirical analysis and common experience prove the reasonableness of this assumption. (Tr. 985 (Duffy-Deno)). As required in the "scorched node" environment, BCPM begins with data on existing wire centers, wire center boundaries and the number of housing units in each census block ("CB"). (Tr. 983 (Duffy-Deno)). Importantly, BCPM treats each "housing unit" as a customer. (Tr. 518 (Staihr); 992 (Duffy-Deno)). BCPM uses existing maps and road data to determine *exactly* where and how much road is in each CB. (Tr. 985 (Duffy-Deno)). BCPM, however, only utilizes the streets and avenues that are likely to be residential or commercial. Road feet associated with driveways, on and off ramps, superhighways, and four wheel drive access roads, for example, are not taken into account. (Tr. 1543 (Staihr); 1031-32 (Duffy-Deno)).

Using this data, BCPM then begins to locate customers and design carrier serving areas. First, all wire centers are sectioned into microgrids, which are approximately 1,500 feet by 1,700 feet. (Tr. 984 (Duffy-Deno)). All customers within each CB are assigned to these small microgrids based on road length data. (Tr. 507 (Staihr)). For instance, if there are 60 miles of road in a CB having 20 microgrids, and three of those road miles (5%) are within one microgrid, then 5% of the household and business line data will be allocated to that microgrid. (Tr. 984 (Duffy-Deno)). A microgrid with no roads gets no customers, and unpopulated microgrids are not included in any design. (*Id.*) Through this process, all customers are assigned to a small area of the CB.

Next, BCPM uses these populated microgrids to design its CSAs. After all customers are assigned to microgrids, they are aggregated into larger "ultimate grids" according to housing and business line data, and the technological and engineering constraints of CSAs. (Tr. 508 (Staihr); 1193 (Bowman)). The ultimate grids are the CSAs, and realistically reflect the manner in which customers are actually clustered.

Once a CSA has been established, BCPM again uses the existing road network to target the placement of the DLC equipment needed to serve the customers where they are located in the CSA. (Tr. 509 (Staihr)). BCPM locates a point in the middle of all roads in the CSA and places a digital loop carrier at this central location—the "road centroid." (Tr. 987 (Duffy-Deno)). The CSA is then divided into four quadrants, which are designated as distribution areas ("DAs"). (*Id.*) Within each DA, another road centroid is established for the placement of DLC equipment. (*Id.*) By using the center of roads (and thus customers) to determine where to place DLC equipment, BCPM puts them in the most efficient location -- close to customers.

The sponsors of BCPM confirmed the accuracy of BCPM's customer location methodology through empirical analysis. Dr. Duffy-Deno randomly selected the Yankeetown wire center in Levy County, which is classified in the lowest density zone. (Tr. 936 (Duffy-Deno)). Environmental Research Institute of Michigan then analyzed a 1995 satellite photograph this wire center and identified all housing units. (Tr. 936-37 (Duffy-Deno)). The longitude and latitude of these housing units were digitalized and then compared to the predicted customer locations produced by BCPM. (*Id.*)

This analysis demonstrated that BCPM's customer location methodology is accurate. Sixty-two percent of actual locations within the Yankeetown wire center were located within three miles of the central office, whereas BCPM predicts that 66% of housing units were located in the same radius. (Tr. 943 (Duffy-Deno)). At a 10-mile radius, BCPM's predicted housing unit locations and the actual locations are 86% and 88%. (*Id.*) Significantly, the correlation between the actual house counts and BCPM's predicted housing units is 0.99. (*Id.*; Tr. 507-08 (Staihr)).

This empirical evidence of the accuracy of BCPM's customer location methodology stands unrebutted. No comparable evidence of HAI 5.0a's accuracy was offered by the Hatfield Model's sponsors. (Tr. 941 (Duffy-Deno)). In fact, AT&T/MCI effectively thwarted attempts by BCPM's proponents to present a similar analysis for HAI 5.0a by refusing to provide the necessary customer location data. (Tr. 943 (Duffy-Deno)). Instead, HAI 5.0a rests upon its developers' assurances that it is more accurate than BCPM's grid methodology. Because only BCPM's customer location methodology has been subjected to and confirmed by empirical evaluation, BCPM should be used to calculate universal service costs.

The Hatfield Model never uses road data to locate customers or design outside plant. Instead, it uses a combination of "geocoding" and "surrogate" locations to place customers within the CB. The

Hatfield Model sponsors may claim that geocoding permits a far more accurate determination of customer location, but this assertion is vastly overstated and not supported by the evidence in this record.

While HAI 5.0a's developers have revamped its customer location methodology—attempting to geocode locations— the simple fact is the majority of customers in high cost areas will be located by arbitrarily placing them along the CB boundary, not through geocoding. This is true for several reasons. First, many customers are never candidates for geocoding because the process begins with incomplete data on the number of customers to be served. Only existing "households" with telephone service are counted; "housing units" that may not have service today, but may have it next month, are ignored. (Tr. 1098-1100 (Duffy-Deno); 1600-01 (Staihr)). Second, the Metromail and Dun & Bradstreet databases that supply the customer addresses do not contain a listing for all Florida customers. (Ex. 70 at 44). Third, all P.O. Box and rural route addresses cannot be geocoded. (Tr. 930 (Duffy-Deno)).

Even for those households to which geocoding does apply, the success rate is so poor that an understanding of the process is arguably not necessary. HAI 5.0a sponsors concede that 179 out of 469 wire centers in Florida (38.16% of the total) have a geocoding success rate of less than 50%. (Tr. 932-33 (Duffy-Deno)). For 25 wire centers— all in the lowest density zone—the geocoding success rate is exactly *zero*. (*Id.*)

The ungeocoded customers, however, are the customers most likely to require universal service support. The Hatfield Model's own sponsors estimate that, on a nationwide basis, approximately 99% of customers entitled to universal service support are located in the two density zones below 100 lines/sq. mile. (Ex. 65 (DJW-BFP-6). But, these are precisely the areas where geocoding is least successful. In Florida, only 34% of the customers in density zone 0-5 lines/sq. mile are geocoded, and only 32% are geocoded in density zone 6-100 lines/sq. mile. (Tr. 932 (Duffy-Deno)). In summary, a significant percentage of Florida customers are *never* candidates for geocoding, and geocoding fails for even greater percentages of customers in Florida's two most rural density zones.

All customers that cannot be geocoded are given "surrogate locations" on the CB's boundary, regardless of whether there are any roads along this boundary, or even if it is a lake or mountain. (Tr. 930 (Duffy-Deno)). The Hatfield Model *never* allocates customers to the interior of the CB based upon road network data. (*Id.*) This is particularly significant in Florida because almost 50% of populated roads are interior to CBs in the lowest density zone. (Tr. 938 (Duffy-Deno)). In all density zones with less than 20 housing units per square mile, 44% of all populated roads are interior to the CB. (*Id.* at 937). Accordingly, these rural customers will necessarily be located incorrectly by the Hatfield Model.

AT&T and MCI respond with the facile claim that moving customers to the boundary is a conservative approach resulting in higher costs. This is not true. Moving customers from several adjoining CBs creates artificial, narrow groupings on their common borders, rather than dispersing them. The BCPM sponsors also proved empirically that costs are lower when customers are put on the CB boundary. (Tr. 938-39 (Duffy-Deno); 1604-05 (Staihr)).

Moreover, no "geocoded" locations are actually used to design the network. After placing some customers on "actual" locations and others on "surrogate" points, a number of proprietary, complex algorithms operating at PNR's offices in Pennsylvania design rectangular CSAs. (Tr. 798-800 (Wood)). The only "locations" that are relevant to this process are those that eventually form the perimeter of each rectangle. The spatial relationship of interior points becomes irrelevant.

After the rectangle is formed, *all locations are discarded.* (Tr. 1487 (Staihr); 950 (Duffy-Deno)). Unlike BCPM, actual customer locations and road data are never used to determine where DLC equipment, feeder and distribution cable should run. Instead, each CSA is divided into assumed customer lots, which evenly but arbitrarily take up the entire serving area, regardless of any actual customer groupings. (Tr. 950 (Duffy-Deno)). The Hatfield Model then arbitrarily moves all customers from their "geocoded" or "surrogate" location within the CSA (not even the Hatfield Model sponsors may know this location) to one of the uniform, often large plots. It then designs backbone and branch cable to reach each fictitious customer location.

This arbitrary relocation and distribution of customers within serving areas renders HAI 5.0a inferior to BCPM. The simple fact is that assigning customers to microgrids, and designing CSAs based on existing roads and customer locations in microgrids is more accurate than HAI 5.0a's method, which uses no roads or fixed customer reference points. The evidence has shown that the process of forming rectangular CSAs, moving customers around, and compressing them into narrow lots artificially reduces costs. The resulting Hatfield Model's distribution network bears no resemblance to reality or the actual network configuration.

2. <u>Compliance With Engineering Standards</u>

As discussed above, BCPM and the Hatfield Model form CSAs after making their respective determinations about where customers are located. A CSA denotes a geographic area and group of customers that can be served by a single DLC site. (Tr. 1193 (Bowman)). Engineering rules govern (or should govern) how customers are grouped into CSAs. The divergent methods by which BCPM and HAI 5.0a form their CSAs and design their networks have a dramatic impact on costs.

In designing outside plant, network engineers are expected to recognize accepted industry guidelines and practices. Many of these are documented in authoritative publications such as AT&T's *Outside Plant Engineering Handbook* ("*AT&T Handbook*"), re-released in October 1996, and *Bellcore Notes on the Networks*. (Tr. 1218-19 (Bowman); 1985 (Murphy)). Other guidelines are set forth in the specifications issued by equipment manufacturers and standards organizations. These accepted engineering standards, which are imposed for service quality and safety reasons, cannot be ignored when building a network -- nor should they be ignored when costing out that network. BCPM abides by current engineering guidelines, thereby ensuring its costs estimates can realistically be achieved without compromising the quality of service, and allows for growth in its network. HAI 5.0a deliberately violates them.

Well-established CSA engineering rules limit the length of the standard 24-gauge copper wire that may extend from the DLC to the customer's premises to 12,000 feet. (Tr. 1219 (Bowman)). This standard is clearly stated in the *AT&T Handbook*:

> Each CSA will ultimately be served via a remote terminal (RT) which houses the digital carrier equipment and divides the feeder from the distribution network. The boundaries of the CSA are based on resistance limits of 900 ohms for the distribution plant beyond the RT. These limits basically equate to 9,000 feet (2743.2 m) of 26-gauge cable and 12,000 feet (3657.5 m) of 19-, 22-, or 24-gauge cable including bridge tap.

(Ex. 53 (RMB-1)). *Bellcore Notes on the Networks*, December 1997, also specifies 12,000 feet as the current carrier serving area standard to ensure quality 2-wire voice transmission, and the capability to support advanced digital services, including repeaterless Digital Data Service, and Integrated Services Digital Network ("ISDN") basic rate transmission. (Tr. 2613 (Wells)). In addition, Digital Switch Corporation ("DSC"), which manufactures the Litespan 2000 DLC equipment that both BCPM and the Hatfield Model deploy, "strongly recommends" that the 12,000 foot limitation be maintained. (Tr. 1219 (Bowman); Ex. 53 (RMB-3)). This 12,000 foot range may be exceeded only if an expensive extended range line card or DLC, and larger, 24-gauge cable is used in the loop. (Tr. 1194 (Bowman). Adhering to these standards ensures that a network is capable of providing advanced services. As noted by the FCC in its *Universal Service Order*, "[t]he loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services." *Universal Service Report and Order* at ¶ 250(1), CC Docket 96-45 (May 8,1997) (*"Order"*).

The BCPM network is designed to adhere to these standards. (Tr. 1196 (Bowman)). BCPM's engineering protocols include an average maximum loop length for each CSA that is less than 12,000 feet. (Tr. 1220 (Bowman)). BCPM achieves this by constraining the size of its CSAs to approximately 12,000 to 14,000 feet per side. (Tr. 1193 (Bowman)). When a loop extends 11,100 feet, BCPM models 24-gauge cable; when it exceeds 13,600 feet, BCPM includes an extended range card. (Tr. 1194, 1275 (Bowman)).

The Hatfield Model deliberately violates the 12,000 feet loop length standard. HAI 5.0a designs its entire network on the premise that every loop with 26-gauge copper cable may extend 18,000 feet beyond the DLC *without* an extended range line card. (Tr. 1220, 1275 (Bowman)). PNR's preprocessing algorithms form CSAs so that every customer can be up to 18,000 feet from the cluster's center. The Hatfield Model splits copper loops inside these CSAs only when they exceed 18,000 feet. (Ex. 43 (DJW-2 at 21, 42)). The Hatfield Model's sponsors have submitted no proof that any telephone company in the United States would design a network today based on an 18,000 foot copper loop standard, or violate the 12,000 foot rule. (Tr. 2609 (Wells)). The Hatfield Model's proponents casually reject authoritative sources such as *AT&T's Outside Plant Engineering Handbook* and *Bellcore Notes on the Networks* based solely the "opinion" of their consultants. (Tr. 2601 (Wells). They have no evidence that anyone else in the telecommunications industry believes that these accepted treatises on outside plant design have been "superceded." (Tr. 1985 (Murphy); 2647-48 (Wells)).

AT&T's response is that HAI 5.0a can be adjusted so that it splits copper loops at 12,000, rather than 18,000 feet. However, given that the Hatfield Model does not work properly, the only way to assuredly fix this problem is to have PNR re-run the clustering algorithm so that no cluster can have a loop longer than 12,000 feet beyond the DLC. This will undoubtedly lead to smaller and more numerous main clusters, and increased costs. Perhaps for that reason, AT&T has not offered this solution.

By disregarding the 12,000 foot standard, HAI 5.0a guarantees inferior service to more than 47,000 customers in Florida in BellSouth's territory alone. (Tr. 1214 (Bowman)). The line loss limit for good quality telephone service should not exceed 8.0 decibels ("dB"). (Ex. 70 at 23). HAI 5.0a produces loops that will lose approximately 12.2 dB for 26-gauge cable, and 10.5 dB for 24-gauge cable. (Tr. 1209-10 (Bowman)). This means that customers will have to shout into the phone to be heard.

In addition, the goal of a forward-looking design -- to have the entire local loop ultimately capable of supporting a transmission rate of 64 kb/sec -- cannot be achieved by HAI 5.0a. (Ex. 70 at 23; Ex. 53 (RMB-1)). Nonloaded 26-gauge cable is capable of providing this bit rate within 12,000 feet of the serving central office. Digital subscriber carrier (pair gain) is necessary to meet that bit rate beyond 12,000 feet. (*Id.*) By extending 26-gauge copper loops to 18,000 feet without extended range line cards, the modems of customers on these loops will not work at their designed speeds.

Having ignored the crucial 12,000 foot copper loop standard, the sponsors of the Hatfield Model found it easy to design a network in violation of other engineering rules, including the following:

Cable Sizing - The *AT&T Handbook* states that distribution cables should be sized for the "ultimate" pair requirements, not merely current demand, and recommends two pairs per residential living unit as the optimum choice, and five pairs per business unit. (Tr. 1985 (Murphy); Ex. 70 at 22). The Hatfield Model, by contrast, determines its distribution cable pair requirements based on the allocation of current ARMIS line counts and the application of distribution cable fill factors designed to satisfy "existing demand plus some amount of growth." (Ex. 43 (DJW-3 at 33)). This does not result in the placement of cable that is capable of serving the "ultimate" demand.

Joint Trenching – Joint trenching with power facilities should be employed only for distribution cables and service wires, not for feeder or trunk cables. (Ex. 70 at 23). HAI 5.0a, however, assumes buried feeder cable will *always* be jointly trenched, and allocates only 40% of the joint trenching costs to the ILEC, with the remainder to be paid by the power company.

Depth of Cable -- The *AT&T Handbook* recommends placing fiber optic cable at a depth of between 36-48 inches. Bellcore generally recommends a depth of two to four feet. *Bellcore Notes on the Networks*, Special Report SR-2275, Issue 3, December 1997, at 12-45.(Ex. 70 at 23). The Hatfield Model assumes the maximum depth for placement of fiber cable is 36 inches for all cable, ignoring instances where a greater depth may be required.

The Hatfield Model's practice of rejecting established guidelines and standards is significant in two respects. First, it demonstrates the Hatfield Model's tendency to reject empirical data in favor of unverifiable "expert opinion." Second, it demonstrates that the cost estimates produced by HAI 5.0a are not achievable unless accepted engineering standards, which are imposed for service quality and safety reasons, are ignored.

3. Technology Considerations

In addition to designing an inferior network, the Hatfield Model builds a network that cannot "talk" for universal service purposes because it fails to account properly for the following factors, either by underestimating or omitting them altogether:

Emergency 911 Costs. Access to emergency services, including in some instances, access to 911 and enhanced 911 ("E911") services is included in each party's definition of universal service. However, the Hatfield Model *does not include any investment or costs for emergency services*. (Ex. 70 at 103). There are no provisions for either the trunks or the databases necessary to offer emergency services.

Digital Loop Carriers. The Hatfield Model does not include many costs associated with digital loop carrier equipment. Specifically, capital costs for rights-of-way have not been included beyond the $3,000 allocated for site preparation and power. (Ex. 70 at 76-77). Site costs actually range from $40,000 to $60,000 in suburban areas; in urban areas, underground sites can cost up to $150,000. (*Id.*) HAI 5.0a also fails to account for the costs of precast concrete huts and controlled environment vaults that are commonly used to house DLC remote terminals.

Operation Support Systems Costs. An important aspect of providing telecommunications services is the ability to test and maintain all types of network elements. Presently, the two most common vehicles for performing these functions are the Switched Access Remote Test System ("SARTS") and the Mechanized Line Test ("MLT") system. (Ex. 70 at 68). AT&T agrees that loops must be tested and that technicians should be equipped for remote access to test systems from the field. (*Id.* at 100). HAI 5.0a, however, ignores all investment associated with test vehicles, and significantly understates an ILEC's associated test expenses. (*Id.* at 101). The Hatfield Model includes no costs for Special Service Centers ("SSCs") and SARTS because they are "embedded methodologies," not forward-looking technology. (*Id.* at 69). Yet, the Hatfield Model does not model *any* replacement testing technology. GTE estimates that these testing design errors result in an understatement of between $9 million and $11 million per test center. (*Id.* at 103).

Network Growth. BCPM recognizes that, for reasons of future efficiency and cost savings, a model must plan for future growth in customer demand. This avoids the inefficiencies and high costs of adding facilities, trenching in paved areas, *etc.*, when more lines are needed. ILECs have traditionally taken this approach in actually designing systems. BCPM accounts for future growth by (i) designing a network that uses sound engineering practices, (ii) building plant to all "housing units"; and (iii) using fiber-based DLC technology with remote terminals located close to actual customers, which enables BCPM to increase capacity just by adding equipment at the end of the fiber runs.

HAI 5.0a sacrifices the ability to handle future growth and access to advanced services in rural areas in favor of short-term savings. One example of this myopic approach is the Hatfield Model's decision to build plant only to "households." (Tr. 982 (Duffy-Deno)). Another is its use of T-1 on copper technology to serve small groups of customers in rural areas, or "outlier clusters." Conventional copper-based T-1 carrier is a 1970s technology, not a forward-looking technology. (Tr. 1216 (Bowman)). No one is installing it today. (Tr. 1981 (Murphy)). Because T-1 copper cable has considerably narrower bandwidth than fiber-based digital loop carrier, it cannot provide many advanced services to rural customers, such as ADSL. (Ex. 70 at 73-76). ADSL has been defined as "a transmission medium path that facilitates 6 Mbps digital signals downstream and 640 kbps digital signals upstream."*(Order at ¶ 380 n. 823)*. The maximum rate T-1 on copper can achieve is 2Mbps. Thus, copper-based T-1 carrier will not be able to handle the performance characteristics of high speed modems. (Tr. 1216-17 (Bowman)). The fiber-based DLC used in BCPM is currently more expensive than T-1 on copper, but is deployed because rural customers are entitled to the same forward-looking technology as customers in the denser serving areas. (Tr. 1473 (Staihr)). By using T-1 on copper, HAI 5.0a intentionally provides inferior service to Florida's most isolated, rural customers.

The Hatfield Model's use of T-1 on copper is also significantly more costly in the long run because only 24 standard voice paths are available over a T-1 on copper facility, and the model defaults to 90% fill or 22 lines. When this limited capacity exhausted and 3 more lines are needed, costly outside plant addition will be required to reach distant customers.

D. The Hatfield Model Should Be Rejected Because It Is Not Open For Inspection Or Verification

The sponsors of the Hatfield Model claim that a cost model should be rejected if the assumptions underlying its major cost drivers are not open for inspection and verification. Applying AT&T's own standard, the Commission should reject HAI 5.0a. HAI 5.0a is no more accessible than Hatfield Version

2.2.2, which the Commission rejected, in part, because it was unable to be thoroughly evaluated. (GTE/ATT Arb. Order at 31.)

AT&T/MCI tout geocoding as the Hatfield Model's greatest achievement. While geocoding sounds impressive, AT&T and MCI have provided no empirical evidence that geocoding works as advertised. Even worse, AT&T and MCI have effectively refused to open the geocoding process for inspection and verification by GTE, BellSouth, Sprint or the Commission. As a result, the Hatfield Model is nothing more than a "black box."

PNR performs the geocoding and decides the shape and location of the clusters that form the HAI 5.0a's CSAs. PNR purportedly follows three engineering constraints on clusters: (i) 1,800 maximum lines in a distribution area; (ii) 18,000 foot maximum loop length; and (iii) 2-mile maximum separation between customers. (Tr. 945 (Duffy-Deno)). PNR's clusters are deemed the "proprietary" product of at least 12 different databases and five independent models or algorithms that have a price tag of approximately $2.6 million. (Tr. 810 (Wood); Ex. 70 at 41). The geocoding and clustering is done completely outside HAI 5.0a, and cannot in any way be viewed or altered by the model's end user. (Tr. 1529-30 (Staihr)). The crucial results of this preprocessing -- the location and dimensions of the rectangular CSAs -- are an unalterable input to HAI 5.0a.

No other party has been permitted to verify that the PNR clustering is done correctly. Despite the increased importance of this data, AT&T has prevented any meaningful analysis of the PNR process, which should cause the Commission to question the model's reliability. In discovery, GTE moved to compel access to the numerous databases that are necessary to understand the geocoding and clustering processes. As usual, AT&T tried to hide behind the fact that the geocoding databases belong to PNR. (Tr. 805 (Wood)). The Commission directed only that AT&T should provide "reasonable access" to the requested information at PNR's offices, and AT&T promised to produce one database, the National Access Line Model ("NALM"). Despite that order, AT&T essentially precluded analysis of the Hatfield Model's integrity by waiting until the last minute to allow inspection, and then imposing severe restrictions on what GTE and others could do. AT&T never produced the NALM (Affidavit of Jino W. Kim at 3-4, submitted under Order PSC-98-1298-PCO-TP, Oct. 6, 1998.) As a result, no verification was possible. In light of the MST analysis, however, something is clearly amiss in the geocoding process. There are also significant unanswered questions concerning the exact number of addresses contained in Metromail's database, treatment of P.O. Box and rural addresses, and the accuracy of the Metromail address databases. (Ex. 70 at 44). In addition, there are many clusters that violate the model's engineering constraints on clusters. (Tr. 2050 (Murphy); 2006 (Tardiff)). Until the model is opened and these questions are answered, this Commission should take little comfort in AT&T's self-serving claims that HAI 5.0a is accurate.

The same discovery conducted by AT&T in a Washington State USF proceeding led to an adverse inference against HAI 5.0a, which even AT&T did not contest. (Tr. in UT-980311(A), Sept. 15, 1998, at 1204-05.) The Commission there agreed that:

> access to the pre-processed geocoding and clustering data used to "geocode" customers and create the customer serving areas is critical to evaluate the HAI Model's database and software.... AT&T's position leaves the parties and the Commission in a totally unacceptable 'black hole' with respect to evaluating this information.

Determining Costs for Universal Service, Dkt. VT-980311(a), Aug. 26, 1998, at 3.

In contrast to HAI, all of the formulas and algorithms used in BCPM are available to the user and all interested parties for review and comment, and can be modified by any user. Even its pre-processing algorithms and database are available for inspection. BCPM contains verifiable databases and processes from Stopwatch, Inc., a residential line count from the Census Bureau data (updated to 1995), a business line count from PNR, LERG data, and BLR data. BCPM is so accessible it can be run in conjunction with its website.

IV. ISSUE 3: COSTS SHOULD BE DETERMINED AT A WIRE CENTER OR SMALLER BASIS

Initially, GTE does not oppose calculation of costs at a wire center level, but the Commission should resolve to move toward a smaller unit of calculation. Specifically, wire center cost estimates should be de-averaged to reflect differences inside and outside base rate areas. The demarcation for the base rate area is about 12,000 feet from the wire center location. While the base rate area aggregates cost at a higher level than CB groups or grid cells, it still captures significant cost variations and would facilitate consistent rate-setting as between ILEC retail, resale and UNE service offerings. (Ex. 35 at 22-23.)

V. ISSUE 4: THE COMPANY-SPECIFIC BCPM INPUTS PROPOSED BY GTE, DERIVED FROM CURRENT COSTS AND EXPERIENCE, ARE MORE REASONABLE THAN THE OPINIONS REFLECTED IN THE HATFIELD MODEL

Like the analysis of the BCPM and HAI 5.0a platforms, the Commission should analyze input values in a two-step process. First, the Commission should evaluate the methods by which the inputs as a whole were developed. Logic dictates that a reasonable approach to developing a body of inputs should lead to reasonable input values. Conversely, an unreliable, biased approach to developing inputs leads to unreliable and biased results. Second, the Commission should review individual input values, paying particular attention to the most significant cost drivers.

Careful consideration of input values, and the process by which they are developed, is imperative in assessing a model's appropriateness. Under the best circumstances, it is difficult to validate the platform of a model, which depends heavily upon "forward-looking" economic and engineering assumptions. Because these assumptions, by their nature, relate to a telephone network that does not actually exist, they are necessarily dependent upon a variety of assumptions and expert opinions that are not easily verifiable against empirical data. On the other hand, input values, and particularly those values relating to outside plant placement costs, are more susceptible to precise quantification and empirical verification. If input values cannot be verified and reflect a bias toward lower costs, how can the outputs of the model be trusted? The simple answer is that they cannot.

The benchmark for a cost model's inputs is that they must reflect "forward-looking" costs. The FCC has defined forward-looking costs as "the least cost, most efficient, and reasonable technology *currently available for purchase with all inputs valued at current prices.*" *Order* at ¶ 224-26 (emphasis added). The FCC has thereby confirmed that the actual costs currently being incurred by the ILECs for forward-looking technology must be the touchstone for determining universal service support requirements, and cannot be casually dismissed as "embedded costs." (Tr. 1477 (Staihr)).

Universal service costs should also be based on company-specific inputs, not a set of national default values applicable to all companies. This is because each ILEC is currently the only carrier obligated to provide service in a particular area on a carrier of last resort basis. The ILEC networks will continue to be used, perhaps indefinitely, to provide service to end-users in such areas. Because the forward-looking costs of each ILEC's network should determine universal service support needs, each ILEC's costs are best estimated through the use of company-specific inputs that reflect the actual serving areas, production technologies, and cost characteristics of the company under study.

As explained below, the evidence has shown that the company-specific and default input assumptions in BCPM proposed by GTE are reasonable and verifiable because they are based on current data collected from ILECs. The Hatfield Model's "one-size-fits-all" inputs are not verifiable because they are based solely on the biased opinions of the model's developers, and have not been validated in any credible or reliable way.

Assuming its inputs are wrong, AT&T's fallback position is always that they are "user adjustable." But that misses the point -- the model should get them right. Moreover, the fact that a model's input data and assumptions are "user adjustable" does not mean that unreasonable or unverifiable default values can be ignored. Given the number of user adjustable inputs, and the difficulty that users will have in determining the precise nature of the costs sought to be captured by a model's input values, many of the predetermined default values will likely be utilized in determining the size of the universal service fund -- even if those values are inaccurate. At a minimum, the burden could likely fall upon the user (i.e., the Commission) to manually alter thousands of adjustable inputs. Because the default values are the likely starting point, all parties must have confidence that they have been accurately established.

A. <u>The BCPM Input Development Process Is Reliable</u>

BCPM derived its outside plant default values from a reliable and consistent source--its Best of Breed survey. (Ex. 57 (BCPM Model Methodology at 22); Tr. (Murphy 2035)). BCPM sponsors sent a data request to approximately ten different ILECs, with five responding to the survey. The values received were then averaged to determine BCPM's national default values. In a recent universal service fund proceeding in Pennsylvania, Dr. Robert Mercer, the principal architect of the Hatfield Model, confirmed the inherent reliability of the BCPM process:

> [I]nasmuch as the telephone companies have already gone through the bidding process, have, for instance, received ten bids, let's say, and have generally gone with the lowest qualified bid, *if you now take the average of those telephone companies, you will in effect be doing the same thing that Hatfield Associates would have done* or I should say that Mr. Donovan's team would have done. . . .
>
> . . . .
>
> If you take telephone companies and they answer that question, it seems to me that you're getting a filtering effect that says the average already represents the kind of lower bids that a telephone company would expect if it thought a contractor was qualified.

(Tr. 2035 (Murphy)). Through the Best of Breed survey, the BCPM sponsors used a wide database of prices currently paid by ILECs to derive reasonable and verifiable input values.

BCPM's default input values are also reasonable because they can be easily adjusted to become company-specific. As already noted, one must determine how a model uses an input and how inputs are manipulated to capture costs accurately before a default input can be adjusted. BCPM uses ILEC data to populate its input tables. Therefore, GTE data can be easily adjusted to conform to BCPM's input parameters.

B. The Hatfield Model Inputs Are the Result of Improper Methods

BCPM's methodology stands in stark contrast to the approach of the Hatfield Model. The Hatfield Model sponsors did not use consistent, reliable, or trustworthy methods to determine input values. They tout the fact that they did not use *any* data to determine values for approximately 1,578 inputs. Instead, AT&T/MCI relied solely on the collective "judgment" of several engineers they hired to help develop the model -- the "outside plant engineering team." (Tr. 2592 (Wells)). HAI 5.0a's adjustable inputs were developed with deliberate disregard of all current ILEC cost information, even where there was no publicly-available documentation and no indication that the ILECs' current costs are unreasonable. For that reason, they cannot be made company-specific.

The developers of the Hatfield Model recognized that no Commission could reasonably be expected to approve 1,578 inputs based only on the biased judgment of the outside engineering team. MCI witness James Wells admitted that the Hatfield Model sponsors were not comfortable proposing inputs without *some* empirical data, even if it was gathered after the fact. (Tr. 2650-51 (Wells)). Thus, the engineering team embarked on a "validation" effort to try to prove that their engineering and economic assumptions did not merely reflect arbitrary value judgments, but were supported by empirical data. The evidence has shown, however, that the engineering team found "support" for the model's controversial outside plant assumptions only by routinely ignoring empirical data that did not comport with their view of the forward-looking telephone network, and employing a methodologically unacceptable pick and choose approach to data collection.

In any well designed forecasting model or "validation" effort, data sources must be used consistently and recognize the relationship between various types of inputs. (Ex. 70 at 21, 29-30). For example, there will always be a trade off between capital and labor. A firm can choose a labor intensive strategy or a capital intensive strategy—not both. If a firm has high capital costs, it can be expected to have relatively lower labor costs. Different ILECs will choose different strategies. The Hatfield Model "validation" effort, however, utilized the low data point from whatever source could be found, and mixed these data sources together in costing out the supposed telephone system of the future. (*Id.*)

To achieve this end, the engineering team scoured the telecommunications literature, searching for any possible data source to support a low value. They drew upon data from a number of different sources, such as a New Hampshire study for the switch maintenance factor, an AT&T study for trunking requirements, a New York vendor quotation for pole costs, and an Iowa contractor for buried placement costs. (Ex. 70 at 25). When the team was unable to find any published industry source (a frequent occurrence), they based their values solely on the ubiquitous "opinion of outside experts," and expect this Commission to trust their judgment.

The engineering team chose to rely on opinions alone even when their own documents could have been used for validation. Mr. Wells was part of an effort at AT&T in 1996-1997 to estimate the cost of building a local telephone network. (Tr. 2651-52 (Wells)). Mr. Wells collected cost estimates for trenching, cable, etc., and kept documents reflecting these costs. Yet, Mr. Wells claims that he never asked AT&T for these documents after beginning his work on the engineering team, nor ever mentioned them to his teammates who were struggling to find supportive data. And, in what should be a startling revelation to this Commission, Mr. Wells conceded that AT&T destroyed all of the pricing documents that he had collected for AT&T's own use after he was transferred to the Hatfield Model project. (*Id.* at 2655).

The strategy to drum up support for pre-determined input values is best illustrated by AT&T's continuing attempt to justify the model's significant reduction in network operations expenses. The Hatfield Model assumes, on a "forward-looking basis," that an ILEC will incur only 50% of its present network operations costs. AT&T has produced a White Paper drafted by one of its employees, Paul Hansen, which discusses this assumption and demonstrates HAI 5.0a's bias toward low input values. (Ex. 70 at 26, 195).

Initially, the developers of the Hatfield Model cited a 1993 New Hampshire study to support their 50% network operations factor. When this assumption was shown to be invalid (the New Hampshire study is silent on this point), they abandoned this reference and relied instead upon testimony of a Pacific Bell witness, Richard Scholl, in a California Public Utility Commission/Universal Service proceeding. (Ex. 70 at 26). This reliance upon Mr. Scholl's testimony soon became, in AT&T's own words, a "problem" because he filed a declaration stating that the Hatfield Model proponents were misrepresenting his testimony. (Ex. 70 at 195). Presented with this evidence, AT&T's "solution" was not to develop an accurate estimate of a forward-looking network operations factor, but rather "[t]o find support" for the 50% factor they had already decided upon. (*Id.*) This was the express purpose of Mr. Hansen's White Paper. Now, instead of Mr. Scholl's testimony, the Hatfield Model's proponents attempt to justify their 50% reduction through a number of hypothetical and speculative opinions as to future efficiency gains that are not subject to empirical verification.

The HAI 5.0a developers' biased approach to operating expenses highlights two principal methodological flaws that infect the HAI 5.0a inputs. First, the sole focus is to achieve the results its sponsors seek. The Hansen White Paper was not directed toward ascertaining the appropriate network operations factor—the sole purpose was to create new "support" for a factor that had already been adopted. Second, and equally important, the sponsors have no hesitation in relying upon a "grab-bag" of data to support their assumptions—without regard to method, consistency, or contradictory data. Other examples of the Hatfield Model's data shopping practices are as follows:

> - It uses selected portions of industry studies. It relies upon a New Hampshire study to validate the low switch maintenance factor, but rejects the same study's findings regarding 125' average drop lengths that are much higher than those assumed in HAI 5.0a.
>
> - It relies upon certain Pole Attachment Agreements to support its assumption that poles are shared by telephone and power companies, but ignores the fact that those same agreements contradict HAI 5.0a's pole costs, sharing percentage assumptions, and its assumption that a 40-foot pole is standard in the industry.
>
> - It continues to rely upon certain data even after that data has been revised or is no longer reliable. For example, the AT&T Capacity Cost Study was updated in 1995, and the assumption regarding the trunk traffic for local exchanges was revised downward. Nevertheless, the Hatfield Model continues to rely upon the reference in the outdated study, which clearly is now applicable only to long distance trunks.

(Ex. 70 at 28).

As a methodological matter, this process of ignoring data, destroying documents, relying upon data from different companies, different geographic areas, and different time periods is patently flawed. By mixing inputs from inconsistent sources, selecting and omitting data from the same source, and always utilizing very low costs, the Hatfield Model designs a cheap telephone system that could never be built and a cost structure that will never exist. (Tr. 1987 (Tardiff); Ex. 70 at 25).

The bogus nature of the engineering team's "validation" effort is further demonstrated by its misuse of the empirical data that they themselves solicited. Prior to the release of Version 3.0, the engineering team sent a survey to vendors to collect substantiation for the engineering assumptions and default input values that had been used in Version 2.2.2. The express purpose of this survey was to obtain "an *average* cost of constructing local loop facilities to provide dial tone." (Ex. 70 at 31, 261). The engineering team received numerous written, detailed responses (known as the "Fassett Documents").

A review of these responses reveals that very few of the key components of the Hatfield Model are supported either by the empirical survey data or average industry prices. (*Id.* at 31-32).

The first thing learned from the vendor responses is that the engineering team quickly abandoned their plan to rely on average values (*Id.* at 31). This is because average prices seriously impeached the reasonableness of the pre-determined input values. (Tr. 2662 (Wells)).

Second, the vendor responses show that some inputs were improperly cobbled together from separate vendor quotes. (Ex. 70 at 34). For example, the Hatfield Model Inputs Portfolio now indicates that the material cost of a 40-foot pole is $201, and the labor cost to install the pole is $216, for a total of $417 per pole, including anchors, down wires, and guys. (Ex. 43 (DJW-3 at 25)). This value represents a significant reduction from the value in Version 2.2.2, where the modelers opined that the installed cost of a *35*-foot pole was $450. (Tr. 2037 (Murphy)). Notwithstanding the earlier consensus on a higher value for a shorter pole, the engineering team used the vendor response to select a $216 labor portion from one response, and a $201 material portion from another response to arrive at the reduced $417 value. (Ex. 70 at 33-34). The engineering team *never* received a contractor quote of $417 for the fully-loaded cost of an installed pole. All fully-loaded installed quotes were significantly higher. Moreover, the developers failed to increase the $216 labor estimate to include two critical components -- the contractor's overhead and profit -- which were specifically excluded from the bundled quotation, and ignored the fact that this quotation did not include the costs of guys and anchors. (*Id.* at 276-279). Other information received by the engineering team estimated the cost of down-guys and anchors to be $292 per pole. The $216 labor estimate was the lowest quote the engineering team received from anywhere in the country, and was lowered even further to $147 by applying a Florida labor adjustment factor of .68%.[2]

---

[2] Mr. Wells found *post hoc* support for the Hatfield Model's pole costs in certain data submitted to the FCC by several ILECs, which showed a wide disparity in costs. What he failed to point out in his written testimony was that the different pole costs was likely attributable to

(continued...)

The practice of rejecting the actual quotes received by the engineering team was commonplace. Moreover, instead of using the average quote, which was the admitted purpose of conducting the survey, the team systematically choose one of the lowest, and often the *absolute* lowest price quote received as the default value. Examples include inputs for buried drop placement (average -- $.70; lowest quote -- $.60; HAI 5.0a default -- $.60); and drop distances (average in suburban areas -- 86 feet; lowest -- 75 feet; default value -- 50 feet). (*Id.* at 35). A review of aerial drop values and manhole values reveal similar results.[3]

In response to GTE's assertions of data shopping and artificial price reductions, Mr. Wells presented a "validation table" in his direct testimony from which he attempted to argue that the Hatfield Model's engineering team had not used the absolute lowest quotation received and was not making arbitrary cost reductions. (Tr. 2486 (Wells)). Mr. Murphy demonstrated that this table, which was prepared by John Donovan (another engineering team member) and addressed only 30 of the 1,578 input values, is plagued by the same biased data collection efforts and reporting methodology that has irreparably flawed the Hatfield Model.[4] (Tr. 2038-39 (Murphy)).

(...continued)

varying interpretations of the FCC's questionnaire. (Tr. 2295 (Tucek)). That is, it was unclear whether the respondents included the cost of installing guys and anchors, which would have had a significant effect on the data. Unlike the price in the Hatfield Model, GTE's submission to the FCC did not include exempted materials such as anchors and guys. (*Id.*)

[3] Dr. Tardiff and Mr. Murphy learned that the engineering team repeatedly used vendor quotes, purportedly collected by Mr. Fassett only for "validation" purposes, to reduce the HAI 5.0a default input values. For example, the engineering team agreed that $ .75/ft for buried drop placement was reasonable in HAI 3.1. But, they subsequently lowered the value 20% to $ .60 in HAI 4.0 when they received a lower written quote. This was true even though all of the remaining written quotes collected by Mr. Fassett for buried drop placement were higher than $ .60. There is no evidence that any input values were ever increased based on the Fassett Documents.

[4] Mr. Wells' defense of the Hatfield Model's default inputs was not based on his own analysis of the Fassett Documents. No one with personal knowledge testified at the hearing that the lowest default input values were not used, that the inputs had been validated by the Fassett Documents, or that the Fassett summary (Ex. 85 (JWW-3)) and Donovan chart were accurate. Mr. Wells admitted that he had never reviewed the Donovan chart for accuracy, or verified that the Fassett

(continued...)

It is positions such as these that discredit the integrity, verifiability and reasonableness of the Hatfield Model's input assumptions as a whole. AT&T has asked the Commission to disregard written empirical data and rely instead upon unverifiable and unsubstantiated opinions. AT&T has asked that the Commission to simply trust the judgment of the Hatfield engineering team -- even though it conflicts with their empirical data. The net result is that the opinion-based inputs in HAI 5.0 have no demonstrated factual basis. These inputs produce costs that are only 43% to 60% of GTE's current costs -- an outcome that defies common sense or logic. In the final analysis, these methodological flaws require a finding that the Hatfield Model's inputs cannot be substantiated or verified, and should be rejected.

C. The Commission Should Adopt the Company-Specific and Default BCPM Input Values Proposed by GTE

As noted above, BCPM will yield specific and sufficient levels of support in GTE's service territory if it is populated with GTE-specific input values. In the limited time allowed in this proceeding, GTE analyzed BCPM's default values and changed those that have the most material impact on total costs based on company-specific information. This process resulted in the GTE-specific inputs described by GTE witnesses David Tucek, Mike Norris, Al Sovereign and James Vander Weide. (Tr. 2234-35 (Tucek)).

The Commission has requested comment on many of the important BCPM default values that GTE modified. As Mr. Tucek and others testified, GTE's company-specific inputs are reasonable because they have been derived from GTE's recent, actual experiences in Florida. (Tr. 2246 (Tucek)). In addition, GTE explains below why HAI 5.0a's national default values for many of these inputs cannot be trusted.

(...continued)
summary honestly summarized the actual Fassett Documents. (Tr. 2659-60 (Wells)).

1. **Depreciation Rates**

Forward-looking depreciation rates should be used to develop forward-looking costs. GTE's proposed inputs properly reflect the physical lives and market values of various assets for an efficient firm in an industry experiencing rapid changes in demand and technology. GTE believes the Commission has for some time considered the evolving telecommunications environment in determining asset recovery periods. In fact, many of the lives GTE proposes here are the same as or similar to those approved by this Commission for GTE as early as 1992. (Tr. 103-32 and Ex. 102 (Sovereign)).

2. **Cost of Money**

GTE proposes that the Commission adopt a forward-looking cost of capital of 12.65% to reflect the increased risks of a competitive environment. (Tr. 255 (Vander Weide)). The Hatfield Model's default value of 10.01%, (Ex. 43 (DJW-3 at 117)), does not adequately account for the higher risk in today's market due to the Act, and is even lower than the FCC's rate of 11.25%. (See generally Tr. 252-94 (Vander Weide).)

3. **Supporting Structures**

Costs for "supporting structures" relate principally the material and labor associated with erecting the poles that support aerial cable, and digging the trenches into which buried and underground are placed. These inputs have a significant impact on total costs for a simple reason -- structures are needed for every inch of distribution and feeder cable. The GTE-specific inputs for poles are found at Ex. 78 (DGT-1R at 12), and GTE proposes the BCPM default trenching inputs.

Pole Costs The sponsors of HAI 5.0a have not yet settled on an explanation for the cost of an installed pole. At the hearing, Mr. Wells testified that pole costs resulted from "engineering judgment," like more than a thousand other inputs. (Tr. 2665 (Wells)). When confronted with Mr. Donovan's sworn testimony in Washington that the $417 pole cost represented an average of vendor quotes, Mr. Wells deferred to Mr. Donovan's explanation. (*Id.* at 2666). Yet, Mr. Well's concession and Mr. Donovan's testimony conflict starkly with the engineering team's credo that average costs should not, and were not, used to estimate costs. This prevarication is made even more confusing by the evidence, discussed above, that the $417 value was obviously derived by mixing and matching portions of separate vendor quotes. The $417 value simply has no credibility.

Trenching. With respect to trenching, the evidence has shown that the Hatfield Model's default values correspond to the lowest estimates received from survey respondents. Even worse, the engineering team "made up" the model's "surface texture multipliers," which are supposed to account for the differing costs of digging a trench depending of the soil type.

In January 1997, Mr. Donovan wrote a memorandum to engineering team members in response to the FCC Joint Board's questions regarding placement costs in difficult terrain. (Ex. 70 at 32). Because Mr. Donovan considered these questions to be "uninformed," he told another team member simply to "make up some default numbers, because we could always change them before publishing the Model." (*Id.*)

It appears that this approach of "making up" (then never correcting) default numbers may have been followed. The 249 default "surface texture multipliers" conceived in January 1997 have never been changed. (*Compare* Ex. 43 (DJW-3 at 135-140) *with* Ex. 70 at 265-271). A comparison of ten contractor quotations received by the team for plowing in "desirable" and "more difficult" soil also supports this conclusion. The average contractor quotation for plowing in "more difficult" soil was 60% higher than in "desirable" soil. (Ex. 70 at 32). Some quotations were up to 120% higher. However, these quotations were apparently never used to develop the terrain factors in the Hatfield Model. The Model's difficult terrain multiplier for stony (and similar) soil reflect only a 10% increase in cost. (*Id.* at 32-33). HAI 5.0a's costs for very stony soil is a 20% increase in cost, while extremely stony surfaces merit only a 30% increase. These "multipliers" fall far short of the 60% increase mandated by the team's own data. As a result, these "multipliers" work as intended -- they have no effect on total cost.

4. **Structure Sharing Factors**

Inputs for structure sharing reduce costs by allocating a percentage of structure costs to other entities. By lowering the sharing factor, total costs are lowered. The sharing factors proposed by GTE reflect its actual Florida experience, and the realistic premise that sharing opportunities will not materially increase. (Tr. 2237 (Tucek); Ex. 78 (DGT-1R at 2)).

Mr. Wells admitted the HAI 5.0a's as sharing inputs are "aggressive." (Tr. 2625 (Wells)). Commissioner Garcia rightly called them "outrageous." (*Id.* at 2627).

Fantastic cost savings -- worth $655 million -- are achieved in the Hatfield Model by implementing unprecedented and speculative sharing assumptions. (Tr. 1988 (Tardiff); 2627 (Wells)). For instance, the Hatfield Model assumes that in all but the two lowest density zones, GTE would bear only 25% of all aerial structure costs. (Ex.43 (DJW-3 at 120). In all density zones, GTE would bear only 33% of the cost of buried distribution cable. (*Id.*) HAI 5.0a's sharing percentages are pure fantasy because they depend entirely on the unrealistic assumption that the power and cable television companies would be replacing their entire networks at the same time the ILEC's network is being re-built. (Tr. 2620-22 (Wells)). Of course, without a "total utility scorching," which Mr. Wells admitted was an improper assumption (Tr. 2672 (Wells)), the power and cable companies have no need to hang any cables on every new telephone pole, or lay a second set of cables in a joint trench with the ILECs. (Ex. 70 at 47-49). Thus, there would be far less sharing.

5. Fill Factors

Fill factors (*i.e.*, utilization rates) in distribution and feeder plant affect costs because they determine, in part, the size of the cable that is needed. As fill factors increase, less spare capacity is needed and smaller cables may be used. Smaller cables are cheaper.

The GTE-specific fill factors for feeder and distribution are 65% and 98%, respectively. (Tr. 2235 (Tucek)). These compare favorably to its Florida and national experience. (*Id.* at 2235-36).

HAI 5.0a's fill factors are far too high. For distribution plant, HAI 5.0a's failure to build plant to housing units means that its fill factor for distribution cables, while not unreasonable on its face, will not enable the network to accommodate demand from currently unoccupied housing units that may soon want service. Put another way, the Hatfield Model's distribution cables are not big enough to serve all housing units. When those units request service, new distribution plant will have to be placed at a much higher cost than if a bigger cable had originally been placed based on a lower fill factor.

HAI 5.0a also improperly sizes its fiber feeder cable by using a fill factor of 100%. (Tr. 2052 (Murphy)). This results in a network with no spare feeder capacity. No network engineer would design fiber plant this way because the feeder network would not be able to handle short-term demand fluctuations on outages, and there would be no spares for replacement of inoperable strands, testing, or growth needs along the fiber feeder run. (Ex. 70 at 50-51).

6. Drops

The GTE-specific drop costs are found at Ex. 78 (DGT-1R at 12)).

HAI 5.0a vastly underestimates drop costs. First, drop lengths in the Hatfield Model are too short to connect many customers to the network. (Ex. 70 at 63). HAI 5.0a uses predetermined drop lengths of 50, 100 or 150 feet, depending on the density zone. (Ex. 43 (DGW-3 at 15)). This is an ill-conceived approach when HAI 5.0a's lot sizes and pole spacing assumptions are taken into account. For instance, 123,635 (11%) of GTE's customers in Florida supposedly reside on lots of three or more acres. (Ex. 70 at 63). Using the Hatfield Model's assumption that these lots are twice as deep as they are wide, drops for 3-acre lots would have to be at least 160 feet long. (*Id.*) For houses on the other side of the street, drops would have to be approximately 180 feet long. Customers residing on lots larger than three acres would require even longer drop lengths. However, the longest drop length in HAI 5.0a is 150 feet.

The engineering team's survey confirms this problem. The team received five estimates of drop lengths. For rural areas, the drop lengths ranged from 94 to 375 feet, with an average of 184 feet. (*Id.* at 77). For suburban areas, drop lengths ranged from 75 to 100 feet, with the average of 94 feet. Although the shortest drop distance estimated in the survey was 75 feet, HAI assumes a drop distance of 50 feet in high density zones.

The Inputs Portfolio quotes a Bellcore survey that, based on the most recent nationwide study of actual loop lengths, the average drop length per loop is 73 feet. (Ex. 43 (DJW-3 at 15)). When run for GTE in Florida, however, the Hatfield Model produces an average drop length of 63 feet. (Ex. 70 at 78). This is a serious understatement as the average width of lots in Florida for GTE is more than 580 feet. Moreover, when HAI 5.0a is run for the companies included in the Bellcore survey, it calculates an average drop length of less than 64 feet, understating the nationwide BOC drop wire investment by more than $750 million. (*Id.*) Finally, the average drop length in the 1993 New Hampshire Incremental Cost Study, upon which the Hatfield Model relies for its switch maintenance assumptions, was 125 feet. (*Id.* at 251).

Drop placement costs are significantly minimized by underestimating the time needed to place a drop. HAI 5.0a unrealistically assumes that all drops will be placed by hordes of low cost, dedicated crews that invade entire neighborhoods, placing drops to every living unit. (*Id.* at 78). Of course, this does not happen. HAI 5.0a also makes an unreasonable assumption about buried drop sharing. The Hatfield Model assumes only 50% of the drop cost will be borne by the telephone company. (Ex. 43 (DJW-3 at 17)). The support for this assumption is that "drop wires in new developments are most often placed in conjunction with other facilities." In reality, the vast majority of drop installations would occur in established neighborhoods. Only a tiny percentage would occur in new developments. It is plainly improper to base the 50% sharing factor for every drop in the network based on what might happen for a small percentage of drops.

7. Outside Plant Mix

Plant mix has an important effect on costs because aerial plant is generally much cheaper than buried or underground plant. GTE's plant mix inputs can be found in Ex. 78 (DGT-1R at 3-11).

Not surprisingly, the structure mix assumed in HAI 5.0a has an unrealistically high percentage of aerial plant, with 60% and 85% aerial plant in the two most dense zones, respectively. (Ex. 43 (DJW-3 at 32)). AT&T's guidelines state that aerial plant should be used only as a last resort when buried and underground plant is not feasible. (Ex. 70 at 22, 51). Thus, these high percentages are explicitly based solely on "expert opinion" and are not substantiated by analysis, empirical study, or any ILEC's actual experience. (Ex. 43 (DJW-3 at 30-32). They are also implausible in a hurricane prone state like Florida.

The justification for these assumptions is that "riser and block cable," which runs to high rise buildings, is included as a subset of aerial plant. (Ex. 43 (DJW-3 at 30)). Even assuming that this is accurate, the corresponding HAI 5.0a assumptions regarding placement costs are seriously defective. Block cable runs from the outside wall of a building, *under the sidewalks and streets*, to the neighboring building. As such, the Hatfield Model should have block cable conduit placements costs for urban areas (for digging up streets, re-pavement, etc.) that are the same, or higher, than underground conduit placement costs, which it does not. (*Id.* at 51). Alternatively, HAI 5.0a should include costs for poles to carry block cable between buildings. The model cannot do this, however, because it assumes that there are *no poles* in the two highest density zones. (Ex. 43 (DJW-3 at 29 n.6, 33); Tr. 1205 (Bowman)). Even though these density zones are likely to have single family home neighborhoods and low density business districts which need poles, (Tr. 2674 (Wells)), HAI 5.0a has no poles for aerial telephone plant. In the end, Mr. Wells confessed that HAI 5.0a's input is "wrong on the low side." (Tr. 2676 (Wells)).

8. Switching Costs and Associated Variables

BCPM follows accepted switch engineering principles to properly size its switches: actual wire center traffic information, Centum Call Seconds calculations, inputs to account for acceptable levels of call capacity, and standard line/trunk ratio of 6:1. BCPM specifically models the most common switches: Lucent 5ESS and Nortel DMS-100. BCPM also accurately accounts for host/remote switch configurations based on LERG data. BCPM's switch costs therefore reflect the optimal technology and costs. Even AT&T's switch cost expert conceded that BCPM's switch module, based on Bellcore's SCIS Model, generates reliable switch costs. (Tr. 2867-68 (Petzinger)).

Ms. Petzinger's criticisms of the BCPM switch module ring hollow. Bellcore's SCIS may be "proprietary," but its algorithms and all of its inputs have been laid open for AT&T's inspection. She criticized GTE's use of GTD-5 switches as not forward-looking because she could not find evidence of any recent sales. Mr. Tucek proved that companies are still making multi-million dollar purchases of GTD-5s. (Tr. 2274-75 (Tucek)). The NBI Study also shows that 45 GTD-5 switch systems were installed in 1995 alone. (Tr. 2885 (Petzinger). Ms. Petzinger criticized GTE's use of company-specific *and* default switch inputs. (*Id.*) Exhibit 78, DGT-1R at 19-22, proves that GTE only used company-specific values for all 90 of its wire centers. Ms. Petzinger's comments were based on her erroneous belief that GTE had 208 additional switches. (Tr. 2790-91 (Petzinger)).

The Hatfield Model, on the other hand, develops its switching investments based on a spurious cost curve derived from incompatible and unidentified data sources. (Ex. 70 at 81-85). The Hatfield Model designs switches by disregarding acceptable switch engineering guidelines: host-remote configurations; switch modularity; Centum Call Seconds; and overall line concentration ratios. (Ex. 70 at 80-100). HAI 5.0a's switching costs have already been tentatively rejected by the FCC's Joint Board in favor of costs based upon "actual ILEC switching purchases." FCC 92-256, CC Docket No. 96-45 (rel. July 18, 1997).

9. Expenses

AT&T witness Art Lerma criticized GTE's expense inputs, but confirmed that his predicted additional decreases were based solely upon prior cost trends in the industry over the past several years. Mr. Lerma erroneously assumes without any empirical analysis that these same cost reductions will re-occur *instantaneously* once competition begins. This logic is totally at odds with the FCC's direction that forward-looking economic costs must be valued at current prices, not speculative future costs. (*Order*, ¶ 224 n. 573). Mr. Lerma conceded that he had not done any analysis of GTE's current operations or recent efficiency gains to see if any further reductions were appropriate, or whether GTE's expense inputs were unreasonable.

VI. ISSUE 5: BCPM RESULTS FOR GTE

BCPM results with GTE-specific inputs are shown in Mr. Tucek's Exhibit DGT-3R (part of Ex. 78). A white pages directory listing would increase the BCPM per-line cost by an estimated $0.34 per month, for a total per-pine, monthly cost of $33.35 (Ex. 54, (MCS-2R at 1).)

VII. **ISSUE 6: DETERMINING COST FOR SMALL LECS**

GTE has no position on Issue 6.

Respectfully submitted,

Kimberly Caswell /dm

Kimberly Caswell
GTE Florida Incorporated
One Tampa City Center
Tampa, Florida 33601
(813) 483-2617

Thomas W. Mitchell /dm

John B. Williams
Thomas W. Mitchell
Collier Shannon Rill & Scott, PLLC
3050 K Street, N.W., Suite 400
Washington, D.C. 20007
(202) 342-8400

Lewis F. Powell, III
Paul Mirengoff
Hunton & Williams
951 East Byrd Street
Richmond, VA 23219
(804) 788-8200

November 2, 1998

Attorneys for GTE FLORIDA
INCORPORATED

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that copies of the Post-Hearing Brief of GTE Florida Incorporated in Docket No. 980696-TP were sent via U.S. mail on November 2, 1998, to the parties on the attached list.

Kimberly Caswell /dm

Kimberly Caswell

William P. Cox, Staff Counsel
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

David B. Erwin
Attorney-At-Law
127 Riversink Road
Crawfordville, FL 32327

Jeff Wahlen
Ausley & McMullen
227 S. Calhoun Street
Tallahassee, FL 32301

Peter Dunbar/Barbara Auger
Pennington Law Firm
P. O. Box 10095
Tallahassee, FL 32302

Benjamin Fincher
Sprint
3100 Cumberland Circle
Atlanta, GA 30339

Carolyn Marek
Time Warner Telecom
233 Bramerton Court
Franklin, TN 37069

Lynne G. Brewer
Northeast Florida Tel. Co.
P. O. Box 485
Macclenny, FL 32063-0485

Office of Public Counsel
c/o The Florida Legislature
111 W. Madison Street
Room 812
Tallahassee, FL 32399-1400

Charles Rehwinkel
Sprint-Florida Inc.
1313 Blair Stone Road
MC FLTH00107
Tallahassee, FL 32301

Tracy Hatch/Marsha Rule
AT&T
101 N. Monroe Street, #700
Tallahassee, FL 32301

Thomas Bond
MCI Telecomm. Corp.
780 Johnson Ferry Rd., #700
Atlanta, GA 30342

Floyd R. Self
Norman H. Horton, Jr.
Messer Law Firm
215 S. Monroe Street, Suite 701
Tallahassee, FL 32301-1876

James C. Falvey
e.spire™ Communications, Inc.
133 National Business Parkway
Suite 200
Annapolis Junction, MD 20701

Harriet Eudy
ALLTEL Florida, Inc.
P. O. Box 550
Live Oak, FL 32060

Michael A. Gross
Assistant Attorney General
Office of the Atty General
PL-01 The Capitol
Tallahassee, FL 32399-1050

Nancy White
BellSouth Telecomm. Inc.
150 S. Monroe Street
Suite 400
Tallahassee, FL 32301-1556

Richard Melson
Hopping Law Firm
P. O. Box 6526
Tallahassee, FL 32314

Brian Sulmonetti
WorldCom, Inc.
1515 S. Federal Highway
Suite 400
Boca Raton, FL 33432

Laura L. Gallagher
Florida Cable Tele. Assn.
310 N. Monroe Street
Tallahassee, FL 32301

Lynn B. Hall
Vista-United Telecomm.
P. O. Box 10180
Lake Buena Vista, FL 32830

Robert M. Post, Jr
P. O. Box 277
Indiantown, FL 34956

Kelly Goodnight
Frontier Communications
180 S. Clinton Avenue
Rochester, NY 14646

Tom McCabe
P. O. Box 189
Quincy, FL 32353-0189

Steve Brown
Intermedia Comm. Inc.
3625 Queen Palm Drive
Tampa, FL 33619-1309

Suzanne Summerlin
1311-B Paul Russell Road
Suite 201
Tallahassee, FL 32301

Mark Ellmer
P. O. Box 220
502 Fifth Street
Port St. Joe, FL 32456

Ben Ochshorn
Florida Legal Services
2121 Delta Boulevard
Tallahassee, FL 32303

Joseph A. McGlothlin
Vicki Gordon Kaufman
McWhirter Law Firm
117 S. Gadsden Street
Tallahassee, FL 32301