BEFORE THE
FLORIDA PUBLIC SERVICE COMMISSION

In the Matter of	:	DOCKET NO. 980696-TP
Determination of the cost of basic local telecommunications service, pursuant to Section 364.025, Florida Statutes.	:	

VOLUME 13

Pages 1412 through 1544

PROCEEDINGS: HEARING

BEFORE: CHAIRMAN JULIA L. JOHNSON
COMMISSIONER J. TERRY DEASON
COMMISSIONER SUSAN F. CLARK
COMMISSIONER JOE GARCIA
COMMISSIONER E. LEON JACOBS, JR.

DATE: Wednesday, October 14, 1998

TIME: Commenced at 9:10 a.m.

PLACE: Betty Easley Conference Center
Room 148
4075 Esplanade Way
Tallahassee, Florida

REPORTED BY: H. RUTHE POTAMI, CSR, RPR
Official Commission Reporter

APPEARANCES:

(As heretofore noted.)

WITNESSES

EXHIBITS

PROCEEDINGS

(Hearing reconvened at 9:10 a.m.)

(Transcript follows in sequence from Volume 12.)

CHAIRMAN JOHNSON: We're going to go ahead and go back on the record this morning. Any preliminary matters?

MS. CASWELL: I do have one, Madam Chairman. At the prehearing conference I indicated our witness Carl Danner would not be available past Wednesday afternoon.

Given the subject matter of the witnesses that are to come today, I think it's a very good possibility that he would not get up today given his current position, so I would ask that he be moved up this morning to directly after Mr. Olson. I've spoken to the parties that I could find this morning, and I don't think anybody has any objections. But that would be my request.

CHAIRMAN JOHNSON: Any objections to us taking Mr. Danner after Mr. Olson? (No response.)

Seeing none, then we'll do that.

MS. CASWELL: Thank you.

CHAIRMAN JOHNSON: Any other preliminary matters?

MR. COX: None that Staff is aware of.

CHAIRMAN JOHNSON: I think then we're ready for GTE's next witness, Mr. Olson.

MR. POWELL: Thank you, Madam Chair. GTE now calls Steven Olson, please.

CHAIRMAN JOHNSON: Of all of the witnesses that are here today, has everyone been sworn in? No?

Mr. Olson, were you sworn in?

WITNESS OLSON: Yes, I was.

CHAIRMAN JOHNSON: Go ahead.

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STEVEN A. OLSON

was called as a witness on behalf of GTE Florida Incorporated and, having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. POWELL:

Q Mr. Olson, please state your full name and business address.

A Steven A. Olson, 600 Hidden Ridge, Irving Texas.

Q Mr. Olson, by whom are you employed and in what capacity?

A I'm employed by GTE, manager of regulatory accounting and compliance.

Q Did you prepare a piece of prefiled testimony and cause it to be lodged here with the Commission on or about August the 3rd and have attached to that testimony a single-page exhibit marked as SAO-1?

A That's correct.

Q Was that testimony and was that exhibit either prepared by you or under your direction and control?

A That's correct.

Q Do you have any corrections that you need to make to the testimony?

A No, I don't.

Q And it would be true, would it not, that there were some corrections to SAO-1, which you have made recently and which I'll represent and I think the Commission and the parties know was circulated late in the day yesterday?

A That's correct.

Q If I were to ask you those same questions today as appear in your prefiled testimony, would your answers be the same?

A Yes.

MR. POWELL: I would move the insertion of Mr. Olson's prefiled testimony into the record as if

read here today.

MR. BECK: Madam Chairman, for the same reasons yesterday, I -- with respect to Mr. Seaman's testimony, I object to Mr. Olson's testimony. His testimony is not relevant to the issues in this docket.

CHAIRMAN JOHNSON: Objection as to relevancy. You can respond, GTE.

MR. POWELL: Yes, ma'am. Thank you, Madam Chair.

The objection to Mr. Olson's testimony should be overruled, and for two reasons. There are two separate but equally compelling reasons why the Commission should reject the objection and admit the testimony. One is a legal reason. The other is more in the nature of an equitable argument.

First the legal argument. The objection is as to relevance. The classic definition of relevance is, is the evidence tendered, might it be helpful to the fact finder or the decision maker on any issue in play in the proceeding.

I would submit to the Chair and to the Commission that not only is Mr. Olson's testimony and SAO-1 relevant, indeed, I think it is essential to the task at hand.

One of the central issues set forth in the prehearing order and set forth by this Commission asks which model should the Commission recommend to the Legislature for purposes of sizing or estimating the size of the cost of universal service; and we've had ample testimony so far as to the two models that are laid before the Commission.

Well, the purpose of these cost models is to show what it would cost an efficient company to provide basic local service. If the Commission wants to weigh the efficacy of these two models in doing what it is they purport to do, there are a number of tests that the models must withstand.

We've heard about the test of internal validity; for example, the Minimum Spanning Tree Test. The Commission will inquire also whether the models are open and subject to inspection and how adjustable they are. A third and important and critical test on model selection is one of external validity; how do the model results compare with reality.

If the models cannot replicate or at least estimate reality, then the model is useless. I would hope that reality would be of interest to the Commission and the Legislature in this very important inquiry regarding the cost of providing and sustaining

and maintaining universal service. Now, there was evidence yesterday and the day before with respect to the HAI model.

The sponsors would have you believe that the model before the Commission now, 5.0a, is a new and improved and substantially different model than the Version 2.2.2 that the Commission rejected in the arbitration process.

Well, among the reasons the Commission rejected the earlier version of the Hatfield model was because it substantially understated ILEC costs. It has certainly been GTE's position that the model now before the Commission, 5.0a. also substantially understates GTE's actual costs.

Well, how do we know this? A very reliable measure of GTE's actual costs are GTE's revenues. GTE believes that the process of regulation has worked in this state. And if that is the case, then the company's current revenues are a terrific surrogate for its current actual costs, and those costs, as reflected by the table on Page 6 of Mr. Seaman's testimony yesterday that stimulated so much discussion in the early evening, demonstrate what the cost today, in fact, is of sustaining universal service.

It is surprising in this context that Public

Counsel would suggest that this evidence that we offer with respect to our current actual costs is of no probative value on the central question of which cost model should be recommended to the Legislature.

Coming back around to the definition of relevance in its classic sense, will this information be helpful to the Commission and helpful to the Legislature as you grapple with these important issues? GTE thinks the answer to that question is quite clear. The evidence is not merely relevant; it is essential.

Now, my second point; the equitable argument. There is a significant fairness component at stake here. It's perfect clearly that Public Counsel does not agree with GTE's theory of the case, but GTE should be permitted to try its own case. We've laid out in the testimony and will lay out in our posthearing brief how we think the Commission and the Legislature should resolve these important questions.

Simply because Public Counsel has a different view of it does not render the evidence irrelevant. It's important evidence to GTE because it is an important part of GTE's case that it wishes to lay before the Commission and the Legislature.

I note parenthetically but not unimportantly that Public Counsel evidently has changed its mind as to the relevance of Mr. Olson's testimony and done so literally at the 11th hour. The testimony was filed nine weeks ago on August the 3rd. I presume Public Counsel did not then think it was irrelevant, because Public Counsel initiated discovery with respect to Mr. Olson's testimony.

Indeed, there was a discovery dispute between GTE and Public Counsel, and Public Counsel engaged the valuable resources of this Commission in pursuing a motion to compel responses to this discovery. It's hardly consistent for Public Counsel today to tell the Commission that this evidence is irrelevant when yesterday and the day before that and for eight weeks before that, Public Counsel thought the evidence sufficiently relevant to pursue discovery.

Lastly on the fairness point, the record that is being developed in the course of these proceedings and which will go, I presume, in some form or another to the Legislature along with the Commission's recommendation is not going to be a small record by a long shot. There has been voluminous testimony. There's quite a bit yet to come.

One might say that the evidence has perhaps strayed a bit from a concise definition of the issues that are on the table. We've heard about the revenue benchmark. We have had some discussion about implementation issues. We've had some discussion about rate rebalancing.

The point I think here on the fairness point at the end is there's no conceivable prejudice to Public Counsel or to any of the other parties by introducing this testimony. GTE should be permitted to try its case as it sees fit, particularly when there can be no prejudice.

To summarize then, GTE would urge the Commission to acknowledge that this evidence is plainly relevant, clearly important, and necessary for the Commission to discharge the duty that the Legislature has given it.

Secondly, as a matter of fairness, GTE should be permitted to continue the discussion that the Commission had with Mr. Seaman yesterday evening, which I thought was clearly of interest to the Commission, certainly of interest to GTE. Mr. Olson's evidence is all of a piece with the discussions with Mr. Seaman yesterday evening.

So to summarize then, we think the objection

is ill founded, and we would urge the Commission to overrule the objection and permit Mr. Olson's testimony to proceed and be a part of this record.

CHAIRMAN JOHNSON: Thank you. Mr. Beck?

MR. BECK: Madam Chairman, Mr. Olson's testimony has nothing to do with either of the models. The issues in this case deal with the cost of basic local telecommunications service. Mr. Olson's testimony does not deal with that.

Mr. Olson's testimony purports to give GTE's regulated intrastate earnings after taking out the directory advertising revenues that would otherwise be required by statute. It's not local telecommunications. It's all intrastate services that it purports to give absent the statutory required advertising revenues. It doesn't help tell you whether to pick the HAI or BCPM model in any way, shape or form.

If GTF were arguing that the return on equity that they've developed in Mr. Olson's testimony is the return on equity that should be used for their model, it might be relevant; but of course that's not what they're arguing. They want you to ignore the return on equity when picking the inputs to the model because they have other witnesses that talk about

return on equity. His return on equity is not the one they want you to use in the model, to be sure, because it would lower their costs if they were to do so.

It simply doesn't help -- whatever the results that he would provide you, whether it's a 4% on equity or a 40% or a negative 5 doesn't help you in any manner pick which model you would use, nor does it help you decide any issue that's before you; therefore, it should be stricken.

CHAIRMAN JOHNSON: Thank you, Mr. Beck. Staff?

MR. COX: I'll address the two reasons that GTE's counsel put forward. The first, the legal reason, the relevancy:

Staff has done its best to look over this information, and we've determined that this appears to be embedded type information that's more akin or proper for a rate case type analysis. We fail to see any relevance to what the Commission is doing here in determining a forward-looking cost proxy model to determine the cost of basic local telecommunications services.

We just can't make the logical jump from revenues to the costs that we're trying to determine in this proceeding. We just don't see it.

With regard to fairness, we agree GTE should be able to put forward its case, but if the information is not relevant, it's simply not relevant; and we believe that the Public Counsel's objection is a valid one.

He wasn't required to voice that objection earlier in the proceeding. He could voice it now. That's his prerogative, and he has the right to do that. And we agree there's no prejudice, but the problem is it still has to be relevant information. And we just don't see the relevancy is the bottom line.

CHAIRMAN JOHNSON: Thank you. I'm going to sustain the objection and strike the testimony -- well, not allow the testimony to be inserted into the record as though read of Mr. Olson; and we did not identify the exhibit, but that would include the exhibit.

MR. POWELL: Madam Chair, I suppose it would be appropriate to go ahead and identify the exhibit. I think next in line it would be No. 56.

CHAIRMAN JOHNSON: Identify it as Exhibit 56 and short title OAS-1.

MR. POWELL: I would also ask the Commission then to receive Mr. Olson's testimony and Exhibit 56

in the form of an offer of proof to be appended to the record in that form, having noted that the Public Counsel's objection has been sustained.

CHAIRMAN JOHNSON: We'll show it proffered, but not admitted. The exhibit will not be admitted.

MR. POWELL: I understand that you're not going to admit it, but what I'm making is an offer of proof of Mr. Olson's testimony and the exhibit, and would ask that it be appended not as admitted evidence, but as the proffered evidence by GTE on this subject.

CHAIRMAN JOHNSON: I think that's what we generally do, so that will be fine.

MR. COX: Chairman Johnson, I think you said OAS-1. It's SAO-1, just so the record is clear.

CHAIRMAN JOHNSON: I always transpose. Yes. Show it identified as SAO-1 and not admitted.

(Exhibit 56 marked for identification.)

CHAIRMAN JOHNSON: Thank you, Mr. Olson. Witness excuse. I think we're ready for Mr. Danner.

(Witness Olson excused.)

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MR. CARVER: Madam Chairman, while he's taking the stand, could I raise another matter briefly?

CHAIRMAN JOHNSON: Yes.

MR. CARVER: At the prehearing conference about two weeks ago, Commissioner Jacobs asked the parties who were going to put up a panel to file a notice last Wednesday to provide everyone, in effect, sort of fair notice as to what their panel would be doing; and the specifics were that each party was to identify the areas about which the various panel members could speak and to designate a lead panel member.

Mr. Pitkin and Mr. Wood, I believe, will be taking the stand later today on behalf of AT&T and MCI, and I don't believe AT&T has filed anything. I have had some informal discussions with their counsel, but I would like to have their notice before their witnesses take the stand so that we can prepare.

CHAIRMAN JOHNSON: Mr. Hatch?

MR. HATCH: Yes, ma'am. I failed to file that document. I had not been able to catch up with Mr. Wood to get that clarified until Sunday night, Monday morning; and I talked to Mr. Carver Monday morning to explain to him my answer from Mr. Wood as to the portions of the testimony.

I assumed that took care of the problem, but if you want the formal document, then that's fine;

I'll be glad to supply it.

CHAIRMAN JOHNSON: I'm hearing a need for the formal document.

MR. CARVER: Yes, ma'am. And, also, one of the things that I believe was to be included was the designation of one or the other of them as a lead member, and I don't think Mr. Hatch even informally has been able to communicate that. So that's something that I hope would be in the notice.

CHAIRMAN JOHNSON: Mr. Hatch, can you take care of that?

MR. HATCH: I'd be glad to. I thought we had solved all these questions. Apparently not.

CHAIRMAN JOHNSON: Thank you. Any other preliminary matters before Mr. Danner? (No response.)

Ms. Caswell?

MS. CASWELL: GTE calls Mr. Carl Danner.

Mr. Danner, could you please state your name and business address for the record?

WITNESS DANNER: I haven't been sworn either.

MS. CASWELL: Madam Chairman, I think he needs to be sworn as well.

CHAIRMAN JOHNSON: Anyone who has not been sworn that needs to be sworn?

(Witnesses collectively sworn.)

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CARL DANNER

was called as a witness on behalf of GTE Florida Incorporated and, having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MS. CASWELL:

Q Again, Mr. Danner, would you please state your name and business address?

A Yes. My name is Carl R. Danner. My address is Suite 1650, 100 Bush Street, San Francisco, California 94104.

Q By whom are you employed and in what capacity?

A I'm employed by Wilk & Associates, Incorporated as a consultant.

Q Did you submit rebuttal testimony in this proceeding.

A Yes, I did.

Q Do you have any changes to this testimony?

A There is a typographical error on Page 3, Line 21. The word "utilize" appears to be misspelled. That should be corrected, and I believe we need a

close quote at the end of that line. Aside that from that, I have no other changes.

Q So that if I were to ask you the same questions today, would your answers remain the same?

A Yes, they would.

MS. CASWELL: Madam Chairman, I would ask that Mr. Danner's testimony be inserted into the record as though read.

CHAIRMAN JOHNSON: It will be so inserted.

GTE FLORIDA INCORPORATED

REBUTTAL TESTIMONY OF CARL R. DANNER

DOCKET NO. 980896-TP

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Carl R. Danner. My business address is Wilk & Associates, Inc., 100 Bush Street, Suite 1650, San Francisco, CA 94104.

Q. PLEASE BRIEFLY SUMMARIZE YOUR RELEVANT EXPERIENCE AND QUALIFICATIONS.

A. I was formerly Advisor and Chief of Staff to Commissioner (and Commission President) G. Mitchell Wilk at the California Public Utilities Commission (CPUC), and in that role I designed key components in telephone regulation for California, and helped develop new regulatory policies and programs for the cellular industry, long distance telecommunications, and other communications services. Since leaving the CPUC I have consulted on issues of regulatory politics and policy to a variety of clients, with a primary emphasis on telecommunications. I hold a masters and Ph.D. in Public Policy from Harvard University, where my dissertation addressed the strategic management of telecommunications regulatory reform. At Harvard I served as Head Teaching Assistant for graduate courses in microeconomics, econometrics and managerial economics. I hold an AB degree from Stanford University, where I graduated with distinction

in both economics and political science. My experience is broad-based, including research into and teaching about regulation, advising regulators, testifying in regulatory proceedings, and also advising clients as a consultant on regulatory issues.

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. My rebuttal testimony addresses direct testimony filed on August 3, 1998 by Mr. Richard Guepe, appearing on behalf of AT&T, and Mr. Joseph Gillan, appearing on behalf of The Florida Competitive Carriers Association ("FCCA").

Each of these witnesses (and Mr. Gillan in particular) offered some incorrect or potentially confusing testimony regarding the proper cost treatment of the local loop when calculating the cost of basic telephone service. Contrary to what their testimony states or may convey, the local loop is a cost of basic local telephone service, and its cost should be included in the calculated cost of basic local telephone service. There is widespread agreement on this point among the economics profession and in the industry, including AT&T, and claims to the contrary contradict the principles of economics, and common sense.

Q. IS THE LOCAL LOOP A COST OF BASIC SERVICE IRRESPECTIVE OF THE COST TO PROVIDE OTHER ASSOCIATED SERVICES?

A. Yes, it is – irrespective of the cost to provide other services, whether "associated" or not. The cost of the loop is caused by a customer's decision to have basic telephone service whether or not the customer uses the telephone to buy other services as well. Therefore, when the Commission calculates the cost of basic local telephone service by use of a cost proxy model (or by any other means), it must include the full cost of the loop as a cost of basic local service.

It's like buying a car – it needs all four tires no matter how much you plan to drive it. I'm not aware of any way to pay for only two tires for a car that will only be driven on Sunday. Likewise, even a customer who won't use the phone much needs the whole loop to have any service at all, which is why that cost is part of basic phone service.

Q. **WHERE IS THIS POINT ADDRESSED IN THE DIRECT TESTIMONY OF MR. GUEPE AND MR. GILLAN?**

A. At pages 12-16 of his direct testimony, Mr. Guepe presents his point of view on how subsidies should be measured, and states that the "costs of local residential services" should include the "forward looking economic costs associated with all services that ~~utilize~~ utilize the local loop" (Guepe, page 13); he then goes on to argue that those costs should be compared with a corresponding total revenue figure to measure subsidies. For his part, Mr. Gillan discusses loop cost-related issues at pages 7-17 of his direct testimony, stating that the loop is a

common cost of multiple services, and recommending an approach to calculating subsidies that is similar to what Mr. Guepe suggests.

Q. MR. GILLAN CLAIMS THAT THE LOCAL LOOP IS NOT JUST A COST OF BASIC LOCAL SERVICE, BUT THAT IT ALSO HELPS "PROVIDE" OTHER SERVICES AND SO IS MIXED UP WITH THEM TO THE POINT WHERE IT CAN'T BE SEPARATED OUT. THUS, MR. GILLAN SAYS, CONSIDERING THE WHOLE LOOP AS PART OF BASIC SERVICE WILL GIVE THE WRONG ANSWERS WHEN TRYING TO TEST WHICH SERVICES ARE SUBSIDIZED. CAN YOU COMMENT?

A. Yes, I can comment. Mr. Gillan is clearly incorrect. The loop is a cost of basic local service and nothing else, a common sense fact on which economists and the industry have agreed.

First, the common sense. A customer needs a loop – and all of it – to get connected to the network and have any telephone service at all. The phone won't work with only half a loop, or a quarter of a loop, or whatever. Giving a customer basic telephone service at all is what causes the need for, and cost of a loop. In particular, a customer who gets phone service and never uses it much still needs an entire loop. And when a customer uses the phone (to make a long distance call, order a pizza, or talk to an attorney), he or she doesn't cause any more loop cost, so it doesn't make any economic sense to say that

loop costs should be allocated to the price of long distance calls, pizzas, or legal bills. It's the same pair of wires (or the electronic equivalent) sitting there whether or not a customer is making a call; the costs don't change, which is why those costs aren't a part of those other services.

Turning to the views of economists: A recent article in the Journal of Regulatory Economics highlighted their conclusions and agreement that the loop is a cost of basic local service:

> "Because of the focus on the costs and revenues of basic local exchange service in cost proxy models, rate rebalancing proceedings, the FCC access charge reform proceedings, and universal service proceedings, the proper treatment of local loop costs has become critically important. One sometimes hears of unpublished measures of cross-subsidization in which residential basic local exchange service is either not subsidized or is purported to actually provide a subsidy to other services. This result is invariably based on a misunderstanding or misrepresentation of the costs of loop facilities as shared or common costs rather than as a cost that is directly attributable to the provision of access to a modern telecommunications network.

"For a variety of reasons, analyses of loop costs are susceptible to logical error. When considered properly and carefully, it is clear that loop costs are not common production costs to the LEC. Rather, loop costs are directly attributable to the services that cause them (e.g. private line, special access, Centrex, and the subscriber access component of basic local exchange service). Kahn and Shew (1987) first described the fallacy of considering the costs of local access as joint or common costs in the context of a discussion on six pricing fallacies. Parsons (1994) later expands the work of Kahn and Shew and arrives at similar conclusions.

There appears to be only one article by economists, Gabel and Kennet (1993(a)), disputing the finding that loop costs are not common production costs to the LEC. However, this article induced a record three comments in response to the article in the Review of Industrial Organization. It also appears that Gabel and Kennet are inconsistent in their article, at times arguing that loop costs are incremental to toll calling and at other times arguing that these costs are common costs." *Parsons, Steve C. "Cross-Subsidization in Telecommunications," Journal of Regulatory Economics 13: 157-182 (1998), pages 169-70. Citations omitted.*

As the above indicates, other professional articles have even catalogued loop allocation fallacies, and described how they contradict the correct use of economic principles. *See Kahn, Alfred E. and William B. Shew. "Current Issues in Telecommunications Regulation: Pricing," 4 Yale Journal on Regulation 191-256 (1987). See also Parsons, Steve G. "Seven Years after Kahn and Shew: Lingering Myths on Costs and Pricing Telephone Service," Yale Journal on Regulation, Vol. 11, No. 1 (Winter, 1994), pages 149-170.*

With respect to the industry's position on the same issue I would note a recent filing made jointly by AT&T and MCI before the Indiana Utility Regulatory Commission (IURC):

> ...the issue of whether the cost of the loop is a direct cost of providing BLS [basic local service] or is a joint or common cost to be allocated among BLS and other services must be decided first and foremost on the basis of sound economics.
>
> "As Dr. Harris testified during cross-examination at the hearing, essentially every credible economist agrees on this issue. Under basic economic principles of cost causation, the cost of the loop is a direct cost of providing BLS. Indeed, the entire telecommunications industry – incumbent monopolists, CLECs, and IXCs – all agree that, as a matter of sound economics, the cost of the loop is a direct cost of providing BLS. The entire

industry also agrees that competition in the local exchange will not develop effectively if the cost of the loop is improperly allocated as a joint or common cost among BLS and other services." *Joint Submission of Proposed Form of Order (by AT&T and MCI), IURC Cause No. 40785, June 8, 1998 (emphasis in original)*

I believe the Commission will recognize a statement of such agreement across the industry as truly extraordinary. Indeed, the Dr. Harris to which AT&T and MCI referred is Dr. Robert Harris of the University of California at Berkeley – who appeared as a witness in that case for Ameritech Indiana, not AT&T or MCI. I can't recall the last time AT&T and MCI cited a witness from an RBOC in this way in an important argument before a regulatory agency.

Simply put, Mr. Gillan's argument regarding the loop is just incorrect, and should be ignored.

Q. WHAT BASIC DEFINITION OF ECONOMICS DETERMINES THE PROPER WAY TO TREAT A LOOP IN CALCULATING THE COST OF BASIC TELEPHONE SERVICE?

A. According to the principles of economics, all costs are opportunity costs, that is they measure what must be given up (on the one hand) in order to obtain something or take some action (on the other hand).

As Dr. N. Gregory Mankiw explains in his introductory economics textbook:

> "The cost of something is what you give up to get it."
> *Mankiw, N. Gregory. Principles of Economics (The Dryden Press, 1997), page 5.*

The key to this definition is cost-causation, or identifying what costs are caused by a particular decision someone makes to use or consume something. This is a fundamental principle of economics; in fact, Dr. Mankiw's text identifies this as one of the ten "core ideas" that form "the foundation for most economic analysis." *Mankiw, page vii.* Thus, to understand how the cost of the loop fits into telephone service, we need to find the decision that causes the cost of the loop to be incurred. That is what "cost" means.

Q. WHAT CAUSES THE COST OF A RESIDENTIAL LOOP TO BE INCURRED?

A. A customer needs a loop in order to have basic telephone service, and once put in place, that loop is dedicated to the customer it serves Therefore, the decision to have telephone service (or the telephone company's accurate prediction that a customer, say in a new development, will subscribe to telephone service) is what causes the cost of a loop to be incurred. To say it another way, a loop is needed to provide access to the network, regardless of how that access is

then used; and customers get access to the network as a part of basic service. Keeping a loop in use for telephone service also causes some other fixed and recurring costs (e.g. for routine billing, customer service and maintenance) that again are caused by the decision to have any telephone service at all.

Indeed, one could even imagine charging for telephone service in exactly the same way as the costs are incurred – levying a substantial one-time fee to purchase the loop, along with a small ongoing monthly fee for upkeep, perhaps followed by a subsequent one-time fee if the loop needed to be replaced many years later. Of course, it also works for customers to rent the use of such an asset on a monthly basis, including the upkeep, with the company financing the initial cost and future replacements that might be needed. Loop costs are usually converted to their monthly lease equivalent in regulatory cost studies, given the broad acceptance of such an approach.

Q. DOES THE COST OF A LOOP VARY WITH HOW IT IS USED?

A. As a general matter, loop costs do not vary with whether or how a loop is used, e.g. the costs are the same whether the loop lies idle or is used to place calls 24 hours a day. I am aware of some additional costs that can be related to certain service demands placed on a loop, such as a need for loop conditioning to assure a certain signal-to-noise ratio. Another example would include ISDN service, where multiplexers need to be added to the line.

But these examples show only that certain types of service or usage can cause additional costs over and above the fixed cost of the loop that every subscriber needs to have any kind of service. Such additional costs, where they occur, should be recovered by usage-based prices.

Q. WHAT DO THESE ECONOMIC PRINCIPLES AND FACTS REQUIRE FOR HOW A LOOP SHOULD BE TREATED IN ANY COMMISSION STUDY OF THE COSTS OF TELEPHONE SERVICE?

A. These economic principles and facts require that the cost of the loop be recognized as a cost of basic local telephone service, since the demand for basic telephone service causes the cost of the loop. By contrast, using the loop to buy other goods and services (such as long distance calls, or take-out pizza) does not cause any of the cost of the loop, so the loop is not a part of the cost of such other goods and services.

Q. SINCE A LOOP IS USED TO HELP PROVIDE MANY TELEPHONE SERVICES (SUCH AS WHEN A CUSTOMER MAKES A LONG DISTANCE CALL), WHY ISN'T THE LOOP A COMMON COST TO ALL OF THOSE SERVICES?

A. It is easy to become confused between the decision that actually *causes* the cost of a loop to be incurred, versus the additional services a customer can buy *using* a loop once he or she has one to use. But

in reality, the decision to have a loop in the first place is different from a decision to use it for a separate purpose, such as making a long distance call or ordering a pizza.

Analogies are helpful for revealing this critical distinction. Having rented a loop, a customer can use it to purchase many other things – long distance calls, professional services from attorneys or accountants, or anything else that can be bought by calling an 800 number or using a credit card. But none of those purchases, long distance included, causes any additional cost related to the loop. Contemplating trying to recover loop costs from an attorney's office or 1-800-FLOWERS helps to highlight the nature of this fallacy.

To use Mr. Gillan's term, a loop can be said to "provide" all kinds of services -- not just telecommunications – depending on how a customer decides to use his or her telephone. But that doesn't mean that any of those other services or transactions cause any loop costs, or that the revenues and costs of those other services should be included in deciding where the subsidies are in telephone service.

Q. HOW DOES MR. GILLAN'S ARGUMENT HINGE ON HIS INCORRECT CLAIM ABOUT THE COSTS OF THE LOOP?

A. Because Mr. Gillan thinks (incorrectly) that it is impossible to determine the cost of basic telephone service, Mr. Gillan discovers what he terms a "rather large dilemma" -- that if the cost of the loop

and the switch is considered as part of basic telephone service, one could calculate that a given customer's basic telephone service is subsidized even though that customer's local telephone company may be making a profit from that customer, due to sales of other services to that customer. This concerns Mr. Gillan. But Mr. Gillan's "dilemma" is not real, and is easily understood using correct economics and common sense.

Basic local telephone service in Florida is cross-subsidized by revenues from other services whose prices are therefore higher than they otherwise would be. Thus, a customer who buys enough of the other services can provide enough mark-up to the telephone company to offset the subsidy he or she is receiving on the basic monthly rate. Indeed, it's quite common for customers to subsidize themselves under this approach to pricing, where one part of the bill is underpriced and the other part of the same telephone bill is overpriced to help make up the difference. Looking at the average revenue per customer figures Mr. Guepe provides (Guepe, page 18), it's obvious that customers are subsidizing themselves in Florida.

Therefore, there's no "dilemma"; nor do we learn anything about the cost of local telephone service by lumping all telephone service revenues and costs together in one pot and figuring out whether they offset one another, as Mr. Guepe and Mr. Gillan propose. Today we have a number of services that are paying the subsidies, and another

set of services that are receiving the subsidies. If you pool together the services that are paying and those that are receiving, their costs and revenues should more or less net out – but that's no reason to deny that the subsidies exist in the first place.

Q. PLEASE SUMMARIZE YOUR TESTIMONY AND CONCLUSIONS.

A. The only conclusion that reflects economic principles and the realities of the telephone network is that the loop, and associated fixed costs, are a part of basic local service. Mr. Gillan's claim to the contrary is simply incorrect, and any such implication that might be taken from Mr. Guepe's testimony would also be incorrect.

When the Commission calculates and/or reports the cost of basic local telephone service in Florida, it must include the full cost of the local loop.

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes.

MS. CASWELL: Mr. Danner is available for cross-examination.

CHAIRMAN JOHNSON: Okay.

MR. HATCH: AT&T has no questions.

MS. CASWELL: I'm sorry. I forgot to ask him to do his summary.

CHAIRMAN JOHNSON: You can do a summary.

WITNESS DANNER: Thank you, Madam Chairman. I'll be brief with the summary.

The purpose of this proceeding, as I understand it, is to determine the costs of basic local exchange service. And so in order to accomplish that task, we need to know what to do with the cost of the loop, and my testimony responds to testimony of two other witnesses that suggest that the cost of the loop may not be able to be attributed to basic local service, but perhaps should be treated in some other way, either allocated or treated in some fashion of total revenues and total costs, as is suggested particularly by Mr. Gillan.

In response, I would offer that cost means cost causation as a bedrock principle of economics, and, in fact, it's such an important principle of economics, that if you don't consider cost as causation, then the uses to which cost information can

be put in economics basically don't work.

Costs send signals through prices to tell people and firms the real consequences of their actions, and if costs aren't based on cost causation, in particular, that function of prices and costs will not work.

I believe there is no dispute in the economics literature as to the definition of costs from this perspective.

As it happens, the cost of a loop is caused by plugging a customer into the network, by giving them access; and in Florida, as in most states, or all states, to my knowledge, most customers obtain their access to the network through basic local service.

Furthermore, that loop is dedicated to a particular customer and so, therefore, there's no question from a cost standpoint that the entire cost of the loop is a part of basic local exchange service for customers who purchase their access to the network in that fashion which, as I said, I believe is most customers.

Further, other services, such as have been cited by Mr. Gillan, don't cause any loop cost. That includes long distance service, vertical services, access to voice mail, even nontelecommunications uses

of the telephone, such as ordering food out or talking to an attorney or other services that are either provided in part through the loop or for which the loop must be used to provide.

None of those other uses or services cause any cost of the loop, so therefore you cannot allocate or attribute any cost of the loop to them.

The term "use" or "helps provide" does not describe cost causation, and so therefore is not an economic cost. Economists generally agree on this. The telephone industry, to my knowledge, generally agrees on this.

I would read briefly from my rebuttal testimony from a filing made by AT&T and MCI before the Indiana Utility Regulatory Commission:

"Essentially every credible economist agrees on this issue. Under basic economic principles of cost causation, the cost of a loop is a direct cost of providing BLS." Which is basic local service in Indiana.

"Indeed, the entire telecommunications industry, incumbent monopolists, CLECs, and IXCs all agree that as a matter of sound economics, the cost of the loop is a direct cost of providing BLS. The entire industry also agrees that competition of the

local exchange will not develop effectively if the cost of the loop is improperly allocated as a joint or common cost among BLS and other services."

I note, with respect to Mr. Gillan's testimony, that I had the opportunity to review the testimony he gave the other day before the Commission, the cross-examination. I note that Mr. Gillan also agrees that a subscriber causes the cost of a loop when he subscribes to basic local service.

So in that sense I don't believe there's any dispute, at least in the record of this proceeding among the witnesses who have filed testimony here, notwithstanding what we heard last week at the workshop.

I believe in this record there may no longer be any dispute as to the cost treatment of the loop and basic local service. And when one attributes the cost of the loop to basic local service, one does discover the rather large cross-subsidies in rates that other witnesses have talked about, and which I know have been debated at some length in this proceeding.

Finally, I rebut Mr. Gillan's suggestion of kind of a revenue side test for this, that in his mind one should look at whether a customer is subsidized in

total rather than whether particular services are subsidized.

In essence he's suggesting that if the cross-subsidies add up and somehow cancel each other out, that there's no problem or no issue. I would submit that that argument assumes away the whole purpose of the Telecommunications Act with respect to making subsidies explicit and finding explicit support for them as a means of promoting competition and accommodating to a more competitive environment.

That completes my summary.

MS. CASWELL: Mr. Danner is now available for cross-examination.

CHAIRMAN JOHNSON: AT&T?

MR. LAMOUREUX: AT&T has no questions.

CHAIRMAN JOHNSON: Mr. Henry?

MR. HENRY: Madam Chairman, I just have one or two.

CROSS EXAMINATION

BY MR. HENRY:

Q Mr. Danner, good morning.

A Good morning.

Q My name is Mickey Henry, and I represent MCI. You were here when Mr. Gillan testified; correct?

A I read the transcript of his testimony. I wasn't here.

Q And did you see where Mr. Gillan in fact said that there was no economically rational way to allocate the cost of a loop?

A I believe I did see that, yes.

Q So a lot of your rebuttal would suggest that Mr. Gillan is incorrect in an economic sense because he advocated the allocation of the cost of the loop is not correct.

A I don't believe I suggested that he advocated allocation. I said that -- I reported his conclusion that one could not attribute the cost of the loop to basic local service. And then he says don't allocate, but do this other approach of which I spoke just a moment ago.

Q Are you familiar with the FCC's decision on the May 7th, '97 order, I believe, on universal service?

A In general terms yes.

Q And the FCC adopted a revenue benchmark which included a -- which included services that are very similar to what Mr. Gillan is proposing as a family of services in this docket; isn't that correct?

A I think that's generally correct, yes.

Q And did you note in the FCC's order where they made the statement that, for example, for vertical services, since the cost models include the cost of a port and the port is where the cost of vertical services sit, that you should include the revenues from those services? Are you familiar with that passage in the order?

A I don't recall that passage. I just don't remember.

Q Do you disagree with that?

A What I offered last week in the workshop, and which I don't address directly in this testimony, was the suggestion that when a customer is set up for basic local service, which includes providing a port, as you suggest, that many other capabilities are made available to that customer as a matter of course in a modern telecommunications network; and that perhaps the most sensible way to price telecommunications service would be to charge the customer the entire cost of that, but also give them all those capabilities at the same time.

So I think that's at least somewhat consistent with your --

Q Okay. But, in fact, we're not giving them the capabilities today. We're requiring them to pay

for those capabilities; correct?

A Yes.

Q One final question: Are you in agreement with your client's proposal that we don't need to look at a cost model to determine the cost of local service; that what we need to do is determine the amount of revenues that they receive that are above cost? Were you here yesterday when Mr. Seaman testified?

MS. CASWELL: Mr. Henry, I'm going to have to object to the characterization of GTE's position that we should not look at a cost model in this proceeding.

MR. HENRY: Okay. Strike that.

Q (By Mr. Henry) You were here yesterday when Mr. Seaman testified?

A I'm afraid I wasn't. I heard a little bit of it over the telephone, but I wasn't present.

Q Are you familiar with the methodology that he and Commissioner Garcia talked about as far as setting up a universal service fund?

A I think so.

Q In his testimony Mr. Seaman basically set up a graph or a chart that showed the revenues from several sources, the costs and the contribution; and,

it totaled up to $487 million. And then he suggested that that was the amount that GTE needed to be paid out of the universal service fund.

Do you think that is the correct way to set up a universal service fund?

A I think to set up a universal service fund, you need to make all subsidies explicit. I think in the process of doing that, since there are joint and common costs in the telecommunications industry, you'll end up with markups on different services that go above what you might call bare incremental costs.

I think the universal service funding should be based on those prices, I guess you'd call them, or implicit prices, that would be derived from the bare incremental costs plus a reasonable contribution to cover joint and common costs.

I confess I'm not familiar enough with the analysis you're referring to to speak to the numbers.

Q Is it important to the analysis, though, that you have -- that you make a determination as to what is the cost to provide basic universal service?

A I would think so, yes.

MR. HENRY: Okay. I have no further questions. Thank you.

CHAIRMAN JOHNSON: Staff?

MR. COX: Staff has no questions for Mr. Danner.

CHAIRMAN JOHNSON: Commissioners? (No response.) Redirect?

MS. CASWELL: No redirect.

CHAIRMAN JOHNSON: One question?

COMMISSIONER JACOBS: Good morning.

WITNESS DANNER: Good morning.

COMMISSIONER JACOBS: I understand the economic arguments. But one of the things we heard consistently -- and not in this docket, but we've heard a lot from people -- is -- and particularly customers who don't use the network for all the other ancillary type services.

And the argument there is, is that they should only pay some basic, bare bones dial tone fee because they don't use it for any of these other services. The problem is, because of the way we provision this product, they can't do that.

And what would be some suggestions about how to address their concern in the context of this argument? Because if we follow your logic, they have to. They don't have any option. They have to rent this loop with all of its bells and whistles regardless of the fact that they don't really need it

or want it.

WITNESS DANNER: That's a very good question, Commissioner. I guess, first of all, I would agree with you that a customer who has a telephone and never uses it, unfortunately it's the truth that the entire cost of the loop and setting them up for the service is still required, just as, you know, if you -- you can't buy a car with fewer than four tires if you don't want to drive it very much, you need a whole loop to reach the network.

I guess there are several options that one could consider that would help that situation. One is that the Commission could define a particular supported universal service for customers in just that situation and say that the company will provide the service; the customer will be charged something less than the full cost; the difference will be supported through universal service, and we'll set that service up in such a fashion through, say, pricing of usage and other features that it really wouldn't be attractive to a customer who won't use the phone very much.

That would be one way you could go at it that would preserve kind of a budget service.

Another consideration I would suggest is

focusing such a service on people who are truly needy; you know, have low incomes. I believe -- I've certainly seen it in other jurisdictions -- that you may have some number of customers who are rather wealthy.

A classic profile there is a second home or a vacation home. You could have a telephone that gets very little usage but where the full cost is still incurred, and the person who owns the home is quite capable of paying for it.

So I would encourage you to think about affordability concerns as part of that, and perhaps target or limit that service to folks who would have a real need there.

COMMISSIONER JACOBS: Thank you.

CHAIRMAN JOHNSON: Redirect?

MS. CASWELL: No, none. Thank you.

CHAIRMAN JOHNSON: Thank you, sir. You're excused.

WITNESS DANNER: Thank you.

(Witness Danner excused.)

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CHAIRMAN JOHNSON: Sprint?

MR. REHWINKEL: Madam Chairman, Charles Rehwinkel with Sprint-Florida. While Dr. Stahr is

getting set up, I just wanted to bring up a preliminary matter relating to his testimony, and that would be --

CHAIRMAN JOHNSON: Let me go ahead and swear him in before I forgot.

(Witness sworn.)

MR. REHWINKEL: Dr. Stahr has filed three pieces of testimony, prefiled testimony, in this matter.

The last one was supplemental rebuttal, and it has maps and exhibits that contain information that was obtained relatively late in the proceeding from AT&T and MCI's contractor, PNR; and we submitted it under request for confidentiality, the ILECs did.

And we had asked that PNR look at the information to determine whether they wanted to maintain confidentiality. And at this point the last word I heard from Mr. Hatch was that they had not heard back.

MR. HATCH: That's correct, Madam Chairman. I had asked them to consider its confidential status and to make a determination of what could be publicly released. I have yet to receive a final word from PNR on that issue. So at the moment it is proprietary.

CHAIRMAN JOHNSON: Okay.

DR. BRIAN K. STAIHR

was called as a witness on behalf of Sprint-Florida Incorporated and, having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. REHWINKEL:

Q Dr. Staihr, could you state your full name for the record, please?

A Yes. I'm Brian K. Staihr.

Q By whom are you employed?

A By Sprint.

Q Are you the same Brian Staihr that has prefiled direct testimony in this matter?

A Yes, I am.

Q Consisting of some 19 pages?

A Yes.

Q Did you also file with that testimony a confidential, Exhibit BKS-1, consisting of a CD ROM containing BCPM 3.1 and the accompanying documentation?

A Yes, I did.

Q Dr. Staihr, regarding your direct testimony, do you have any corrections or changes to make to that testimony?

A No, I don't.

Q If I asked you today the questions contained in your prefiled direct testimony, would your answers be the same?

A Yes, they would.

MR. REHWINKEL: Madam Chairman, at this time I would move Dr. Stahr's direct, prefiled direct testimony, into the record as though read.

CHAIRMAN JOHNSON: It will be so inserted.

MR. REHWINKEL: And I would ask that Dr. Stahr's Exhibit BKS-1 be given an number for identification.

CHAIRMAN JOHNSON: BKS-1 will be identified as Exhibit 57.

(Exhibit 57 marked for identification.)

Q (By Mr. Rehwinkel) Dr. Stahr, did you also prefile rebuttal testimony of some 25 pages in this matter?

A Yes, I did.

Q Did your rebuttal testimony have appended to it 10 exhibits labeled BKS-1(a) through BKS-10?

A Yes, it did.

Q If I asked you the questions contained in your prefiled rebuttal testimony today, would your answers be the same?

A Yes, they would.

Q Do you have any corrections or changes to make to this testimony?

A No, I don't.

MR. REHWINKEL: Madam Chairman, at this time I would ask that Dr. Stahr's prefiled direct testimony -- rebuttal testimony be inserted into the record as though read.

CHAIRMAN JOHNSON: It will be inserted.

MR. REHWINKEL: And that Dr. Stahr's rebuttal exhibits be given -- I guess a composite exhibit would be how you want to do that -- be marked for identification at this time.

CHAIRMAN JOHNSON: Okay. What's the short title for those?

MR. REHWINKEL: I guess BKS rebuttal exhibits.

CHAIRMAN JOHNSON: We'll call it BKS rebuttal exhibit, and it's identified as 58.

(Exhibit 58 marked for identification.)

MR. REHWINKEL: Thank you.

Q (By Mr. Rehwinkel) Dr. Stahr, did you also prefile supplemental rebuttal testimony pursuant to the prehearing officer's order in this matter consisting of some 10 pages?

A Yes, I did.

Q Were there also appended to that supplemental rebuttal testimony 19 exhibits labeled BKS-1 through 19?

A Yes, but there is no Exhibit 9, so -- there's a number 19, but there's no 9, so there are actually 18 exhibits.

Q Okay. Do you have any corrections or changes to make to that supplemental rebuttal testimony?

A I have one very minor change, and it's just one word, and it's on Page 2 and it's on Line 14; and the word "both" should just be crossed out.

Q With that change, if I asked you the questions contained in your prefiled supplemental rebuttal testimony, would your answers be the same?

A Yes, they would.

MR. REHWINKEL: Madam Chairman, I would move that Dr. Stahr's supplemental rebuttal testimony be inserted into the record as though read.

CHAIRMAN JOHNSON: It will be inserted.

MR. REHWINKEL: And I would ask that the 18 exhibits appended to his supplemental rebuttal testimony be given a -- identified as a composite exhibit and marked for identification at this time.

CHAIRMAN JOHNSON: Okay. It will be marked

as 59 and it's --

MR. REHWINKEL: Probably BKS supplemental rebuttal exhibits.

CHAIRMAN JOHNSON: BKS supplemental rebuttal exhibit; again, the number is 59.

(Exhibit 59 marked for identification.)

A. The purpose of my testimony is to put forth the position of Sprint – Florida, Inc. ("Sprint") regarding the proper costing method and model to be used in calculating basic local service costs necessary to develop universal service support for Tier 1 companies in the state of Florida.

Q. For purposes of calculating costs in order to determine explicit universal service support, how does Sprint define basic local telecommunications service?

A. For purposes of calculating costs, Sprint defines basic local telecommunications service as it is currently defined in the FCC's May 8th Report and Order on Universal Service ("Order"), paragraph 56. In that Order, the services designated to receive support are (paraphrasing): single party service; voice grade access to the public switched network; Dual Tone Multi-frequency signaling or its functional equivalent; access to emergency services; access to operator services; access to interexchange service; access to directory assistance; and toll limitation services for certain customers.

Q. What is the position of Sprint regarding the proper costing methodology that the Florida Public Service Commission should adopt for universal service high-cost purposes?

A. Sprint believes this Commission should adopt the Benchmark Cost Proxy Model, Version 3.1 ("BCPM 3.1"), as filed in this proceeding, for use in determining forward-looking costs for Tier 1 LECs in Florida. I am sponsoring BCPM 3.1 on

behalf of Sprint. A CD-ROM version of the model and the supporting documentation, including the model methodology, is included as Exhibit BKS-1. A paper copy is available upon request.

Q. Why does Sprint believe the Commission should adopt the BCPM 3.1?

A. The Florida Legislature has determined that a cost proxy model is the appropriate costing methodology for use in determining forward-looking costs in the state of Florida (House Bill 4785 (Section 1, 364.025 (4) (b)). Sprint believes the BCPM 3.1 is the best costing methodology to use for this purpose, since it reflects the forward-looking costs that would *actually be incurred* by an efficient local provider serving the residential and business customers of this state.

Q. Does the BCPM 3.1 calculate the costs that local providers have historically incurred in the provision of basic service to the residents of Florida?

A. No. The BCPM 3.1 calculates the *forward-looking economic cost* of providing basic service. The economic cost differs from the historical or embedded cost in the following way:

Costing theory defines the *historical or embedded cost* of a good or service as an actual record of the value of resources that were dedicated to the provision or used in the production of that good or service. In contrast, the *economic cost* of a good or service is a measure of the value of resources that would be used if that good or

service were produced in the most efficient way possible.

The BCPM 3.1 does not calculate historical or embedded costs. Historical costs are inappropriate for use in this case because even if historical costs could be accurately developed they would, at best, reflect the firm's accounting practices and investments over time. They would not reflect the costs of providing individual services in today's market, i.e., the costs that a new entrant would face. The BCPM 3.1 calculates forward-looking economic cost.

Q. What, then, is forward-looking economic cost?

A. Forward-looking economic costs are associated with the present and future use of resources. They disregard sunk costs that have already been incurred and cannot be affected in the future. ("A sunk cost is simply an expenditure that has already been made and cannot be recovered. Because it cannot be recovered, it should have no bearing or influence whatsoever on the firm's decision." *Microeconomics*, Pindyck & Rubenfeld, 1989.) These forward-looking economic costs are the relevant costs for decision-making on the part of a firm with regard to present and future investment and production, as well as for pricing.

Q. Has the FCC commented on the definition and use of forward-looking economic costs?

A. Yes. In the FCC's August 8, 1996 Order on Interconnection ("First Order",

portions of which have been stayed by the 8th Circuit) the concept of forward-looking economic cost is defined as having both an incremental cost component and a shared/common cost component (First Order, paragraph 672, also 29). It is also cited as the proper basis for pricing and is defined as containing a reasonable profit or return on investment (First Order, paragraph 673.)

In addition, in the FCC's May 8, 1997 Order the FCC stated that forward-looking economic cost was the proper measure to use when calculating federal universal service support because it was sufficient to ensure provision of the supported services but not excessive, which might lead to the provision of support for inefficiencies. (Order, paragraphs 223-230).

Because the BCPM 3.1 is a proxy model, it estimates the costs that would be incurred by any efficient local provider if that provider served the entire market. A "market" might be defined as the entire state of Florida, or a particular area currently served by an incumbent local exchange carrier (ILEC), or a portion of the area currently served by the ILEC. The BCPM 3.1 can and does calculate the costs for any of these "markets".

Q. ***Why might the costs produced by the BCPM 3.1 differ from those that were historically incurred by the existing phone companies in the provision of basic service?***

A. The following are three reasons why these costs might differ:

First, the existing telephone network in Florida was constructed over an extensive period of time, and facilities expanded as the population of the state grew. Conversely, the BCPM 3.1 model assumes that the entire network is built at a single point in time. This allows the service provider to realize certain "efficiencies" and "economies of scale" that could not have been realized historically.

Second, the theoretical network constructed by the BCPM 3.1 uses state-of-the-art, forward-looking technology. In many cases this is not the same technology that is currently being used today. For example, in certain locations the BCPM 3.1 might use fiber cable to reach a customer that is actually served by copper cable today. In other cases, the model may install a digital switch in a central office that currently houses an analog switch.

Third, the geographic layout of the network differs from the actual network that is in service today. The BCPM 3.1 operates under the following assumption: The only part of the existing network that is actually used is the current location of the central offices. (The central office contains the switch (or computer) which is used to connect calls to and from customers in a certain geographic area. The central office is often referred to as a wire center, and all customers with physical connections (cables) from their homes or businesses to that central office are said to be served "out of that wire center.") For example, the cables that currently serve customers in the southern part of the Immokalee area might extend out from the central office along roads, but the BCPM 3.1 might place the cables across

fields if that is a more economical layout of the plant. Of course, placing cable across fields might involve incurring some right-of-way costs that placing cable along the road would not require. This difference would have to be included in the model inputs. However, both sets of cables would originate at the same location, the company's existing central office location.

Q. Why does the model do these things in a manner that does not reflect the existing network?

A. Two reasons. First, quite simply, because the FCC requires it. The Order listed several criteria that proxy models must comply with if they are to be considered as the costing methodology to be used in calculating the federal portion of universal service support. These include all of the three above reasons. A detailed description of how the BCPM 3.1 meets all of the FCC's guidelines and criteria is included in the supporting material filed with the model, the document "Model Methodology", and a summarized version of this information is presented below. In addition to these criteria, the FCC has published additional guidelines for proxy models and requested that the models have certain additional capabilities, such as, optimization features and the ability of the model, if required, to use geocoded data. The sponsors of the BCPM 3.1 have incorporated these guidelines and capabilities as they were made public, and the model is in complete compliance with the FCC's published guidelines for calculating federal universal service support.

Q. ***Do you believe that the FCC's guidelines and criteria, and the assumptions contained therein, are reasonable?***

A. In general, yes. However, if this Commission disagrees as to the *appropriateness* of some of the FCC's assumptions, the sponsors of the BCPM 3.1 are ready to work with the Commission to incorporate into the model whatever changes the Commission concludes are appropriate for Florida.

Q. ***What is the second reason the BCPM does not reflect the historical or book costs of the existing network?***

A. As stated above, the existing network evolved over a long period of time. Historical or book costs reported over many years do not reflect the efficiencies that can be realized today in the provision of basic service. They also do not reflect the realities of today's market with regard to, for example, labor costs, inflation, environmental constraints or a host of other cost-affecting factors.

Q. ***Why is it important, from the perspective of developing a competitive market that economic costs be developed on a forward-looking basis?***

A. True facilities-based competition can only come to all areas of Florida if explicit universal service support is portable and sufficient to compensate potential new providers offering service over their own facilities. It is important to get the cost right with regard to what costs a new provider would incur on a going-forward

basis in order to provide the new carrier with proper incentive to enter the various markets.

Q. ***Why is the BCPM 3.1 the proper model to use to estimate the cost of providing basic service?***

A. The cost of basic telephone service is primarily, and, in rural areas, almost completely, determined by the cost of the *loop*. (According to both proxy models cited in the FCC's May 8th Order, in many areas the cost of the loop accounts for more than 90% of the cost of basic service.) The loop is the actual physical connection between the telephone company's central office, or switch, and the customer's location. If the cost of the loop is estimated incorrectly, it is likely that the total estimated cost of service will also be wrong.

The cost of the loop is determined primarily by two factors: *distance and density*. *Distance* affects cost in the sense that the further a customer is situated from the telephone company's central office (or switch), the more cable that is required to reach that customer and the higher the cost of the physical connection. *Density* affects costs in the sense that if a trench must be dug to place the cable required to serve the residents of a new subdivision, that trenching cost is smaller *per customer or per line* if the subdivision serves 100 customers in a square mile than if it serves 20 customers in the same square mile.

Both of these, *distance* and *density*, in turn depend on where the model assumes

customers are located in relation to the central office, and located in relation to each other.

The BCPM 3.1 has an extensive and detailed algorithm for creating serving areas and locating customers within the serving area (known as the *ultimate grid*) which is described in detail in the Model Methodology (see Exhibit BKS-1). This location methodology, which has been validated statistically, is based on both forward-looking engineering criteria and the strong correlation between road mileage and population distribution. In the process of building its network, the BCPM 3.1 does not make unrealistic assumptions or adjustments that can distort the distance and density of customers. Standard modelling conventions allow for minor adjustments to be made for the sake of simplicity and regularity; however, the effects of these adjustments are quite small.

In addition, as important as customer location is, equally important is constructing the appropriate network to those locations. The BCPM 3.1 builds an efficient network by maximizing the shared portion of the network route, by ensuring that both rural and urban customers receive the same quality of service through the same technology and by optimizing the layout of the feeder routes to minimize their distance. Feeder cables are a key part of the loop, they are the large cables coming directly out of the central office. Feeder cables eventually branch out into "distribution" cables which in turn branch out to "drops". Drops are those cables that actually connect the distribution cables to houses and businesses.

By accurately identifying customer location, and building an efficient network to those locations, the BCPM accurately estimates the costs that an efficient provider would incur in the provision of basic service to an entire market.

Q. Is the BCPM 3.1 a Florida-specific model?

A. The model platform (algorithms, equations, etc.) is generic in that the structure of the equations will not change from state to state. A very simple example would be, *Cable Length in Feet * Installed Cost of Cable per foot = Cable Investment* which holds no matter what state is being processed. However, because the *Cable Length* is Florida-specific, and the *Installed Cost of Cable* is Florida-specific, the resulting *Cable Investment* will be Florida-specific.

The network that the model builds is Florida-specific for two important reasons. The model uses extensive *Florida-specific geographic data* that reflects the physical conditions in which the network must be constructed: soil type, depth to bedrock, water table depth, slope variables, rock hardness, etc., all at an extreme level of detail. All of these location specific variables impact the cost of providing basic telephone service.

Second, the model's user-adjustable inputs have been carefully chosen to reflect not only location-specific issues (such as Florida maintenance expenses and placement costs) but to reflect the way that the network is constructed in Florida (for example, percent of distribution cable that is aerial versus underground.)

Q. ***Are all of the inputs in the BCPM 3.1 Florida specific?***

A. No. Just as the values of certain inputs should and will change from location to location, others will not. Sprint is also sponsoring the testimony of Kent Dickerson in this proceeding, and Mr. Dickerson's testimony deals extensively with BCPM 3.1 input issues.

As with any model, the accuracy of the cost estimates will increase as the inputs themselves are refined. Since some data such as vendor prices and discounts may be of a proprietary nature it may be necessary for the Commission to involve itself in the acquisition of this data *from the companies that actually serve Florida*, to ensure that the cost figures used are Florida-specific, precise, supportable and sufficient.

However, it is important for the Commission to note that accurate cost estimation is not solely (or even primarily) dependent on input values. Accurate cost estimation depends on the validity of the relationships that are built into the platform of any forward-looking cost model.

Q. ***You mentioned earlier that the BCPM 3.1 estimates the forward-looking economic cost of providing basic service. Does this mean the model ignores all historic or existing cost data?***

A. No, not at all, nor should it.

Economic theory does not, *a priori*, preclude the consideration of all historic costs, in particular, recently incurred costs in a forward-looking economic cost study. All that it demands is that the costs used in such a study be representative of future costs. Whether historic or current costs are a good approximation of forward-looking costs is an empirical issue. Indeed, to argue otherwise—i.e., to exclude any consideration of current costs in a forward looking study—leads to the absurd conclusion that none of the available empirical data should be given any weight in a forward looking cost study. This would not only preclude the use of all existing data, but all forecasts based on historic data, in essence reducing forward looking cost studies to pure guesswork.

To accurately estimate future costs it is vital to take into account as much information as possible. In many instances, existing or historic data is a valid indicator of future costs. This, of course, requires a careful analysis of the current or historic data to determine whether it is reasonable to expect those costs to continue to be incurred, and at those levels, in the future period being modeled.

In general, embedded investment levels are not, at least for ILECs, a good indicator of future investment levels. There are several reasons for that. First, embedded investment includes technologies that are obsolete, or, at least, not the technologies used in the forward-looking network. Second, those embedded investments were incurred over a long period of time -- some over 20 to 25 years

ago. Even if the technology had not changed, inflation and labor costs (for installation or placement) would render those embedded values a poor indicator of future costs. For that reason, in the BCPM 3.1 we have relied on current equipment prices as the best indicator of forward looking investment costs, and totally disregarded book or embedded investment costs.

On the other hand, current operating expense data is in most instances the best indicator we have of future expense levels. This is because operating expense data captures current experienced costs in performing a function. For example, we can quantify the expenses we incur in maintaining digital switches and fiber transmission facilities. There is every reason to believe that these expense levels can reasonably be used as an approximation of the expenses we will incur (or anyone serving our market *would* incur) in the near-term for those same activities.

Using maintenance expenses as an example, the best basis for determining the forward-looking costs of *any* company serving the Sopchoppy area is to look at the maintenance expenses of the company that actually *does* serve Sopchoppy. Contained in that company's costs are the effects of the conditions under which any company would be required to operate if it served Sopchoppy. That is not to imply that adjustments to expense levels might not be necessary. However, it is clearly better to use existing data, adjusted for known changes, rather than rely on pure speculation.

Q. What guidelines, criteria, etc. were used in developing the BCPM 3.1?

A. The Florida Legislature has not, to date, provided specific guidelines or criteria for the proxy model submitted for use in calculating universal service costs. This is not say that guidelines do not exist. In the FCC's May 8th Order on Universal Service the FCC listed specific criteria for any proxy models put forth as proposed costing methodologies for universal service support. These criteria are listed below (in paraphrased, summary form), each with a short discussion of how the BCPM 3.1 meets the specific criterion:

1. *Technology in the model must be least-cost, most-efficient, and reasonable for providing supported services. Actual wire center locations must be used. Loop technology must not impede the provision of advanced services. Wire center line counts should equal actual line counts. The model's average loop lengths should reflect actual average loop lengths.* BCPM 3.1 meets all these criteria by using only forward-looking technology, by optimizing as the network is built, by assuring the capability of providing advanced services, by using actual wire center locations, actual wire center line counts, and actual loop lengths if available to adjust investment.
2. *All network functions or elements needed to produce the supported services must have an associated cost.* The BCPM 3.1 contains a cost for each network element contained in basic service.
3. *Only long-run, forward-looking economic costs may be included. Embedded costs must be ignored, but the model must be based on actual*

purchase prices for facilities and equipment. In the BCPM only forward-looking costs are calculated, embedded costs play no part in the model's algorithms. Actual purchase prices serve as the basis for model inputs, as is consistent with the FCC's May 8th Order definition of forward-looking economic cost (Order, page 124, paragraph 224).

4. *Rate of return must be 11.25% or a state's prescribed rate of return for intrastate services.* Rate of return is a user-adjustable input in the BCPM, the user is able to set the value at any level, including 11.25%.

5. *Economic lives and future net salvage percentages within the FCC's authorized range must be used.* As with rate of return, economic lives and future net salvage percentages are all user-adjustable inputs in the BCPM. A user can set these variables to any desired levels.

6. *The model must include all business and residence lines, including multi-line business services, special access, private lines, & multiple residence lines.* BCPM 3.1 includes all of the above, plus the ability to use actual wire center line counts for single line residence & business, multi-line residence and business, special access, etc. if these counts are available.

7. *Reasonable allocation of joint and common costs must be included.* BCPM 3.1 allows the user to input either a common cost factor or a per-line expense figure. The model includes a reasonable (and user-adjustable) allocation of joint & common costs.

8. *The model, all underlying data, formulae, computations, software must be available to all interested parties for review/comment. Data must be verifiable, engineering assumptions reasonable, outputs plausible.* The

BCPM 3.1 is completely open and available to all parties. All preprocessing of data including computer code, algorithms, etc. have been provided to both the Florida Commission staff and the FCC, and are available to anyone through the BCPM website WWW.BCPM2.COM. The model uses public data (Census Bureau data, BLR wire center boundary data) and all data, computations, formulae and algorithms are 100% verifiable.

9. *Model must contain the ability to examine and modify critical assumptions and engineering principles.* The BCPM 3.1 allows a user to modify all of the specific variables listed in the criteria plus hundreds of other user-adjustable inputs through simple drop down menus or through direct access to EXCEL spreadsheets.

10. *The model must de-average support calculations to the wire center level at least and, if feasible, to even smaller areas such as a Census Block Group (CBG), Census Block (CB) or grid cell.* BCPM 3.1 provides estimates of universal service costs for areas as small as variable grids, which are significantly smaller than a CBG or wire center. These individual grid costs can then be aggregated to the census block group or the wire center.

Q. ***At what level of geographic detail can the BCPM 3.1 provide the forward-looking cost of basic local telecommunications service?***

A. Costs in the BCPM 3.1 are calculated at an individual *grid* level and then can be aggregated up to various levels: census block group, wire center, density zone,

company, state, etc. This provides the Commission with the largest degree of flexibility when determining the level at which support will be calculated. In addition, it allows for the identification of high-cost "pockets" within more standard areas. For example, within the Tavares wire center there may be specific census block groups that are very high cost, yet the average cost in Tavares might be significantly lower. The level of cost detail developed in the BCPM allows targeting any high cost support to where it would be most appropriate.

Q. Does this conclude your testimony?

A. Yes it does.

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

REBUTTAL TESTIMONY OF BRIAN K. STAIHR

ON BEHALF OF SPRINT-FLORIDA, INCORPORATED

DOCKET 980696-TP

SEPTEMBER 2, 1998

Q. Please state your name, title and business address.

A. My name is Brian K. Staihr. I am employed by Sprint United Management Company ("Sprint") as Regulatory Economist. My business address is 4220 Shawnee Mission Parkway, Suite 303, Fairway, KS, 66205.

Q. Are you the same Brian Staihr who filed direct testimony in this proceeding on August 3, 1998?

A. Yes I am.

Q. What is the purpose of your rebuttal testimony?

A. In my rebuttal testimony I address specific points raised by Don Wood with regard to the HAI Model Version 5.0a, filed in this proceeding by MCI and AT&T. I also address certain comments made by Mr. Wood regarding the Benchmark Cost Proxy Model (BCPM) Version 3.1 as filed by Sprint.

Q. Please provide a summary statement of your rebuttal testimony.

A. Contrary to Mr. Wood's statements, the HAI Model is not "the most accurate and reliable means" of developing cost information (Wood Direct p. 3). In the past several months, significant problems have been identified at both the Federal and state levels regarding the accuracy of the HAI Model 5.0a, as filed in this proceeding. These problems have specifically involved the HAI Model's preprocessing, customer location algorithms, network construction algorithms, and various assumptions built into the model and the model sponsors' values for certain user-adjustable inputs. Several of these problems are discussed in the testimony that follows.

Q. In his testimony Mr. Wood lists two states, Kentucky and Louisiana, where the Commissions chose to rely on the HAI Model for USF purposes. Do these two decisions provide evidence that the problems you mention above were of no concern to these Commissions?

A. Absolutely not. It is important to understand that a great deal of information and analysis regarding the HAI Model has come to light only in the past few months. This is because a large portion of the information used by the HAI Model in its preprocessing stages was only made available to parties (under order of the Nevada Commission) in April of this year. I specifically refer to the geocoded locations that are placed within main and outlier clusters. These clusters are then used by the HAI Model.

In April and May of this year Sprint examined this previously unavailable information used

by the HAI Model and made several *ex parte* presentations to the FCC. These *ex parte* presentations outlined how this information is used in the HAI Model preprocessing and customer location algorithms (Sprint FCC *ex parte*(s), April 17-30, 1998). *These documents demonstrated that in rural areas the HAI Model systematically underestimates the dispersion of customers. As a result of this underestimation, the HAI produces less distribution plant than the amount that would actually be needed to provide service to the customer locations the model purports to use.*[1] [Footnotes are included as endnotes in Exhibit BKS-1A] All of these *ex parte* documents are on record at the FCC, and I have included several of the documents here as Exhibit BKS-2.

Q. Did the Kentucky and Louisiana Commissions have access to these *ex parte* presentation documents?

A. No. The Louisiana proceeding to which Mr. Wood refers took place in late January (1/28-30). The Kentucky proceeding to which Mr. Wood refers took place at the beginning of March (3/3-6).

Q. At the time of the Kentucky and Louisiana proceedings, did any party to those proceedings have access to the information that served as the basis for those *ex parte* presentations?

A. No. The information that served at the basis for those documents is housed at the economic research firm of PNR & Associates in Jenkintown, Pennsylvania. Until April 15-17, 1998, no party other than PNR had been allowed access to that information.

Q. How did the FCC respond to these *ex parte* presentations?

A. Following these presentations the FCC produced its own analysis of the HAI customer location algorithm conducted by Jeffrey Prisbrey. This analysis and Sprint's response to it are attached as Exhibit BKS-3. The results of Mr. Prisbrey's analysis support Sprint's findings: That the HAI Model method "underestimates the dispersion" of customer locations (Prisbrey page 3). According to Prisbrey, this underestimation is most extreme when clusters consist of small numbers of customers, as is often the case in rural areas. This underestimation causes the model to build insufficient plant, because it builds to locations that are closer together than the customers' actual locations

Q. Can you comment on how this information was received, or the impact this information had, in any other state proceedings?

A. In Nevada, Costing Docket # 96-9035, the Nevada Commission initially chose the HAI Model's immediate predecessor, the Hatfield Model 3.1, to be used for unbundled element (UNE) costing with the intent to also use the model for universal service purposes (USF). [Nevada PUC Opinion and Order, March 5 1998]. When it was pointed out in the proceeding that the FCC had rejected the Hatfield Model 3.0, the Commission moved toward the HAI Model 5.0a, again with the intent of using the model for both UNEs and USF [ibid.]. Sprint then filed a report with the Nevada Commission discussing the HAI Model's customer location algorithm and the FCC analysis discussed above [April 22, 1998]. In a subsequent order, the Nevada Commission declined to submit the HAI model to

the FCC to be used in calculating universal service support [Docket 97-5018, Nevada PUC Order, May 14, 1998].

In Minnesota, although the Minnesota Public Utilities Commission appears to have adopted the HAI Model for interconnection and UNE issues, the presiding Administrative Law Judge issued questions about the model on July 16, 1998 directly related to this underbuilding issue. Specifically, the ALJ has asked whether the distribution plant constructed within each cluster should be extended further (increased) in order to come closer to the actual amount needed to provide service to purported customer locations. [State of Minnesota, MPUC Docket No. P-442, 5231, 3157, 466, 421/C1-96-1540].

More recently, in the state of Washington, the Washington UTC issued a bench request asking both model sponsors to make adjustments to their models. Specifically in the case of the HAI Model, the Commission asked the HAI Sponsors to make corrections that would address the issues raised in the aforementioned Prisbrey/FCC analysis regarding customer dispersion. [Washington UTC, Universal Service Docket #UT-98031(a), August 26, 1998].

Q. How does this information apply to Mr. Wood's testimony, specifically the cites on pages 6 and 7 from the decisions of the Kentucky and Louisiana Commissions?

A. The cites from both Commission decisions refer to the HAI "locating customers" (Wood Direct page 6). As stated in my direct testimony, there is no question that location is a key driver of cost. However, it is not enough for a model to "locate" customers, because a model must also *use* that location information when building the network and calculating

costs. If a model "locates" customers but then fails to use that information, there is no advantage to locating customers. The *ex parte* presentations attached demonstrate how the HAI Model's preprocessing ignores actual customer locations when it constructs a network in rural areas. The result, particularly in rural areas, is an understating of the cable required to serve customers. Hence, the HAI Model is not the "most accurate and reliable means" of cost estimation for USF purposes.

Q. Does the HAI Model use geocoded customer location information when it constructs its network?

A. No, it does not. Geocoded locations are only used in the model's preprocessing to determine *which* customers will be served together. Once that has been determined, geocoded location information is never again used.[2] That is why the HAI model produces less plant than is actually required to serve customers.

Q. Since the HAI Model does not build to actual locations, is there a significant advantage to using geocoded information just to determine which customers will be served together, as is done in the HAI Model?

A. Not really. The BCPM considered using geocoded data and rejected the idea for two specific reasons.

First, it is important to realize that geocoding is far from an exact science. The latitude/longitude coordinates assigned to any given street address can vary significantly

from geocoder to geocoder, especially in rural areas. A simple example of this is shown in Exhibit BKS-4. On this sheet we have six actual Florida street addresses that have been geocoded by two separate systems. As you can see, each of the systems has placed the customers in a very different location, despite the fact that each system classifies this point as a "street address", the finest level of geocoding available. According to the HAI Model, each of these addresses is an exact location. The question that remains, however, is, which of these exact locations is right?

Second, in rural areas (the areas of most concern for universal service purposes) that street-address level data generally does not exist, and the data that does exist is often of questionable quality. Sprint recently filed comments at the FCC that explain how the use of *some* geocoded data in a cost model can often be worse than using none at all. A copy of these comments is attached as Exhibit BKS-5. Nonetheless, the BCPM is *capable* of using geocoded data, as requested by the FCC, to assign customers to areas which would be grouped together to form serving areas, much in the same way the HAI Model groups customers. For this proceeding Sprint undertook an analysis to determine exactly how much difference it would make to use geocoded data. The result of the analysis showed that it makes very little difference.

Q. Please describe that analysis.

A. As I stated earlier, the only way the HAI Model uses actual customer locations is to determine which customers will be served in which cluster. The BCPM builds to areas called *grids*, not clusters, and customers are assigned to grids through a detailed algorithm

described in the BCPM Model Methodology. Since all grids are based on latitude and longitude, it is a straightforward process to use latitude/longitude coordinates of geocoded points to assign customers to grids and proceed from there. This of course assumes that good latitude/longitude data exists.

In this analysis we took 3 specific wire centers from Sprint's operating territory in Florida for which we had reasonably good geocoded data. The 3 wire centers were Inverness, Beverly Hills and Avon Park. The total number of lines served by these 3 wire centers is slightly over 50,000. Using actual customer locations, we assigned residences and businesses to microgrids. From that point, microgrids were aggregated into ultimate grids using the standard approach, and the model was re-run. In some cases the new ultimate grids differed from the original ultimate grids because the new placement of customer locations caused the microgrids to be aggregated differently. In other cases, the grids may have remained the same but the actual customer counts and dispersion of customers within the grid may have changed. Our goal was to determine what *costs* and *cable distances* the BCPM would produce using the geocoded locations, and how these costs and distances would compare with the standard BCPM results. These results are shown in the table below. I have attached a more detailed explanation of the geocoding and placement process as Exhibit BKS-6.

Inverness	$39.42	$39.80	0.9%
Beverly Hills	$37.00	$37.53	1.4%
Avon Park	$40.92	$41.51	1.4%

	Total Route Distance Using Standard BCPM Approach (w/Drop)	Total Route Distance Using Geocoded Data (w/Drop)	Percent Deviation from Original
Inverness	7,261,177	7,391,367	1.8%
Beverly Hills	3,009,300	3,088,937	2.6%
Avon Park	3,091,569	3,207,724	3.8%

As the table shows, the average costs per line vary by less than 1.5% in every case.

More importantly, the amount of network that is built (in terms of route distance) does not vary significantly in the two versions of the model. In every case, the variation was less than 4 percent.

Q. How do you interpret these results?

A. These results provide strong evidence that the original customer location algorithms used in the BCPM are accurate and reliable in providing a standardized way of modeling customer location. In numerous proceedings (including this proceeding, see Wood Direct p. 8) the HAI Sponsors have made the unsupported claim that the BCPM method of placing customers in microgrids based on road mileage was flawed, and inferior to the use of

geocoded data. What Mr. Wood does not mention is that in the universal service areas of Florida, 1) the vast majority of the HAI locations are not geocoded and 2) in cases where there is data, the geocoded locations are never used to construct the network anyway!

These results, although clearly a sample, demonstrate that the BCPM approach of initially allocating customers along road miles is valid (which the BCPM Sponsors have always known, based on statistical tests of correlation between road miles and population). Most importantly, they support the conclusion that *without using geocoding* the BCPM is superior to the HAI Model in terms of minimizing the distortion that can occur when one models customer location in rural areas incorrectly.

Q. Specifically, how does this distortion occur in the HAI Model?

A. Once the HAI Model has determined that a certain number of customers will be served in a specific cluster, there is no attempt to maintain the spatial relationship between the customers. The model will distribute the customers' lots uniformly across the area of the cluster. An example of this is shown in Exhibit BKS-7.

In this Exhibit, the dots represent actual customer locations that the HAI purports to use. Panels A, B and C are depictions of various dispersions of eight customer locations. These would be considered the "actual" or geocoded locations. Panel D is a depiction of how the HAI Model will place the eight locations in Panels A, B and C before it builds the network. The exhibit shows how the HAI Model will model the customer locations the same way in every case, despite the fact that the customers are actually situated very differently. Existing

distances between customers are ignored, distances which can often be several miles. Also, because the BCPM separates its serving areas into quadrants, the distortion that occurs in Panel A cannot occur in the BCPM. In Panel A, the majority of customers are located in the NW quadrant of the area and none are located in the SW quadrant. In the BCPM, this relationship is maintained: the SW quadrant would contain no customers, and the NW quadrant would contain the number you see in Panel B. In the HAI Model, this does not occur.

Q. You said that once the geocoded data is discarded and the HAI model builds its network, the result of the distortion pictured above is an understatement of cable requirements? Is there evidence of such an underbuilding in the results produced by the HAI Model in this proceeding?

A. Yes there is. Sprint has conducted an analysis for its Florida territories similar to analyses shown in the *ex parte* presentations mentioned above. The results of the Florida analysis are completely consistent with our findings in other states. In the rural areas of Florida, the network "built" by the HAI Model is a non-functioning network. The HAI Model systematically and significantly underbuilds the distribution network.

Q. Please describe how you determined that the HAI underbuilds.

A. The concept is very simple. We examine the amount of network plant that the HAI Model builds within its main clusters.[3] This includes everything on the customer side of the digital loop carrier: the distribution cable, connecting cable[4], and drop cable. All of these are used in the model to do two things: to connect customers to the network (at the DLC) and, by

default, to connect customers to each other.

We then examine the distance between the original customer locations as they are used in the HAI Model's preprocessing. This equates to the distances between the blue dots in Exhibit BKS-6, Panels A, B and C. The distance measure used is a *minimum spanning tree* (MST). The minimum spanning tree measures the linear distance required to connect any set of points or customer locations in the most direct way. The length of the MST is what we have determined to be "sufficient". (A minimum spanning tree is discussed and pictured in Exhibit BKS-8.)

In reality, the distance of the MST is usually less than what would be "sufficient" to connect all customers to the network and to each other. The distance of the actual telephone network between a given set of locations (points) is usually longer than the length of the MST for that same set of points. Some reasons for this are: 1) the telephone network usually follows roads (which the MST does not), 2) the telephone network must go up and down hills (the MST assumes the world is flat), and 3) the telephone network must take into account natural barriers such as mountains, lakes, etc. (which the MST ignores.)

However, for our analysis we have assumed that the length of the MST is sufficient. We then compare the length of what the HAI builds to the length of the MST. If the total distance of connecting, distribution and drop cable in a cluster is at least as long as the MST for the points in that cluster, we determine that the Model has not underbuilt that cluster. If the total distance of connecting, distribution and drop cable is *less* than the MST for the points in that cluster, we determine that the HAI has underbuilt that cluster. If a cluster is underbuilt, the network the HAI builds to serve that cluster is non-functioning.

Q. Please describe your findings.

A. In the overwhelming majority of cases the HAI underbuilds the main clusters in rural, low-density areas. As the table below shows, in the lowest density zone the HAI underbuilds over 90% of the main clusters in Sprint's serving territory.

Company	Density Zone	Total Number of HAI Main Clusters	Number of Main Clusters Underbuilt by HAI Model using MST	% of Main Clusters with Insufficient Plant
Sprint-United	**0 to 5**	**186**	**169**	**90.8%**
Sprint-Centel	**0 to 5**	**87**	**82**	**94.2%**
Sprint-United	**5 to 20**	**184**	**126**	**68.5%**
Sprint-Centel	**5 to 20**	**214**	**174**	**81.3%**
Sprint-United	**20 to 100**	**314**	**111**	**35.4%**
Sprint-Centel	**20 to 100**	**98**	**38**	**38.8%**

In the table I have separated the next-lowest density zone (5 to 100 lines per square mile) into two parts: 5 to 20 lines per square mile, and 20 to 100 lines per square mile. This split does not exist in either model, but it is valuable as a tool for viewing that this underbuilding problem occurs most frequently in the very low density areas, the exact areas that are of most concern for universal service purposes.

Q. Have other parties used the concept of a minimum spanning tree (MST) as a measure of sufficiency in terms of length?

A. Yes. In the attached FCC analysis, Jeffrey Prisbrey used the same concept to measure customer dispersion. More recently, the FCC staff has been working on a synthesis of the two models presented in this proceeding. This synthesis, termed the HCPM (Hybrid Cost Proxy Model), uses a minimum spanning tree as a measure of sufficiency for outside plant and the algorithm is built into the loop portion of their model.

Q. In other proceedings, have the HAI Sponsors commented on the use of the MST as a measure *of* "sufficient" plant?

A. Yes they have. Recently in Texas, Dr. Robert Mercer, author of the HAI Model, and Mr. John Klick stated that the MST was an "inappropriate standard" to use in such a comparison. [Supplemental Reply Testimony of Dr. Robert Mercer and Mr. John Klick, Texas PUC Docket #18515, June 10, 1998]. Mercer/Klick went on to state that the "Steiner tree, not the MST, constitutes the minimum true distance required to connect a series of points in a network." [Additional Reply Testimony, Mercer/Klick, Texas PUC Docket #18515, June 30, 1998].

Q. What is a Steiner tree?

A. A Steiner tree is another distance construct from mapping theory. Like the MST it measures distance between a set of points, locations or nodes. However, in the Steiner tree it is possible to add points or nodes in the process of connecting the original points. This

can result in an overall shorter distance between points, shorter than the MST. Two simple examples are shown in Exhibit BKS-9, and the concept is discussed in Exhibit BKS-8.

Q. The Mercer/Klick testimony implies that it would be more appropriate to define "sufficient" cable as a distance equal to the Steiner tree, not the minimum spanning tree, in Sprint's analysis. Do you agree?

A. No, I do not. As stated above, in the overwhelming majority of cases the MST distance would actually represent an *insufficient* amount of cable, since it does not account for barriers and constraints that a real-world network must consider. Obviously something less than the MST distance, such as a Steiner tree distance, would be insufficient as well.

Just as importantly, the addition of nodes can only decrease the "required" amount of cable for very few, specific configurations of points. Most of these configurations involve less than five (5) points or locations. It is common knowledge that all HAI main clusters must contain at least five customer locations and most contain many more, even in rural areas. Therefore it is simply incorrect to assume that 1) the Steiner Tree distance will be something shorter than the MST distance, and 2) that the Steiner Tree distance is the appropriate measure of what is "sufficient".

But in the spirit of cooperation Sprint has also conducted an analysis using an equivalent of the Steiner tree. As I state above, it has been shown mathematically [Prim, Exhibit BKS-8] that by adding points or nodes, such as a Steiner tree does, it is sometimes possible in special cases to connect a series of points with less than the MST. But it has been shown that this *reduction* in distance can never be more than 13%. In other words, assume there

are 5 households in a HAI main cluster, and the MST tells us it requires 1000 feet of cable to connect them all to each other and to the network. Adding points of interconnection, as the Steiner tree does, might reduce that required amount of cable but it will never reduce it below 870 feet.

In the table below, we present the number of HAI Main clusters in low-density regions that underbuild the network using the Steiner tree as a measure of "sufficient" cable length. The length of the Steiner tree is represented as 87% of the length of the MST.

Company	Density Zone	Total Number of HAI Main Clusters	Number of Main Clusters Underbuilt by HAI Model (using Steiner Tree (87% MST))	% of Main Clusters with Insufficient Plant
Sprint-United	**0 to 5**	**186**	**157**	**84.4%**
Sprint-Centel	**0 to 5**	**87**	**80**	**91.9%**
Sprint-United	**5 to 20**	**184**	**109**	**59.2%**
Sprint-Centel	**5 to 20**	**214**	**152**	**71.0%**
Sprint-United	**20 to 100**	**314**	**81**	**25.9%**
Sprint-Centel	**20 to 100**	**98**	**28**	**28.6%**

As the table shows, using the Steiner tree as a measure of "sufficient" cable has little impact. In the overwhelming majority of cases that represent universal service areas, the HAI still underbuilds the network.

Q. The figures above speak to the frequency with which the HAI underbuilds, but what is the magnitude of this shortage?

A. The two tables that follow demonstrate that the magnitude of this shortage is significant. In the first table, I have shown a sample of main clusters from Sprint's serving territory in Florida. The table lists the wire center associated with the cluster and the cluster name, the length of the minimum spanning tree, the length of total plant that the HAI builds within the main cluster, and the difference between the two (the shortage). This is only a sample, for illustrative purposes.

CPCRFLXA008	108,716	60,694	48,022
CLTNFLXA002	45,131	181	44,950
LBLLFLXA003	48,695	6,058	42,637
WCHLFLXA005	63,122	23,169	39,953
NPLSFLXC004	50,783	13,048	37,735
IMKLFLXA003	54,642	18,966	35,676
OKCBFLXA018	81,317	46,014	35,303
LKPCFLXA009	45,311	10,818	34,493
PTCTFLXA033	107,654	73,536	34,318

As you can see, the lengths that the HAI Model underbuilds are not insignificant. In the table below, I list the total in miles of this underbuilding, by density zone, for Sprint's serving territory. Recall, the shortage listed on each line below does not address outlier clusters, nor does it address feeder in any way. The shortages listed are found within main clusters.

Company	Density Zone	Shortage (Amount Underbuilt Within Clusters by the HAI's Own Definition)	Shortage (Amount Underbuilt Within Clusters by the HAI's Own Definition, 75% of Max)
Sprint-United	0 to 5	637 miles	460 miles
Sprint-Centel	0 to 5	333 miles	223 miles
Sprint-United	5 to 20	434 miles	288 miles
Sprint-Centel	5 to 20	669 miles	381 miles
Sprint-United	20 to 100	244 miles	138 miles
Sprint-Centel	20 to 100	91 miles	39 miles

Q. Have results similar to these been found in other states?

A. Yes. In every state for which Sprint has seen the actual cluster data and been able to perform such an analysis, the result is always the same: In the low density areas, this underbuilding is systematic, significant, and occurs in the overwhelming majority of main clusters.

Q. How have the HAI Sponsors responded to these statements when presented to them?

A. In the aforementioned Texas proceeding, the response of the HAI proponents was twofold. First it was suggested that if this is indeed a problem or shortcoming for the HAI Model, the BCPM would exhibit the same shortcoming to a much greater degree. Mercer Supplemental Testimony, June 5, 1998, states "Sprint's claim of a flaw is misleading, greatly overstated, and is of equal or more applicability to the BCPM as well."

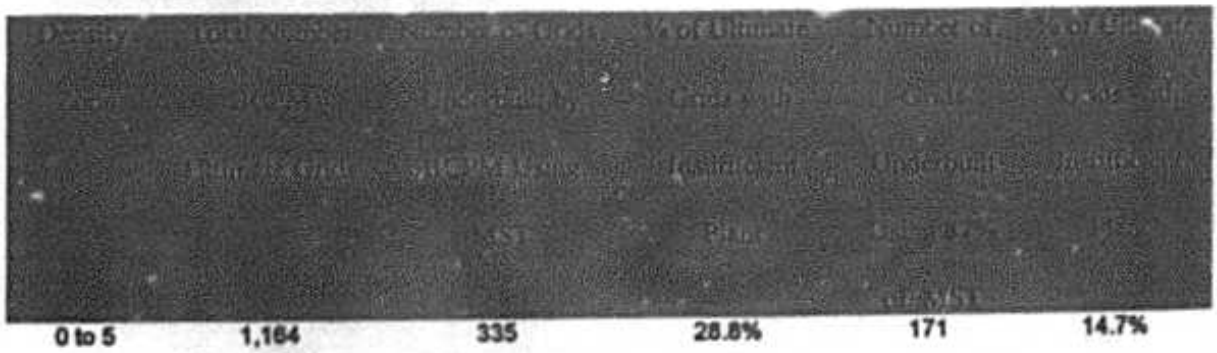
Second, the HAI proponents claimed that the HAI built substantially more backbone and

branch cable inside their clusters than the BCPM built inside its grids, a statement which was intended to support the first statement above. (Mercer/Klick, June 30, 1998.)

Q. Have the BCPM Sponsors conducted a MST analysis on their own model in Florida?

A. Yes we have. It is not possible to replicate the exact MST analysis that was done on the HAI Model because the BCPM in its standard format does not place points, but places counts of customers within microgrids. However, if assumptions are made regarding how these counts are placed in a microgrid, it is possible to conduct a type of MST analysis that measures the dispersion of original customer locations and how that compares with the cable built by the BCPM. A discussion of the BCPM MST approach is attached as Exhibit BKS-10.

For the HAI Model, our analysis was done at the main cluster level. The equivalent level in the BCPM is the ultimate grid level, and this is the level that was used for our MST analysis. The table below shows the results for the same density zones as shown above for the HAI Model, for all of Sprint's territory in Florida. (Due to time constraints I was unable to separate grids by company.)



5 to 20	787	89	11.3%	25	3.2%
20 to 100	721	4	< 1%	2	<1%

As the table shows, there is evidence that sometimes the BCPM underbuilds in rural Florida. However, the frequency of this occurring is much smaller than with the HAI Model. Using 87% of the Minimum Spanning Tree as the measure of what is "sufficient" cable, recall that the HAI Model underbuilt well over 85% of main clusters. By comparison, the BCPM underbuilds less than 15% of grids. The HAI Sponsors' claim, that the BCPM exhibits the same problem to an equal or greater degree, is without foundation.

In addition, it can be worthwhile to compare actual plant built by each model within the basic unit of analysis, either the main cluster (for HAI) or the ultimate grid (for BCPM). Unfortunately, the two units do not directly equate to each other, so any meaningful comparisons must be made at the wire center level, and even then the comparison is imperfect. First, because our analysis focuses only on main clusters, it would be incorrect to compare a HAI total with a BCPM total for the same wire center. Second, examining data at the wire center level misses important detail because it allows high-density areas within the wire center to offset low-density areas. The solution is to look at wire centers that are low-density overall.

In the table below we provide the following information:

What the HAI Model builds within main clusters for an entire wire center;

What the total MST distance is for the main clusters in that same wire center;

The degree, if any, to which the HAI Model fell short of "sufficient" cable;

What the BCPM builds within ultimate grids for an entire wire center;

What the total MST distance is for the ultimate grids in that same wire center;

The degree, if any, to which the BCPM fell short of "sufficient" cable.

As stated earlier, our concern is with the lowest density areas of Florida, since these are clearly of highest concern for universal service purposes. The table lists the wire centers, in Sprint's Florida serving territory, where the overall density was less than 20 lines per square mile.

1							
2							
3							
4	GNVL	837,911	1,241,375	403,464	1,574,751	1,321,860	0
5	GLDL	547,884	695,539	147,655	886,196	791,228	0
6	PNLN	758,103	995,501	237,398	1,185,130	1,036,367	0
7	LEE	641,367	966,026	324,659	1,304,735	1,173,921	0
8	KNVL	844,510	310,829	0	863,493	605,045	0
9	ZLSP	1,181,784	995,511	0	1,312,056	1,103,090	0
10	SPCP	496,392	694,267	197,875	969,965	781,920	0
11	CHLK	1,008,642	1,313,833	305,191	1,673,651	1,436,335	0
12	RYHL	658,109	896,039	237,930	1,167,481	956,386	0
13	GNWD	875,148	976,640	101,492	1,562,988	1,352,350	0
14	EVRG	744,918	327,307	0	505,130	386,073	0
15	MALN	694,647	806,258	111,611	1,184,506	1,056,533	0
16	BAKR	1,447,839	1,547,207	99,368	2,595,212	2,059,406	0
17	FRPT	1,049,030	1,268,181	219,151	1,984,645	1,389,764	0
18	MNTI	2,507,994	2,941,833	433,839	4,395,127	3,469,573	0
19	CTDL	590,714	580,683	0	948,482	721,563	0
20	WSTV	68,129	85,375	17,246	94,145	76,766	0
21	GDRG	800,128	759,808	0	1,319,982	1,044,484	0
22	STMK	170,084	241,346	71,262	430,952	333,115	0
23							

24 As the table shows, in every case where a reasonably direct comparison can be made, the

BCPM builds sufficient plant at the wire center level, whereas the HAI falls short in the majority of cases.

Also, it is important to note that in many of the wire centers shown above, the MST distances are roughly similar between the two models. The fact that MST lengths would be similar, but the HAI builds less than the MST while the BCPM builds more, lends support for the following: *A key difference between the two models is not merely how each model's preprocessing initially allocates customer locations. Rather it is in how closely the model comes to using those locations when it builds its network.*

Q. Is the plant listed in this table all categorized as distribution plant, or backbone and branch cable?

A. No, not for either model. Connecting cable is included in the table above because, in both models, connecting cable is built inside the basic unit (the grid or the cluster) to connect customers in one section of the grid/cluster with customers in another section. In the BCPM it is used more often than in the HAI.

There has been a great deal of confusion as to what types of plant or cable should be included when calculating "what either model builds". For the HAI Model, in the majority of cases the basic unit of analysis, the cluster, represents one serving area and one distribution area. In the BCPM, most ultimate grids represent one carrier serving area that is separated into (up to) four distribution areas. Sometimes the two models have different terms for the cable that is used at various points in the network. Because of this, it is best to consider all plant built within the basic unit (grid/cluster) since all of it may be used for the

purposes of connecting customers to each other and to the network.

In most cases for the HAI, a customer on the west side of any cluster is connected to a customer on the east side of that cluster using *backbone or branch cable*. The same two customers would be connected in the BCPM using *connecting cable*. Both are copper.

On the other hand, connecting cable in the BCPM often is found on the customer side of the DLC. Connecting cable in the HAI Model is usually found on the office side of the DLC. In the HAI Model, connecting cable is fiber. In the BCPM it is not.

Because of this potential for confusion, the comparisons above used everything that exists solely within the cluster or grid: connecting cable plus distribution (backbone and branch) cable. Drop was also included. The results of the table demonstrate the following: A proper comparison of the amount of plant built by the two models, eliminating any confusion over nomenclature or terminology, demonstrates that the shortages discovered in the HAI are significant and systematic in the rural areas of Florida, while the BCPM does not suffer from the same shortcoming.

Q. Please summarize your rebuttal testimony.

A. In his direct testimony Mr. Don Wood states that a model must do two things: It "must accurately determine customer locations" and it must "connect those customers with the serving central office using network facilities that are efficient..." (Wood Direct page 4).

In my rebuttal testimony I have clarified the first point. Contrary to Mr. Wood's statement,

a model must not only "determine" customer location but use the location as well. We have seen that the HAI Model does not do this.

Second, according to Mr. Wood the model must "connect" the customers to the network. The analysis presented here provides evidence that in the rural areas of Florida the HAI Model fails this test as well.

I have shown that the HAI Model consistently and significantly underestimates and underbuilds the amount of cable needed to do exactly what Mr. Wood states it must, "connect" customers to the network. I have presented evidence that the FCC conducted its own analysis that supports the findings shown here. In summary, the HAI Model is not the most accurate and reliable costing methodology available to the Commission but a model that is fundamentally and systematically flawed.

Q. Does this conclude your rebuttal testimony?

A. Yes.

SUPPLEMENTAL REBUTTAL TESTIMONY

OF DR. BRIAN K. STAIHR

ON BEHALF OF SPRINT-FLORIDA, INCORPORATED AND

BELLSOUTH TELECOMMUNICATIONS, INC.

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 980696-TP

OCTOBER 9, 1998

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS AFFILIATION.

A. My name is Brian K. Staihr. I am the Regulatory Economist at Sprint United Management Company.

Q. ARE YOU THE SAME BRIAN K. STAIHR WHO FILED DIRECT AND REBUTTAL TESTIMONY IN THIS PROCEEDING?

A. Yes.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to provide the Florida Public Service Commission (Commission) insight into the flaws in the PNR customer location methodology upon which HAI's modeling of distribution plant is based. My supplemental rebuttal testimony, is filed on behalf of both Sprint-Florida, Incorporated and BellSouth Telecommunications Inc. This testimony is based on an expedited review and analysis of the data at the PNR premises. Although the limitations on

the time frame to review the data precluded an extensive analysis, our findings are indicative of pervasive problems in the methodology employed to construct the PNR polygon clusters and to form the HAI rectangles that correspond to each of the PNR polygon clusters.

Q. PLEASE SUMMARIZE YOUR PRIMARY FINDINGS AND CONCLUSIONS?

A. The evidence provided here validates the criticisms of the HAI model described in my rebuttal testimony and contradicts claims made by the HAI proponents in their rebuttal testimony. The findings described and illustrated in the attached exhibits can be summarized as follows:

1. Examination of PNR polygon clusters and their corresponding HAI rectangles confirms the disparity between the shape and/or orientation of the underlying PNR polygon clusters and the so-called "equivalent" HAI rectangles.

2. The PNR clustering algorithm ignores both geographic barriers such as large bodies of water in constructing clusters of customers and modeling the corresponding distribution plant to serve those customers.

3. Some of the PNR clusters overlap, suggesting the potential to overbuild distribution plant in some areas, despite understating the dispersion of customers in other areas, and underbuilding in other areas. In such clusters, it is unclear which cluster customers have been assigned to in the overlapping areas.

4. Some of the clusters extend beyond the borders of the wire center.

5. A comparison of the HAI distribution cable and drop lengths to the distribution cable and drop distance required to serve the customers in the locations identified by PNR, taking into account road constraints, indicates that the HAI model grossly underbuilds distribution plant. The extent to which HAI distribution and

drop cable distance falls short in this analysis is much greater than that reflected by the Minimum Spanning Tree (MST) analysis which simply connects customers as the crow flies.

6. The limitations of address geocoding are illustrated by depicting the substantial disparity between the address geocoded locations identified by PNR and the actual customer locations obtained via satellite imagery for the Yankeetown wire center.

II. ANALYSIS OF PNR CUSTOMER LOCATION DATA

A. Lack of Correspondence Between the PNR polygon clusters and the HAI rectangles

Q. MR. DON J. WOOD AND MR. BRIAN F. PITKIN CLAIM IN THEIR REBUTTAL TESTIMONY THAT THE HAI RECTANGLES "PRESERVE THE BASIC AREA, SHAPE AND LOCATION OF THE PHYSICAL CLUSTER OF CUSTOMERS..." (P. 57.) DO YOU AGREE WITH THIS CHARACTERIZATION OF THE RELATIONSHIP BETWEEN THE PNR POLYGON CLUSTERS AND THE HAI RECTANGLES?

A. No, I definitely do not agree with this characterization. Based on our preliminary examination of the PNR polygon clusters and the corresponding HAI rectangles during our visit to PNR, this characterization by Mr. Wood and Mr. Pitkin is quite misleading.

Q. PLEASE ELABORATE ON WHY THEIR CHARACTERIZATION IS MISLEADING.

A. Certainly. The customer location methodology involves the use of an algorithm to cluster customers. According to the HAI model documentation, this process is subject to three constraints. Once customers are clustered into main and outlier clusters, PNR constructs a convex hull around the set of address geocoded and surrogate points associated with that cluster. It is this convex hull that I refer to herein as the PNR polygon cluster. The PNR polygon cluster is transformed into a rectangle that may have little resemblance to the underlying PNR polygon cluster. According to the HAI model documentation, the HAI rectangle has the same geographic center and area as the PNR polygon cluster. Beyond this, however, the cluster and rectangle do not necessarily resemble one another, in shape and orientation (i.e. North, South, East, West). This phenomenon is illustrated in the attached figures. Exhibit BKS-1 depicts a cluster where none of the actual customer points is contained within the so-called "equivalent" HAI rectangle, and only two lie on the border of the rectangle.

Since the HAI rectangle is used as the basis for modeling distribution plant, distortions between the shape and orientation of the PNR polygon cluster and the HAI rectangle can result in understating the dispersion of customers in the locations identified by HAI via the PNR polygon clusters. This can in turn result in a substantial underestimate by the HAI model of the distribution plant required to serve the customers as located by PNR. These distortions in the PNR polygon cluster's shape and orientation, relative to the HAI rectangle, are illustrated in Exhibits BKS-2 and BKS-3.

B. Formation of PNR Polygon Clusters Ignores Geography

Q. MR. JAMES W. WELLS, JR. CONTENDS IN HIS REBUTTAL TESTIMONY THAT "HM 5.0a CLUSTERS CUSTOMERS BASED ON THEIR PROXIMITY TO EACH OTHER AND TRANSMISSION DESIGN RULES, WHICH IS WHAT AN OSP ENGINEER WOULD REALISTICALLY DO IN DESIGNING A LEAST-COST LOCAL LOOP NETWORK." (P. 5) DO YOU AGREE WITH HIS CONTENTION?

A. No, I definitely do not agree based on my observations of clusters obtained during the PNR site visit. First, PNR forms polygon clusters that ignore water areas that would never be bridged by a "real" distribution area. This is illustrated in the clusters provided in Exhibits BKS-4, BKS-5, and BKS-6. Exhibits BKS-7 and BKS-8 depict a wire center in the Florida Keys, where the PNR clustering algorithm is oblivious to the fact that it is making one cluster out of parts of two islands, then using another part of that island in a cluster that spans to another island. Clearly this is inconsistent with Mr. Wells' claim that HM 5.0a clusters customers in a manner consistent with a realistic, engineering design of a least cost network.

Although the Benchmark Cost Proxy Model Release 3.1 (BCPM 3.1) uses a statistical measure that overlays ultimate grids within wire center boundaries that may contain geographic barriers to clustering customers, it is imperative that these issues regarding the formation of HAI clusters are raised here, to dispel the perception created by HAI proponents that HAI's clustering algorithm forms natural clusters of customers consistent with "real" distribution design areas. The evidence provided here refutes their claim that their clustering process is not arbitrary and is superior to BCPM 3.1's clustering process.

C. Overlapping Clusters and Clusters Extending Outside the Wire Center's Boundaries

Q. ARE THEIR OTHER TROUBLING ASPECTS OF PNR'S CLUSTERING PROCESS?

A. Yes, there certainly are. First, many of the PNR polygon clusters that we observed during our on site visit at PNR overlap one another. This is depicted in Exhibits BKS-10, BKS-11, BKS-12, BKS-13, and BKS-14. Given that HAI constructs rectangles upon which distribution plant is modeled that have an area equal to the area of the underlying PNR polygon cluster, there are clearly areas where it appears that distribution plant is overbuilt. Since distribution plant is not fungible, overbuilding in some areas does not compensate in any way for inadequate distribution plant in other areas. Appropriate targeting of universal service funding necessitates properly identifying high cost areas in need of support, designing a network that can serve each high cost area without overbuilding or underbuilding.

Moreover, since clusters overlap, it is not possible to determine the cluster to which customers identified in the overlapping portion belong.

Second, PNR's clustering algorithm results in clusters that extend outside of the wire center boundaries that contain the underlying address geocoded and surrogate points. This is illustrated in Exhibit BKS-15. Note that in Exhibit BKS-15, much of the PNR polygon cluster is outside the wire center's boundaries. This phenomenon occurs because the PNR clustering algorithm

forms a convex hull about the original cluster points.

D. HAI Distribution Cable Distance Falls Vastly Short of the Requisite Distribution Cable Distance Based on Real Road Constraints

Q. MR. WOOD AND MR. PITKIN ASSERT IN THEIR REBUTTAL TESTIMONY THAT "ANY MST DISTANCE CALCULATED BY THE BCPM SPONSORS, BASED ON THESE OVERLY-DISPERSED SURROGATE LOCATIONS, WILL LIKELY OVERSTATE THE MINIMUM AMOUNT OF CABLE THAT WOULD BE REQUIRED TO SERVE THESE CUSTOMERS WHERE THEY ACTUALLY ARE LOCATED." (P. 72) DO YOU AGREE WITH THEIR ASSERTION?

A. No, I do not agree. Mr. Wood's and Mr. Pitkin's contention that the MST presented in my rebuttal testimony is conservative, i.e. is likely to overstate the minimum cable required to serve those customers is refuted by evidence gathered during our on site visit at PNR. Recall that the MST analysis in my rebuttal testimony was based on the minimum distance to connect customers as the crow flies, in locations identified by PNR. As such, that MST distance clearly understates distribution cable distance, which must take into account roads, bodies of water, etc. I present here two analyses of required distribution cable length, based on the road network underlying two HAI clusters whose distribution-plus-drop cable length was already shown to be short of the MST distance for the customer points of the cluster (in one case distribution-plus-drop was only 59% of MST length, in the other case only 65%).

When we look at the underlying roads, we realize that the required distribution

cable -- taking the minimum route possible along these roads-- is clearly LONGER than the MST distance, and that the HAI Model is EVEN SHORTER in its building of distribution cable than was indicated by a comparison to MST length. MST UNDERSTATES the amount of cable required. Where HAI underbuilds relative to the MST, its shortage in a realistic measurement is even greater than when compared to the MST distance. Exhibit BKS-16 illustrates that in the first case examined, the HAI distribution cable and drop distance for this cluster is only 34% of the requisite distribution cable taking into account the road network. Exhibit BKS-17 illustrates that in the second case examined, the HAI distribution cable and drop distance for this cluster is only 51% of the requisite distribution cable and drop distance taking into account the road network.

E. Comparison of PNR address Geocoded Locations With Actual Locations Based on Satellite Imagery

Q. DID YOUR ANALYSIS OF PNR ADDRESS GEOCODED DATA FOR THE YANKEETOWN WIRE CENTER PROVIDE ADDITIONAL INSIGHT INTO THE SHORTCOMINGS OF ADDRESS GEOCODING?

A. Yes, it certainly did. A comparison of the points that PNR address geocoded for the Yankeetown wire center with actual locations based on satellite imagery reveals a gross discrepancy between the address geocoded locations and the actual locations. This is depicted in Exhibits BKS-18 and BKS-19. These observations are a reminder of the limitations of address geocoding and a validation that address geocoding is an estimation process as well.

III. LIMITATIONS OF THE PROCESS FOR ANALYZING THE PNR DATA

AT THE PNR SITE

Q. COULD YOU PLEASE EXPLAIN WHY THE VARIOUS TOOLS OF ANALYSIS PREVIOUSLY DESCRIBED, WERE NOT APPLIED MORE BROADLY, I.E. INCLUDED A MORE EXTENSIVE ANALYSIS OF CLUSTERS AND WIRE CENTERS IN FLORIDA?

A. Certainly. In order to use a wide range of tools of analysis, it was imperative that we limit the application of the tools to a small subset of clusters and wire centers. We only had one and a half days to conduct our on site investigation. The computers were not available to us until Wednesday afternoon, October 7, 1998, despite the fact that the Commission's Order required that their facilities be made available as of October 6, 1998.

Moreover, limitations on the computers provided impeded the speed and progress of our analysis. We provided our required computer needs to AT&T on October 6, 1998. Included in that list was two computers with at least 5 Gigabytes on each computer's hard drive. The computers provided to us by PNR had only 3.1 Gigabytes on their hard drives. Consequently, we had to work around this by reading the Florida customer location database from PNR's network. This customer database is quite large, 1.6 Gigabytes (7 million records of data). It required substantial time, i.e. approximately 4 hours, simply to read that data from the network to our desktop machines. This slowed processing time down significantly. Furthermore, one of the computers provided had problems with the hard drive, restricting that hard drive to half of what was presumably available. This precluded our working on that machine. Another machine was provided

during the evening of Wednesday, October 7, 1998. In addition, PNR's network went down while we were half way through the process of reading the FL customer database. That process had to be initiated once again. These challenges, in addition to the restrictive time constraints, limited our ability to analyze more comprehensively the data.

Q. DID THESE LIMITATIONS ON YOUR ABILITY TO ANALYZE THE DATA MORE FULLY, IMPACT THE INTEGRITY OF THE RESULTS PROVIDED HERE?

A. No, they did not. The results provided in my testimony here are indicative of problems inherent in the PNR customer location data, the PNR clustering process, and the corresponding HAI rectangles. These findings validate the criticisms that I raised in my rebuttal testimony. Moreover, they confirm the superiority of BCPM 3.1's superior customer location methodology.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

Q (By Mr. Rehwinkel) Dr. Staihr, do you have a summary to give of your three prefiled testimonies?

A Yes, I do. Because I have three sets of testimony, I'm going to kind of do this in three parts, and they're short, and then I'll do a little conclusion.

Part one is pretty easy. We're here to pick a model. Sprint believes that the BCPM is the right model to pick. As to why, we'll get into that. We talked a lot about geocoding and about clusters and about acres, but if we take a step back and kind of look at it from a bigger viewpoint, if you will, the reason we're calculating costs is to figure out explicit universal service support here in Florida; and the reason we want to figure that out is because it's the only way competition will show up in Florida, in all areas of Florida.

For a new entrant to come in and actually compete, that entrant has to be assured of being able to cover his or her costs, and those are the costs that this entrant will actually incur here in Florida, not in Vermont or Colorado, but here.

The BCPM is the best model to calculate the costs of doing business here for two specific reasons. The first one is the platform. When I say platform, I

mean the equations and algorithms that make up the model. The platform is based on engineering assumptions that are efficient and they're forward-looking, but they're very well connected to reality, the way people really build networks.

The other reason has to do with the inputs. The inputs have been carefully chosen by people who do business in Florida to reflect the cost of doing business here. That combination shows up in the BCPM. It doesn't show up in any other model. That was part one.

Part two, my rebuttal testimony: Understandably, the Hatfield sponsors don't agree. They believe that the Hatfield model is the best model to pick, and the reasons that they have put forth are that their engineering is better than ours and they have a superior customer location approach.

Now, in my rebuttal testimony I talk about the second one. As we saw yesterday and as I've shown in my testimony, the only thing that the Hatfield model does with regard to customer locations is ignore them. The only thing it does is it does not use them, and in the process of ignoring them, it distorts any pertinent information that may have been included with them.

Dr. Duffy-Deno yesterday put a picture up on the overhead that showed a little bit about how these are ignored and somewhat distorted, and I've got a picture that looks like that. It's kind of big.

COMMISSIONER GARCIA: You can make that go up.

WITNESS STAIHR: The picture looked like that, and I just wanted to put it back up there to talk about it.

This is what the Hatfield model does with its customer locations. The blue dots are where the people are. The black dots are where it builds the network. Looking at that, BCPM sponsors don't think that that network there is enough. We'll probably talk a lot about what is enough.

But in Sprint's territory, as I show in my testimony, in the universal service areas, the low density areas, they don't build enough 90% of the time. Yesterday you heard Dr. Duffy-Deno say 68% in BellSouth. For Sprint it's 90%. This is an example. It's a picture. It's not real.

What you have in the supplemental testimony, part three, is real. It's Florida. It's Vernon, it's Trenton, it's Beverly Hills.

Now, what it's not, and what I'd like it to

be, there are places like Sopchoppy, Sumatra, Immokalee, real rural. We don't have those. We didn't have time. We'd like to go back and get them.

But what you have in front of you, if you could pull out No. 1, No. 2 and No. 11 and glance at those. For No. 1, it's a picture of a cluster. The cluster is in blue. I don't think I can put this on the overhead because of the confidentiality. That cluster -- do you have this here? I'm sorry. These pictures. (Pause)

The only pictures I'm going to refer to are 1, 2, and 11. First, No. 1. It says Beverly Hills at the top. It says "BVHL FLXA". The green dots are the locations, the blue areas the cluster. The red rectangle is what enters the HAI model. And if I can quote the HAI sponsors, they say that they have a dynamic clustering algorithm that determines natural groupings of customers. I will be interested to see the natural grouping on the page.

If you'll flip right next to No. 2, what you've got is a Yankeetown cluster. The green dots are the points, the blue is the original polygon, and the red is the rectangle that enters the model. According to the Hatfield sponsors, the rectangles preserve the basic shapes of the cluster.

And if you'll flip all the way over to No. 11, toward the back there, what you have is a picture of Vernon.

COMMISSIONER GARCIA: Why is this confidential?

WITNESS STAIHR: You would have to ask the Hatfield sponsors that.

MR. HATCH: Commissioner Garcia, I can't answer that. The information belongs PNR. They're the people that can make the determination whether it's proprietary or not. I'm trying to get that answer for you. I don't have it yet.

COMMISSIONER GARCIA: Okay. I'm sorry. Where did you go?

WITNESS STAIHR: No. 11, which is a picture of Vernon.

As Mr. Wood, the Hatfield witness, pointed out earlier in this proceeding, the problem with the BCPM, the problem with our grid approach is that we tend to separate customers who should be served together.

What you have in this picture of Vernon is a whole lot of overlapping clusters. You've got a cluster to the west which has points further east than the cluster to the east. You've got a cluster to the

north that has points farther south than the cluster to the south.

We don't know which points go in which cluster. Maybe PNR will eventually let us know. But in terms of separating customers who should be served together, this is a perfect example of how arbitrary the cluster determination is that the Hatfield model is based on.

COMMISSIONER GARCIA: Do me a favor. You're on this now and looking at this map, I guess, broadly. Tell me how your model would capture this.

WITNESS STAIHR: Okay. You can't even start until you look at where the roads are here. We don't have the roads --

COMMISSIONER GARCIA: The reason I point this out is it almost appears that there are roads. I mean, there's a great similarity, and that's why I asked you, because I doubt that this is a -- just a coincidence that they're all lined up this way.

WITNESS STAIHR: No. And if I can point -- If you look at the top left corner, you see there's kind of a circle there. Okay. Having looked at this for a long time, what that is is a census block boundary. And for that census block, nobody could be geocoded, so the Hatfield people put everybody on the

boundary.

COMMISSIONER GARCIA: Okay. Because I was looking at it and saying there must be a road there or something that --

WITNESS STAIHR: Yeah. That's very clear -- I haven't seen the census block boundary, but we could overlay it on this if PNR let us do that.

COMMISSIONER DEASON: What was the geocoding success ratio for Vernon?

WITNESS STAIHR: I don't have Vernon here, but we can get that from the ex parte that -- oh, here. Mr. Rehwinkel has it. According to the Hatfield sponsors' documents, 0.06%.

COMMISSIONER DEASON: Say that again, please.

WITNESS STAIHR: Zero. Less than 1%.

COMMISSIONER DEASON: Less than 1%

WITNESS STAIHR: Yes.

COMMISSIONER DEASON: Success?

WITNESS STAIHR: Yes.

COMMISSIONER DEASON: For the entire Vernon area?

WITNESS STAIHR: Yes, for the Vernon wire center.

All I have left is a conclusion, and it's

real short. Both the models that you have before you make assumptions. Both of them make adjustments, because when you're modeling something, you have to treat things in a standardized way.

It comes down to which assumptions do not introduce a bias to the model. With regard to the models you have, the BCPM is the one that gets closer to being right. That's my conclusion.

CHAIRMAN JOHNSON: Thank you.

MR. REHWINKEL: Dr. Stahr is tendered for cross-examination.

MR. COX: Chairman Johnson, before we begin the cross-examination, Staff thinks it would be appropriate to identify and mark an exhibit, and it may be a conflict on the identification with some of the rebuttal exhibits that Mr. Rehwinkel and Mr. Stahr introduced a moment ago.

It's identified as BKS-11, so we may need to come up with a new identifier for it. It is the deposition transcript and late-filed deposition Exhibit Nos. 1 through 15. It's a composite exhibit, and we'd ask that that be marked for identification. As a new identifier --

CHAIRMAN JOHNSON: I'm sorry. BKS-11?

MR. COX: Yes.

CHAIRMAN JOHNSON: We don't have anything identified as --

MR. COX: I thought Mr. Rehwinkel mentioned BKS-1 through something.

CHAIRMAN JOHNSON: Yes, but we called it something else.

MR. COX: Okay. So we can go with our identifier?

CHAIRMAN JOHNSON: Uh-huh. We called one of them BKS rebuttal and one of them supplemental rebuttal.

MR. COX: That will be fine.

CHAIRMAN JOHNSON: BKS-11, and that will be identified as 60.

MR. COX: Thank you.

(Exhibit 60 marked for identification.)

CHAIRMAN JOHNSON: Any questions on this side of the room?

MR. REHWINKEL: Madam Chairman, before we get started, could I be clear we've got actually two -- we've got another BKS-11 within the composite Exhibit 59, which is a supplemental rebuttal exhibit, the maps that you were just looking at. Is this now 60?

CHAIRMAN JOHNSON: Uh-huh.

MR. REHWINKEL: Okay.

MR. LAMOUREUX: Than you, Madam Chairman. The curse of being first in the alphabet.

CROSS EXAMINATION

BY MR. LAMOUREUX:

Q Good morning, Dr. Staihr.

A Good morning.

Q I'm Jim Lamoureux. I represent AT&T.

A Nice to see you.

Q Let me begin by asking you a couple of questions about your summary.

In endorsing the BCPM in your summary, you mentioned two things. One were engineering assumptions, ard one were input.

As to engineering assumptions, you're not an engineer; right?

A No, sir, I'm not.

Q So in your endorsement of BCPM's engineering assumptions, you're relying on the engineers that participated in putting together BCPM; is that right?

A Yes. I talked a lot with the engineers, and I asked them a lot of questions about how we build our network; and I'm talking about Sprint's engineers, not necessarily BCPM engineers.

Q So for questions about engineering

assumptions within BCPM, really that's for people like Dr. Bowman?

A I absolutely agree. He would be a much better person to ask those questions to.

Q And in terms of inputs, inputs are not a modeling issue. Would you agree with me on that?

A Inputs are a modeling issue in the way that they're used in the model. I'm not the specific input witness. Mr. Dickerson and Mr. Laemmli are.

My purpose in the proceeding here today is because all those things come together, and you kind of need a person to deal with how they come together, and that's me.

Q So, again, in endorsing the inputs to BCPM, you're not -- you're relying on input that you've -- advice that you've gotten from other folks on those inputs?

A No, not completely; because in endorsing the inputs, I'm also endorsing the way the model uses them and uses them appropriately and accurately. It's a big part of whether or not the input is any good, how the model uses it; and I'm dealing with that.

Q Okay. But as to questions about specific inputs, why did you choose this input rather than that input, that's more a question for Mr. Dickerson or --

A Or Mr. Laemmli.

Q Or Mr. Laemmli?

A Yes.

Q Okay. And would you agree with me generally that a model itself could be efficient, forward-looking, but if you chose backward looking inputs or historical inputs, you would get an inappropriate result?

A You can do a lot of things with a model to get an inappropriate result, and inputs is one way to do that.

Q Let's jump right into this idea that you said in your summary that the Hatfield model ignores customer locations. And for convenience, I want to focus on BKS-1 to your supplemental rebuttal.

A Yes.

Q It will be a little dancing in the dark since we can't put it up, but I hope by asking I can make it clear.

A Sure.

Q The dots on that page, those represent the customer locations as identified by PNR; is that right.

A Yes, they do.

Q The irregular shaped polygon that surrounds

those dots, that's the polygon that's drawn as a result of those customers locations.

A Yes, it is.

Q That's the convex hull?

A Yes, it is.

Q This irregular shaped polygon -- sorry. Strike that.

The customer locations are used to construct that irregular shaped polygon.

A That is correct.

Q So it's not entirely accurate, then, that the model ignores customer locations because those locations are used to construct that polygon; isn't that right?

A That's where we're going to have to disagree, because you've got it wrong. The model never sees --

COMMISSIONER GARCIA: Sorry. You're going to have to disagree because?

WITNESS STAIHR: I'm sorry. I said you got it wrong, but that's incorrect.

Q (By Mr. Lamoureux) It's incorrect because you're separating out the process of drawing the polygon from the model?

A I'm also separating out what goes into the

model. The polygon never goes into the model. The model never sees the polygon. The model never sees that the top guy is 5 miles away from the bottom guy.

Q Okay. Let me try it this way, then. The preprocessing stage of the Hatfield model does not ignore the customer locations, because those customer locations are used in constructing this irregular shaped polygon; isn't that right?

A That's right. The preprocessing done at PNR, again, which never enters the model doesn't ignore those.

Q Once that irregular shaped polygon is drawn, that is used to construct the more regular shaped polygon.

A Just the measure of the area; not the shape.

Q But also the height/width aspect ratio as well --

A Yes; and that's where the distortion occurs.

Q But the --

COMMISSIONER DEASON: Excuse me. Let me ask a question. Looking at the exhibit, do we know those are actual locations? Were those actually geocoded, or was there an assumption made about putting it on the perimeter of the census block?

WITNESS STAIHR: Having worked with this a

while, first we know Beverly Hills had a very good geocode rate; above 60%, maybe as high as 70, but I know for a fact it's above 60.

Looking at the way these are laid out here and having looked at a lot of the geocoding lately, you notice that they're very different from the Vernon one that had zero.

The way that they're clustered in the bottom right and the way that they're curved in the top left, glancing at this, and having had a reasonable amount of experience, I would bet these are geocoded points. I don't know that, because PNR doesn't let us know that.

Q (By Mr. Lamoureux) I just want to step through this one step at a time. In the preprocessing stage of the model the customer locations are identified; combination of geocode plus surrogate.

A That's correct.

Q Those com -- those locations are then used to construct this irregular shaped polygon?

A That's correct, too.

Q Information about that irregular shaped polygon is then used to construct the more regular shaped polygon.

A Most of it is not; only a very small part,

and that's only the area. The pertinent information is not used.

Q The area as well as the height/width aspect ratio; is that --

A Again the height/width aspect ratio of this polygon is actually not what's used. The height/width aspect ratio of the minimum boundary rectangle is what's used. I can go through that if you'd like.

Q No. I'm okay with it.

A Okay.

Q And then this regular shaped polygon is what comes out of the preprocessing to go into the model?

A That's correct.

Q Were you here for I think Mr. Wood's presentation at the beginning of the hearing?

A Yes, I was.

Q Do you agree with him that models generally can't handle irregular shaped polygons?

A Definitely I agree with that.

Q So there's a rational reason why the irregular shaped polygon is transformed into a more regular shaped polygon so that the model has something it can work with?

A I'm not sure I can agree with that.

Q Would you agree with me, though, it would be

pretty near impossible for a model to use an irregular shaped polygon like this?

A No. I would definitely disagree, because that's exactly what the FCC is doing.

Q Okay. And that's in their hybrid cost proxy model?

A Yes, sir.

Q And in that hybrid cost proxy model, the FCC uses a clustering process rather a griding approach; is that --

A Absolutely wrong. They use a grid laid over a cluster; a grid very similar to the BCPM's grid.

Q They first construct a cluster, don't they?

A Yes. They construct a cluster using the technique that we use to cluster grids.

Q In fact, have you seen the public notice issued by the FCC on August 7?

A Yes, sir.

Q And are you familiar in that it talks about their platform using a clustering approach because it appears to have advantages over griding approaches?

A Yes. They are very into their clustering approach, which is very different than your clustering approach.

Q In what way is it different?

A Their clustering approach is a divisive approach which is similar to what the BCPM does with grids, which means, you take a big area and you split it. The Hatfield clustering approach is called an agglomerative approach. You take little areas and add them together.

Q But it doesn't use the same sort of griding approach that BCPM begins with of constructing small microgrids and aggregating them up into an ultimate grid without doing any clustering first.

A No. What it does is, it takes those small grids and lays them over the cluster to avoid the distortion that occurs in the Hatfield model.

Q But the hybrid cost proxy model begins with a cluster, it does not begin with a grid; correct?

A That is correct.

Q Let's talk about the BCPM. I drew something on the board to save a little time.

And we talked a little bit about this with Dr. Duffy-Deno yesterday, so I'm going to try and move through it fairly quickly.

The way BCPM works is its finest level of geographic construct is a microgrid; right?

A Yes, sir.

Q Okay. And it takes a collection of

microgrids and composes an ultimate grid, or macrogrid.

A Those are two different things, but yes, an ultimate grid.

Q Okay. Ultimate grid.

COMMISSIONER GARCIA: So that I know, what's the difference?

WITNESS STAIHR: Were you here for my presentation, sir, at the beginning?

COMMISSIONER GARCIA: Yes.

WITNESS STAIHR: I showed a picture of Tallahassee, and some grids were little and some grids were big, but all of those were ultimate grids. The size that it ends up being depends on how many people are there, how closely they are packed together. You've got a lot of people closely packed together, you'll have a small grid; lot of people spread out, you'll have a bigger ultimate grid. They can be different sizes.

Q (By Mr. Lamoureux) But it takes a collection of microgrids, and on top of that collection of microgrids it draws an ultimate grid.

A It aggregates or -- yes.

Q It collects the microgrids in an ultimate grid.

A Yes.

Q And there are 64 microgrids in an ultimate grid.

A No. There are 64 microgrids in a macrogrid. There may or may not be 64 in an ultimate. I'm just trying to keep it --

Q Okay. Well, for simplicity sake, what I've got here is a macrogrid with 64 microgrids in it.

A Yes.

Q Okay. The way we get to where plant is built -- and that's what I want to get to in BCPM -- is it takes that macrogrid and divides it into four quadrants; is that right?

A Yes.

Q Okay. And then within the quadrants it constructs something called a road reduced distribution area within each quadrant; is that right?

A Within each populated quadrant --

Q Okay.

A Well, actually, yes; it's constructed within each. It may not be used.

Q And this road reduced distribution area is centered on the road centroid of the quadrant; is that right?

A That's right.

Q And then what BCPM does for constructing -- for modeling constructing plant is it designs plant from the center of the ultimate grid -- well, it designs table first from the center of the ultimate grid into each road reduced distribution area.

A Each populated road --

Q Okay. So if in my example, for example, if three of these road reduced -- three of these quadrants are unpopulated, it will create the road distribution area for each, but it will only design plant into the one that's populated?

A Yes, sir.

Q Okay. What I want to get at is, because this road reduced distribution area -- what I've drawn in the dash lines -- is centered on the road centroid of the quadrant, it may not cover all the microgrids that have population in them; isn't that right?

A That is exactly right, yes.

Q So, for example, let's saying this quadrant is populated here. This road reduced distribution area could be drawn depending on where the centroid is so that it only covers these upper four microgrids, even though there -- these microgrids down here may be populated?

A Okay. You have to be careful, because if

these microgrids are populated, it's because there are roads there. If there are roads there, the road centroid won't be put where you just said it would be put.

Q Okay. Let me take this. If this quadrant is -- has roads in it in such a way that there are far more roads in the upper left-hand part than in the bottom right-hand part, the road reduced distribution area is going to be pushed up towards the upper left-hand part of the quadrant.

A Yes, sir, that's correct.

Q So it could very well be possible that there is a microgrid that has some roads in it and, therefore, is assumed to be populated, but the road reduced distribution area does not cover that microgrid.

A That's right.

Q So in constructing where plant is built, plant may very well be built in the BCPM -- plant may very well be built in BC plant -- PM -- to places -- not to all places where BCPM has assumed people live.

A Okay. And there's something very important that you can't forget here, and that is -- that this gets technical, and this is an engineer question.

Because we do not taper our backbone

cable -- if we have to have backbones and we built them here, they could just as easily have been here, reaching an area that isn't really covered by the road reduced area. (Indicating)

In your model you taper the backbone cable, so you guys can't do that. It's a modeling convention so that the length of cable is not such that it couldn't actually serve a customer that isn't located in the road reduced area.

Q Okay. And when you're talking about -- we're talking about connecting cable?

A Now I'm talking about backbone or branch cable.

Q And that's within the road reduced distribution area?

A Yes.

Q Okay. So the way the model works is it first constructs the connecting cable into the road reduced distribution area --

A Right.

Q -- and then it constructs branch and backbone cable within that road reduced distribution area.

A That's right.

Q But you agree with this road reduced

distribution area could very well be in a part of the quadrant that doesn't cover all the microgrids that have roads and, therefore, BCPM initially assumes were populated.

A Yes. It could very well be that the plant is placed where we assumed someone was and isn't.

COMMISSIONER GARCIA: While you're getting set up again, looking again at this exhibit that we were looking at, tell me what -- assuming that, as you stated, this is a very accurate -- using the HAI model, give me an example what would happen if we use BCPM.

WITNESS STAIHR: It would be real easy if I could put this on there and draw on it, but I don't --

COMMISSIONER GARCIA: Well, I don't think you have to. Just let's assume that this is how we have the people, that they're spread out to two extremes.

WITNESS STAIHR: Right.

COMMISSIONER GARCIA: Tell me how BCPM -- first of all, give me an idea of how the ultimate grid would look against the space that I'm looking at. Is that the red triangle? Is that an ultimate grid that --

WITNESS STAIHR: No, no. That's a Hatfield

reduced rectangle --

COMMISSIONER GARCIA: Okay. So give me an idea of how --

WITNESS STAIHR: Okay. First off, because no ultimate grid can be as big as some of the reduced rectangles, this would probably be served in two different ultimate grids. The top people in the left corner would be in one carrier serving area, the other people would be in another.

We'd look at where the records are. And here it looks like we've got a road that kind of curves around to the right and zips back up. Okay. If it happened that --

COMMISSIONER GARCIA: That's a complete assumption on your part. It's just you're seeing them there and you assume that it's a winding road.

WITNESS STAIHR: Yeah. I can't tell without being able to actually see whether these are actual or surrogate points, and we don't know that.

COMMISSIONER GARCIA: Okay.

WITNESS STAIHR: Do you want me to assume they're actual and they're on a road?

COMMISSIONER GARCIA: Yes. Let's assume, as you stated, that this is very, very accurate.

WITNESS STAIHR: So the road is going to

go -- curve around there and go straight up. We're going to calculate a road reduced area, okay, for that, and that's going become our distribution area; but before we do that, we put an ultimate grid over that bunch of customers.

COMMISSIONER GARCIA: You're looking at the top left?

WITNESS STAIHR: Top left, yes. We find the road centroid, which is probably that one, two, three fourth dot down. See the fourth dot down from the top? We would probably put the digital loop carrier right there at the road centroid. The connecting cable would branch out probably to the right and to the left, head up to serve those people, head down to serve the people on the bottom right, just as was drawn here.

COMMISSIONER GARCIA: However, let me just -- looking at this same thing, let's say that this is really a rural area. You've divided it into -- you've got all these customers to the left. I assume that the dots that are right on the edge are the ones that the HAI puts there because it doesn't know where they go.

WITNESS STAIHR: I don't think your assumption may be right. Those could very well be

actual customer locations, and it's just that their clustering methodology decided those could be included but no further ones could.

COMMISSIONER GARCIA: Well, then it makes my point even better. If, let's say, there was a state road that ran -- or I don't know where Beverly is, so let's -- and that's my own problem -- but let's assume that an interstate went through there, which you do not discount in your model, and these are rural people.

What it would do -- let's say, the road ran east to west. What it would do then is take those people, if we knew their address but didn't know about roadways, and then it would cluster them along that roadway.

WITNESS STAIHR: Not if it's an interstate, because we don't put people on the interstate. We'll put them on a state highway, we'll put them on dirt roads, but we won't put them on an interstate.

COMMISSIONER GARCIA: Okay. But it would cluster them all along a roadway there if that's what you had.

WITNESS STAIHR: It would distribute them along the roadway, and then it would take that area --

COMMISSIONER GARCIA: But it would also

distribute them along dirt roads that happened to be there.

WITNESS STAIHR: Yes, it would. It doesn't leave out dirt roads.

COMMISSIONER GARCIA: So it would take all these people and distribute them evenly along a roadway.

WITNESS STAIHR: Yes. And if I could --

COMMISSIONER GARCIA: Wouldn't that have a tendency in this case to -- if there was a roadway grid that was very spread out, in this case increase the assumptions and costs involved in serving those customers?

WITNESS STAIHR: It would if we left them spread out. We don't leave them spread out. What we do is, say, they're along a road, we put them along the road. We take the buffer area, 500 feet on either side, convert that to a square, and build the plant within the square.

I talked earlier that you have to make standardizing assumptions once you get to a very low level. That's one of them.

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(Transcript continues in sequence Volume 14.)

BEFORE THE
FLORIDA PUBLIC SERVICE COMMISSION

In the Matter of: Determination of the cost of basic local telecommunications service, pursuant to Section 364.025, Florida Statutes.	DOCKET NO. 980696-TP

VOLUME 13

Pages 1412 through 1544

PROCEEDINGS: HEARING

BEFORE: CHAIRMAN JULIA L. JOHNSON
COMMISSIONER J. TERRY DEASON
COMMISSIONER SUSAN F. CLARK
COMMISSIONER JOE GARCIA
COMMISSIONER E. LEON JACOBS, JR.

DATE: Monday, October 14, 1998

TIME: Commenced at 9:10 a.m.

PLACE: Betty Easley Conference Center
Room 148
4075 Esplanade Way
Tallahassee, Florida

REPORTED BY: H. RUTHE POTAMI, CSR, RPR
Official Commission Reporter

APPEARANCES:

(As heretofore noted.)

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