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 21

Pages 2365 through 2568

PROCEEDINGS: HEARING

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

DATE: Thursday, October 15, 1998

TIME: Commenced at 9:00 a.m.

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

REPORTED BY: CATHY H. WEBSTER, RPR

APPEARANCES:

(As heretofore noted.)

ADDITIONAL APPEARANCES

BETH KEATING, Florida Public Service Commission, Division of Legal Services, 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399-0870, appearing on behalf of the Commission Staff.

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(Transcript follows in proper sequence from Volume 20.)

KENT DICKERSON

continues his testimony under oath from Volume 20

CONTINUED CROSS-EXAMINATION

BY MR. RUSCUS:

Q While we're talking about an understanding of the BCPM, have you noticed the cable prices for 24-gauge copper cable assigned to 3000, 3600, and 4200 pair sizes?

A Yes. I don't know if you heard my deposition. I saw Mr. Wells attempted to state that Sprint was filing costs for cable that didn't exist. If you take a simple look at it, you'll see that the cost for those sizes are the same as the 26-gauge sizes. The model has inputs for those. We satisfied them. The inputs for the three thousand and above 24-gauge are in fact based on existing 26-gauge copper prices.

Q In terms of understanding the BCPM, though, do you understand why it deploys cable that doesn't exist?

A I don't think it does deploy cable that doesn't exist. To the extent that you handle the inputs to the model in the fashion that I just stated it does not deploy cable that doesn't exist.

Q You're suggesting that a price input might be an appropriate correction for the flaw in the model that establishes specific deployments of 24-gauge cable in 3000, 3600, and 4200 pair sizes; is that correct?

A No, sir; that is not correct.

What I said is you have to understand a model in both its function and its form and how the inputs are used. And if you understand that, as I do, there is no flaw in the model. My inputs are correct. The model uses them correctly.

Q Now back to the topic of the appropriate prices for Florida, you share territory boundaries with both GTE and BellSouth; correct?

A I expect that's certainly true.

Q Is it your expectation that if either GTE or BellSouth were to compete for local customers in your territory that somehow, because they are in your territory, their material costs would go up or down to match yours, whatever your stated costs are?

A No, I don't think they would. It would be my testimony, again, that what I provided is factual information. It's the best information available. It's certainly predictive of the current providers' costs in Sprint serving area. It will be years down the road before we probably have to deal with the issue you're talking about to a large extent. It's the best information available.

Q And you said it's the best information available to predict Sprint's cost; wasn't that your testimony?

A Yes. And I think, you know, we can't forget about the customers that this whole proceeding is intended to support. And it's Sprint that's serving those customers and likely to be Sprint that will continue to serve those customers for quite some time because we can't forget we're talking about the more rural areas that Sprint serves.

And I've listened to the affordable local rate proceeding and I've listened to this proceeding. There's been quite a bit of recognition that the competition will come slower to the rural areas. So if you're trying to predict the cost of serving these rural areas, this is the obvious logical information.

Q Can you turn to page 16 of 51 of your testimony, of your BCPM cost submission.

A Sixteen of fifty-one, and what section of it?

Q It's called "Loop Cost Inputs."

A Okay.

Q This -- Let's focus on the portion entitled "26-gauge cable aerial." Do you see that section in the lower block?

A Yes.

Q When I look at Sprint's inputs, I see what's identified as material costs. I see nothing listed as supply costs, nothing listed for tax placing, splicing, or engineering, or an adjustment. And then I see a total. Is that an accurate representation of what's on that page?

A Yes.

Q Does that mean that the material costs and the total costs in this, that the material costs actually represents a total cost for material and installation?

A That's correct.

Q If I'm this Commission and I want to make a decision bout the 40%, or whatever it is, of these costs that are attributable to materials different from what Sprint has identified, how is the Commission to isolate your material costs with the way you've presented the data?

A They can ask me for that information.

Q Okay. And, similarly, if they wish to evaluate your labor costs against any standard of realism or validation, how are they supposed to do that looking at these inputs?

A Quite easily. You can go and look at my gross editions for each one of these cable categories for last year, for example. That's what I do. I look -- Yes, sir.

COMMISSIONER GARCIA: Well, go ahead and finish.

A Well, what I routinely would do is go look at the gross additions. And I would look at the details of what has been capitalized to the books of the company for a very recent period.

COMMISSIONER GARCIA: Good. I was going to ask you about that. Let's say that this Commission decided to go to the legislature and say we, you know, we find that there is a need for rebalancing. Do you think that we should have asked the State -- I think we may have it to some degree, but we should ask the legislature for specific power to go into your books and records on a yearly basis as we go into the rebalancing and take a look at what you've spent, how you've spent it, and then allocate that to the rebalancing issue so that we slowly get to a state of rebalancing?

I mean, should we go into sort of partially -- I don't know what to use, the word, because it's not regulation but it certainly is revenue balancing. In other words, we go into your books -- I'm certain AT&T would want to participate or MCI or whoever -- but clearly the Commission would go into your books and say, well, Commission, here's what I spent at my plant and my base to provide local service to my customers.

The Commission would look at that and you'd probably look at the other side, you know, your losses and whatever, but that wouldn't be central. What would be central is figure out what exactly you're spending on a yearly basis in keeping or maintaining or subsidizing those customers and then allocate that somehow with any rebalancing that we do.

And I know that's far and away and beyond and into policy issues, but clearly we would be able to do that; wouldn't we?

A The Commission always has, you know, free and full access. And, you know, to whatever extent it would be helpful to look at our actual operations in administering this --

COMMISSIONER GARCIA: Counsel points out something that I've been thinking about and I think I expressed it yesterday, how, you know, whether the pole is 172 feet apart, whatever, these costs go shifting as time goes on. They go lessening. They may increase. Your deployment of different facilities. And clearly we shouldn't be paying for certain things but other things we should pay for.

And I think several of the witnesses have alluded to that in questioning, that this is -- There is no constant number. There is not a target that this Commission could hit. And I would probably beyond that: I am certain that there is no target that the legislature could hit, regardless of what model used.

So should it be a process that we just simply come back here and look at these figures, which are changing and use that as a formula?

A Yes, I would be open to that. In terms of -- Seems like there's two things going on: To the extent that we do the rate rebalancing, I think almost everybody's proposal is that's revenue neutral. But if you're saying let's monitor the actual construction that's going on in these companies' territories to see if the costs are in line with what we're predicting in the model, you know, I think that would be appropriate.

You know, I don't know what time period you want to take that on. I think you could identify what the major drivers of the costs are and that's where you could spend your time.

But I think that's very much in line with the reality-based approach that I take to doing these cost studies.

COMMISSIONER GARCIA: Thank you, counsel.

BY MR. RUSCUS (Continuing):

Q In this past dialogue about movement and costs, isn't it true that for each and every input you've provided the Commission in terms of material and labor, you have not indexed those prices to reflect anything other than your current operations today?

A That's correct. I have not made any speculative future adjustments, but I would take you back, again, to KWD-1. This approach results in substantial reductions in investment levels, 27; more importantly, the associated expenses to operate them, 37%. To apply an indexing on top of this would be redundant and excessive.

Q Would you consider a consultation with the TPI to be a speculative process?

A TPI is not to take today's costs and predict what tomorrow's cost is. TPI looked at yesterday's costs and said let's bring it up to today's costs.

I've already done that. There is no need to apply TPI factor. I didn't go back and look at what the cost of cable and wire, material or labor was five years ago. I looked at what it is as you and I sit in this hearing room this moment.

Q So in terms of the cost of the network to build going forward, you didn't even trend out the existing trends, for instance, in digital loop carrier equipment in order to provide inputs for today; is that correct?

A I didn't go beyond the 22% reduction that my study reflects for digital circuit equipment. I reflected the current facts as we know them today.

I do know; I've worked through this. The cost of digital loop carrier is going up in my experience, not down. It's going up. It's providing increased functionality as it does so, which it relates to the discussion that's gone on numerous times with the need to provide access to advanced services. That's why the digital loop carriers have greater functionality. That's why they're going up in costs.

Q Let's look at your digital loop carrier costs. Turning to page --

COMMISSIONER JACOBS: Excuse me. This is from your knowledge that you gained that digital loop carrier is increasing in cost?

A Yes; that's correct. I've looked at the cost of SLIK 2000 versus the current cost of a Rel-Tech device and they have increased based on the data that I've looked at.

COMMISSIONER JACOBS: Go ahead and proceed.

BY MR. RUSCUS (Continuing):

Q And does that data suggests that the costs have increased per university of traffic or simply per device?

A On a per unit of traffic, similarly sized equipment items.

Q Referring to page 42 of 51 of your DLC input sheet; do you have that page?

A I will.

Yes.

Q You indicated in your summary a correction to the DLC identified as running from 673 lines, and I suppose that's up to 1344; is that correct?

A That's correct.

Q And the new value is $148,000?

A Right.

Q And you've testified that the national default inputs that the BCPM sponsors put together are reflective of ILEC costs on a national aggregate basis; is that correct?

A Could you ask that again?

Q Yeah. The default inputs in the BCPM are the product of national averaging of ILEC values or sponsor values?

A Yes.

Q Can you accept, subject to check, or check it if you want, that the DLC default costs, instead of being 148 as you indicated for that unit, is only $96,000?

A What is the associated DLC COT investment for the same size in that default value?

Q I don't know.

A Well, I think there may be some interaction there is why I ask. But I'll accept that that's the number, subject to check. That's part of the reason why I use company specifics because I know for a fact these to be indicative of Sprint's costs. I've done considerable analysis in this area.

I recently did an analysis of five work orders for this same vendor equipment installed in Las Vegas in fourth quarter of '97. It's right in line with this range. It's almost three times the costs associated or suggested by the HAI national default, which is supported by one sentence of documentation.

Q And its 50% above the costs suggested by ILEC average data; isn't that correct?

A Well, again, I don't have the defaults in front of me. I think there may be some interaction with the COT investment table. I also don't know what the default value for the line card investment is.

But I'll accept your math. Again, as I stated earlier, evidence to me that all companies aren't able to buy the equipment at the same price.

We are price cap regulated in Florida. If we could buy and install NGDLC devices for the costs suggested by HAI or that BCPM national default, we'd do it. We'd do it every day gladly because we're price cap regulated.

Further, the environment upon which our NGDLC contract is negotiated at a national level, three quarters of the Sprint LTD operation is price cap regulated.

The prices we have NGDLC reflect the prices afforded to a company that has all the proper incentives to get the cheaper price possible. Our cost is our cost.

Q But it's not necessarily the cost of an efficient provider other than Sprint coming in and attempting to serve the Florida territories; isn't that correct?

A I'm going to reject the inference of an efficient provider, inference being we're not an efficient provider.

If a larger company -- Again, back to simple business dynamics, there are companies -- We serve about seven and a half million access lines, Sprint local telephone division. We're very small compared to even GTE, much less the Bell Companies. I think BellSouth is about three times larger than Sprint.

Naturally, they have some ability to buy these equipment items at a cheaper price than Sprint. I see no reason to penalize Sprint; more importantly, the customers, the two million customers served by Sprint by calculating a high cost support fund based on an unobtainable vendor price that Sprint cannot attain.

Q Is the answer to my question yes or no?

A It was no. I don't agree with your characterization that a more efficient provider could come in and get it cheaper. What I was explaining is that a larger company, some larger box may buy these equipment items cheaper. That's no reflection on efficiency whatsoever.

Q For the record, there was no more in my question.

I simply said the costs an efficient carrier could achieve other than Sprint could achieve coming in to serve the territory.

Moving on, you included nonrecurring costs in your expense pool; is that correct?

A Yes. I've calculated the total cost to provide basic local service. That's certainly a component of the total costs.

Q So the universal service fund would provide subsidy, in essence, going to the nonrecurring costs; correct?

A Well, I don't know that. All I've been asked to do here is to provide a forward-looking estimate for the cost of basic local service. I have done that. How the fund would be administered is yet to be determined.

Q Is it your under- -- Excuse me.

A It would depend, you know. You could include this in the revenue benchmark, for example. You could perhaps decide that we don't want that in there and in that case it could be taken out.

But in providing an estimate for basic local service costs, it's a component of providing basic local service and it's properly included until direction given otherwise.

Q And you would agree that if you're collecting money through the fund to fund nonrecurring costs and you weren't including the revenues you receive from customers in the revenue benchmark, that you'd be double counting those costs?

A Not double counting them, but I think it would be appropriate to have a match there.

Q Okay. Now earlier you stated that all the -- or something to this effect -- that all of the efficiencies that are possible have already been included in Sprint's operations. Is that a portion of your summary?

A Mr. Ruscus, I need to back up so we're all clear. The revenues generated from service connection charges, for example, will not match the nonrecurring costs in general. I think the nonrecurring costs will exceed the cost recovery afforded from those rates.

I'm sorry; could you ask your next question?

Q But your answer still stands that they would need to be matched because --

A Yes, I believe they would.

Q Earlier you indicated you believed, I think in your summary you said this, that the efficiencies that could be captured were already captured in Sprint's cost; is that correct?

A Yes. Let me talk about that for a moment, if I could. I heard Mr. Wood say, well, they'll consolidate their network maintenance center. We've already done that. We've got a network maintenance center, sits in North Carolina, that administers --

Q Excuse me. I actually had a question and you've just started off on a mini monologue.

My question was whether you had stated in your summary that you had included the efficiencies available in your current costs. And I need a yes for that to transition to my next question or a no if I improperly summarized it.

A Yes. I assumed you wanted to hear about it.

Q I just want to ask you the following question: Isn't it true that the nonrecurring costs reflect your actual Sprint experience at the present time?

A Yes. And that is based on -- And I will explain now. It's based on use of consolidated network maintenance centers. It's use -- It reflects the use of automated provisioning systems, work force management automated systems, which feed jobs to technicians with hand-held HAS units. It reflects sonic technology. It reflects -- Mr. Wood suggested we still dig poles with posthole diggers. Mr. Laemmli informed me in his 20 years of outside plant, he's yet to see that done in Sprint's territory.

I believe that, yes, the current expense relationships that I have used in my cost study which generate the 37% reduction to 1997 expense levels reflect an efficient operation. It reflects most of the specific examples that the HAI documentation suggests are going to achieve efficiencies into the future. They're already in our network. So to the extent that they achieve efficiencies, they're already reflected in 1997, and I'm already 37% below that level in my cost study.

Q When you calculated the nonrecurring costs pool upon which your factor was based, you did not reflect any adjustment for the fact that the model you're sponsoring and involved with deploys next generation digital loop carrier equipment; is that correct?

A Well, we are deploying next generation digital loop carrier in our network today.

Q What percentage of your actual costs reflect costs incurred using that type of system as opposed to an older digital loop carrier system or an analog system?

A I'm not certain. However, the plant non specific network operations in that category, my forward-looking study is 36% below the 1997 ARMIS level. So it certainly allows for some reduction in that expense level.

Q But the question I asked you was in the pool of costs you used to calculate your cost factor, did you make an adjustment in non recurring costs based on the fact that the model you sponsor uses next generation digital loop carrier to the exclusion of older technologies?

A Not at that level of specificity. I developed my expense loadings with full knowledge of how they are applied and function in the model. To the extent that you depict more efficient technologies in the model, to the extent that you predict forward-looking levels of investment, i.e., 27% below the 1997 level, to the extent that you look at the results and you see that your approach receives a 37% reduction on 1997 levels of expense, to pursue some minutiae level of detail adjustment on top of that would be redundant.

Q Earlier you were talking about fill factor. And I believe your testimony indicates that your fill factors have to take into account the requirement that you provide service in three working days and satisfy 90% of trouble reports in a certain time period; is that correct?

A Yes, that's correct.

Q Is BellSouth subject to the same requirements in Florida?

A I assume so.

Q And BellSouth's fill factors for feeder are significantly less than yours or significantly greater; isn't that correct?

A I don't know. Do you have them in front of you?

Q Yeah, you can accept, subject to check, that the ones reported by Ms. Caldwell are 71% and yours range from 69% down to 63%, based on the change you made earlier; that a fair assessment of your change?

A And you're telling me that BellSouth's feeder fill factors are 71% for every density zone?

Q That's what's been identified by Ms. Caldwell.

A Well, if that's true, I would not characterize that as substantially higher, no, not at all.

Q But you would agree that --

A I would suggest that the density zones, which contain the vast majority of Sprint's access lines is almost ide. :ical, looking down this revised number where 70%, 69, 68, 67, 66; those are where the majority of the lines are. So, 71, no, we're very similar, would be my conclusion.

Q But you agree that both of you are subject to the same rules and the fill factors that you've identified are lower than those identified in BellSouth's study; is that correct?

A Minimally lower.

Q And they range from 69% to 63%; is that correct?

A Sixty-two to seven. Again, for the density zones where the majority of the lines are, they range from 65 to 70.

Q Earlier you indicated that you felt in order to provide -- because you didn't know who would get a second line, you had to provide two distribution pairs to each household; is that correct?

A Yes. I explained that the least cost approach to provisioning distribution plant is to put two pair in at the time of initial installation. That's a practice that every facility-based telecommunications provider has in place as we speak.

Q And do you know what the number for distribution pairs for households is as reported by BellSouth?

A No, I do not.

Q Now if I live on a street that has ten houses and I know that between 15% and 20% of those people are going to need a second line or maybe there's a future higher percent, isn't it true that I can simply run one cable all the way down the street that has all the pairs, let's say it's 500-foot street, and simply pull off that 15% at the drop terminal as necessary without providing a full twice as many lines as the number of people on the street?

A You could, but you're going to have a huge cost penalty as your second line penetration grows, which it is. As well as you've got a huge cost penalty, first of all. You have to come back and you've got to dig new trenches through streets, sidewalks, driveways, yards, landscaping.

Now imagine the inconvenience to the customer of doing business that way on top of this. Again, we're price cap regulated in Florida. We don't do -- You know, why would we do this if we didn't truly believe this was the least cost approach to providing service?

Q Isn't it true that if I run a cable down the street, past all my drop terminals that has the number of pairs necessary to serve the people with one line, in addition, has some percentage more but less than fully doubled, that I don't have to dig a single trench in order to -- or cut a single driveway or anything else -- in order to go to my drop terminal pedestal, whatever it's called, and pull and attach the line as necessary to the house as necessary?

A Only if you want to make an unrealistic fantasy assumption that second line penetration is not growing and we all know that it is.

Q Is your expectation that you use two lines per distribution, two distribution lines --

COMMISSIONER GARCIA: Maybe we should just don't provide two lines to AT&T customers, and that way we would move along on this point. I think you've made your point, but, you know, we're --

BY MR. RUSCUS (Continuing):

Q I'd like to ask you a couple of questions about your switch costs. You've used default inputs in certain instances because you believe that the results when those inputs are used are consistent with Sprint's current experience; correct?

A Yes.

Q Isn't it true that Sprint's current experience in the SCIS data Sprint has provided to demonstrate its current experience does not reflect the inclusion of GR or TR-303 next generation compatibility?

A No, I don't think that is true. I think that the SCIS runs reflect TR-303 compatibility. The NGDLC devices assumed in this cost study certainly reflect TR-303.

Q If I go through the 139 switches provided in your response to interrogatory No. 39, do you know whether I'll find more than two switches that are identified and prices having compatibility with TR-303?

A I don't know. Again, we use the switching algorithm for about half the switches. And it's my understanding that that is in conjunction with TR-303. The NGDLC inputs that I use are certainly TR-303 compatible.

TR-303 increases switching costs, by the way. The savings from TR-303 is on the loop side of the network, not on the switching side of the network.

Q Are you suggesting that the ports needed to support GR-303 are more expensive rather than less expensive?

A No, I'm suggesting that the overall switch investment is more expensive. I associate the port costs with the loop.

Q If you assume that for the purpose of the model that you're supporting that the port costs actually are included in the switch, isn't it true that the GR -- the ports necessary to be compatible with GR-303 technology are actually less expensive than the ports that relate to older technologies?

A Yes. I believe that's true. There is additional eq pment items as well.

Q Now you have also for your small switches used the small switch option in the BCPM; correct?

A Yes.

Q And isn't that an option whereby rather than using your data, or let's call the regular BCPM data for switches under a certain number of lines, you kick over into what's called the small switch mode and has prices related to those switches?

A I think that's correct.

Q Isn't it true that the data that the BCPM used to create those costs came from a study by Mr. Gable submitted to the FCC which based those prices on rural utility companies from the RUS?

A I don't know. You're really getting into model questions. I'm not a model witness. What you say could be true.

Q I beg your pardon?

A I said what you said could be true. I'm not a model witness.

Q Were that the case, would you not agree that the efficiencies available to Sprint in its 19 states is greater than that commonly available to a small rural provider?

A Efficiencies in what? What kind of efficiency?

Q Its leverage in purchasing switches, in obtaining discounts.

A I don't know necessarily because what I have seen, for example, is that -- Let's go back to digital loop carrier. I've seen where RBOCs buy more of the large size digital loop carriers and they get a better vendor price. I've seen Sprint buy more small sizes and, therefore, they get a better price than a bigger company.

That may be the fact with some RUS companies. They may buy more of the smaller switch sizes than Sprint does and, therefore, they may get a better vendor price. I don't know.

Q How many switches are commonly deployed by a small rural utility, rural telephone provider?

A I don't know. I've not studied that. I've not studied the issue you're asking me about. I've not compared RUS companies' switching costs to Sprint's.

Q Does Sprint employ --

A Again, let's back up here for a minute because it would be my understanding that the Sprint specific discount still applies in that algorithm. So to the extent that we could purchase them cheaper, it would be my understanding that that discount gets applied in the model.

So if what you're speculating is true, it's already reflected in the model results.

Q Where did you get your understanding from?

A I don't know. It's my understanding in general. That's why I satisfy a model input for a switch vendor discount is because it then gets applied in the model.

Q If somebody who had let's say intimate knowledge with the algorithms in the model were to testify that there were no such discount applied, would you have any reason to disbelieve that testimony based on your own personal knowledge?

A Well, don't take it personally, but it would depend on who said it. If Dr. Brian Staihr said it, I would be inclined to believe it.

COMMISSIONER JACOBS: Can I ask you a question real quick.

A Yes.

COMMISSIONER JACOBS: I'll give you a scenario. You have a major competing company, who is going to come into your territory and they're going to compete with you on a UNE basis. And you're going to have to buy a new switch to serve that same territory that they're going to be in. Okay?

A Right.

COMMISSIONER JACOBS: You know they're going to use digital loop technology. Are you going to go out and buy a switch that won't allow you to reduce your per line investment substantially in the future?

A What was the last part of your question, please?

COMMISSIONER JACOBS: Are you going to go out and buy a switch that won't allow you to reduce your per line investment in that territory in the future?

A Are we going to replace our switch as the result of a new entrant coming in?

COMMISSIONER JACOBS: No, no, no. Let's say you have to.

A I have to replace my switch?

COMMISSIONER JACOBS: Yes; that's the hypothetical. Okay. Are you going to buy a switch to compete in that territory that won't allow you to reduce your per line investment substantially going forward?

A I think I would buy them at -- If it occurred today, I would buy them at the prices I've reflected in my forward-looking cost study. That's why my forward-looking cost study shows a 53% reduction of digital switching equipment.

So I think the answer to your question is yes. I would buy the switch at today's lower price and that's what I've indicated in my cost study.

COMMISSIONER JACOBS: So if that competitor were BellSouth or GTE and they would track, their investment would track the Turner, which determine scope of costs for that switch, and show declining costs over time, would you not look to make sure your investment, your price for that switch were not going to track what they're doing?

A Well, at whatever point in time that switch was purchased, I think it would be based on the current cost of switching equipment. If --

COMMISSIONER JACOBS: No, answer -- Understand what I'm saying. I'm saying you have a competitor who has ability to go out and negotiate on pretty equal terms as you.

A Right.

COMMISSIONER JACOBS: And they're going to go out and negotiate to acquire a reduction in investment per line to go into your territory.

A Right.

COMMISSIONER JACOBS: You're not going to go and do the same thing?

A And I already have, I guess would be -- Yes. To answer your question, yes, Sprint is price cap regulated. We want to get the cheapest switches possible. That is the way we've approached the contract that is in place. That contract has been reflected here. It reflects what you're talking about. That's why my study results in a 53% reduction in switching investment.

COMMISSIONER JACOBS: Okay.

BY MR. RUSCUS (Continuing):

Q Can you turn for a moment to page 72 BCPM model documentation?

A I don't have that available.

Q Would you accept, subject to check, that footnote 44 on that page indicates that the small switch curve used in this process was developed by Dr. David Gable of Queens College; it was presented to the FCC by Dr. Gable on August 20th, 1997, in a study titled "Estimating the Cost of Switches and Cable Based on Publicly Available Data." The study was based on regression analysis using data provided by the Rural Utility Service.

A Yes; I'll accept that. I recall reading that at some point.

Q Okay. Mr. Dickerson, were you here yesterday when GTE witness Seaman told the Commission that he expected to acquire a universal service fund of approximately 447 million dollars?

A I'm not sure I was, but if you want to go ahead and ask your question.

Q And Mr. Martin I believe suggested something in the ballpark for BellSouth of 800 million, or a billion two between them. Is it not the case that the BCPM model is capable of taking the costs resulting from your input and calculating at least a range of fund sizes based on that?

A Yes. It's capable of accepting various scenarios for benchmarks, revenue benchmarks, and then calculating a fund size based on a comparison of that revenue benchmark to the costs calculated in the model.

Q Did you calculate any service fund size beyond the 1.2 billion indicated by the other companies for Sprint?

A I'm confused. One, I don't think a fund size was within the scope of what was requested here, but I'm confused. You're saying 1.2 billion and I'm totally baffled.

I do have in front of me that at a $31 and $51 revenue benchmark that the FCC suggested, my cost results of $31.98 for Sprint would be a fund size on capped investment of 68 million.

Q That was my question.

A Yeah.

Q And that's just for Sprint's territories and not for the territories identified yesterday; is that correct?

A That's correct. And I wasn't clear if you were putting out total Florida numbers.

Q Yes, sir.

MR. RUSSELL: I have no further questions.

CHAIRMAN JOHNSON: Staff, how much will you have?

MS. KEATING: Not more than five minute.

CHAIRMAN JOHNSON: How much redirect is anticipated?

MR. REHWINKEL: It will depend.

CHAIRMAN JOHNSON: Okay. Go ahead.

MS. KEATING: Chairman Johnson, before I begin I'd like to ask that Staff's exhibit for this witness be identified for the record.

We would ask that Exhibit KWD-3, which is the deposition transcript, the Late-Filed Deposition Exhibit Nos. 1 through 7, and errata sheet from Mr. Dickerson's September 16th deposition be identified as Exhibit 82.

CHAIRMAN JOHNSON: I have it as 81. Is it 81?

MS. KEATING: I believe it's --

CHAIRMAN JOHNSON: No, you're right.

MS. KEATING: I believe it's 82.

CHAIRMAN JOHNSON: It will be 82.

MR. REHWINKEL: And, Madam Chairman, if I might, Mr. Dickerson has provided somewhere to me or within the organization an errata sheet to his deposition. I would like to have the opportunity just to provide that. We could do it as a late-filed, if that would be more efficient.

CHAIRMAN JOHNSON: You said you do have it now, though?

MR. REHWINKEL: I don't have it with me.

CHAIRMAN JOHNSON: We'll do it as a late-filed. It will be Late-Filed 83.

(Exhibit 82 marked for identification.)

(Late-Filed Exhibit 83 identified.)

CROSS-EXAMINATION

BY MS. KEATING:

Q Good afternoon, Mr. Dickerson. I'm Beth Keating for Commission Staff, and I've really just got a few questions.

First off, BellSouth and GTE have indicated that they use certain indexes in calculating their inputs into the model.

A Yes.

Q Did Sprint Florida use any index in calculating its inputs?

A No, it did not. I used current costs. And, again, my understanding of the TPI factors generally is they bring historic costs up to current costs. And I think I've established the results of my study produce substantial reductions from current costs today. So I would think it would be redundant to apply them to the inputs that I've developed.

I'm not that close to Bell and GTE's inputs, so I don't know if there is some reason, some different methodology that would justify their use in their approach or not.

Q Okay. Thank you.

Are you familiar with AT&T's witness Lerma's rebuttal testimony?

A Yes, I've looked at it. I don't know if I have got it here or not.

Q Well, you may not need to refer to it for this question. But in his rebuttal testimony, witness Lerma indicated that GTE-Florida had properly removed non-recurring costs from its calculation of the basic local costs. But he said he couldn't determine whether Sprint-Florida had done the same.

A No, we did not. Again, my understanding is we were asked to estimate the total cost of basic local service and that's certainly a cost of providing that. As we discussed earlier, you know, depending on how the Commission wants to go with this, it can be removed or it can be recognized in a revenue benchmark to the extent there's some charges that help recover these costs in addition to the recurring charges.

Q Mr. Lerma also indicated that Sprint does not advertise basic local service. So Sprint should not include any advertising expense in the calculation of basic local service.

First off, does Sprint advertise basic local service?

A Well, certainly Sprint does image advertising. Sprint does second line promotions. I guess, further, a lot of these adjustment discussions are down into the details. I guess I'd take us back to Exhibit KWD-2. Those expenses Mr. Lerma is talking about would be booked in customer service. The category of customer and corporate operations in my cost study, the level of expense is 62% below the 1997 level. That's far and a way sufficient to cover any marketing expenses that Mr. Lerma is concerned about.

COMMISSIONER CLARK: I'm sorry. Just so I'm clear: You think there should be marketing expenses in --

figured into the BCPM in some input?

A Well, I'm not certain, but the question I answered was do you incur marketing expenses associated with basic local service. And my response was, yes, we do, particularly as you head into a forward-looking competitive environment.

What I then went on to say is the customer and corporate op and marketing would be part of that category. My forward-looking cost study has 86 million dollars worth of expense in that category. My 1997 level of expense was 228 million. So I'm 62% below.

So certainly you can view that as nowhere near the totality of the expense categories where marketing expenses are booked would show up in my forward-looking cost study. In fact, only 38% of the total 1997 level costs for that category are in this cost study.

COMMISSIONER CLARK: But it's your testimony that it should be in the cost study?

A Some level of marketing expense, yes. And I think that the level is going to relate to what you include in your revenue benchmark. To the extent that you include any additional revenues beyond basic local service revenues, my position only increases. You know, you certainly would include them to the extent that you were going to include any vertical services. In fact, you need to include the cost for those services.

COMMISSIONER CLARK: What if we don't include them? What would be the purpose of including image advertising?

A Well, in a forward-looking environment, where we have predicted substantial reductions, the logic being driven that we're talking about a forward-looking competitive environment which will further discipline companies to be more efficient, I think it's only fair to suggest that in that same environment they're going to advertise to attract and retain customers.

Further, we've already included the demand associated with second lines. In fact, the model includes the demand associated with all lines. In order to calculate the lowest unit cost on the loop part of this network, it includes the demand for all lines, special access, business lines. You certainly are going to have to advertise and keep contact with your business customers. And those units are included in this cost study so as to depict the overall unit economies of scale that come about.

COMMISSIONER CLARK: Thank you.

A Again, I hope I'm not troubling you. There is not substantial amounts of marketing expense in this cost study.

COMMISSIONER CLARK: Thank you.

MS. KEATING: Thank you. Staff has no further questions.

COMMISSIONER CLARK: I did have one other.

CHAIRMAN JOHNSON: Commissioners.

COMMISSIONER DEASON: I'm looking -- I'm looking at your Prefiled Exhibit KWD-1 that was attached to your prefiled direct.

A Okay. Do you have a page number? That would be the cost study itself?

COMMISSIONER DEASON: Right.

A Okay.

COMMISSIONER DEASON: And I'm looking at page 1 of the results section.

A Okay. This would be the one that showed $31.78.

COMMISSIONER DEASON: Right. It references the $31.78.

I guess my first question is in reference to that $31.78, you had mentioned in your testimony that you compared that to the $31 revenue benchmark that at least FCC has proposed. Do you support the use of a revenue benchmark?

A No, I don't. That's a standard BCPM output. No, I think Sprint's position would be it should be an affordability comparison, that issue, and several economists testified to it. We'd like to see the issue focused on those customers who truly can't afford to pay the cost of providing them service. And that would -- You know, with that type of focus, it puts the focus on the right issue: Can these customers afford to pay it or not?

COMMISSIONER DEASON: But should we be subsidizing -- Is that your definition of universal service fund, the purpose of universal service fund?

A A comparison of the cost, of a deaveraged cost to an affordability mechanism? Yes, I believe it would.

I could provide you an example. My wife and I live in a rural area. We live about 40 miles south of Kansas City. Combined, we've got a six-figure income. Our basic local service rate is $5.25. I've got a SLIK rate on top of it. We're paying $.8.75 for basic local service.

If you do a revenue comparison, you're not capturing the fact that my wife and I could afford to pay substantially more for our service.

COMMISSIONER DEASON: Well, then are you -- You think the Commission then should get income figures from all customers and determine who can pay what and base rates on that?

A I'm not an economist and so I don't know that I'm the best person to provide you guidance for how to establish the affordability benchmark that you would compare to.

COMMISSIONER DEASON: So you disagree with the testimony we had yesterday that the purpose of universal service is to subsidize the service, not to subsidize customers?

A No, I think -- No, I think -- I believe that what I'm suggesting does subsidize the service and, in fact, does not subsidize customers.

What it does is it says if it costs $50 to provide service where I live, let's not subsidize Kent Dickerson and Pat Dickerson who can clearly afford to pay the $50.

COMMISSIONER DEASON: So what if you have a neighbor who cannot, they pay a different rate even though you're in the same area?

A Well, at some point you're not going to be able to get it down to Kent Dickerson and his neighbor. But what you try and do is say we think $30 is a reasonable level of costs. And, yeah, there might be some Bill Gates out there, but how many of the total people we're looking at here, what is the percent of Bill Gates and Kent Dickersons.

What you're really trying to say is at a level that's administratively feasible, let's say that the costs, the reasonable level that people should be paying is $30. If the cost is $50, we won't ask them to pay 50; we'll ask them to pay 20. The companies providing service to them will get the other $20. That $20 would be revenue neutral to reductions in other rates so that there is no windfall to the service provider.

I think this dovetails with the comments I heard you say in the affordable local service proceeding.

COMMISSIONER DEASON: Yeah. We're not here to figure out what I think. We're here to figure out what you think.

A Okay.

COMMISSIONER DEASON: The $31.78 is the capped amount Can you briefly explain to me -- I understand that there is a $10,000 limitation. How does that mechanism work and what is the rationale for it?

A The rationale for it is at some point it becomes so expensive to serve certain extremely rural customers that you are going to look for an alternative technology, probably a wireless technology. And it caps the overall investment to serve that customer at $10,000.

COMMISSIONER DEASON: And the reason for that is there could be an alternative -- There's something else that could be cheaper than actually running the wire that distance which would result in $10,000 per line costs?

A That is correct.

COMMISSIONER DEASON: Okay. That limitation does not address the fact that there could be contributions in aid of construction; does it?

A No, it does not.

COMMISSIONER DEASON: Does the model -- Does BCPM address the fact that there can be contributions in aid of construction for some customers?

A No. It could be modified or that could be recognized in some fashion, but the filings we made have no inputs or mechanisms on that issue.

COMMISSIONER DEASON: Should it?

A Yes; I think if you're going to continue those, I think you'd need to deal with it. I don't think it's probab`` material to this two million overall calculation, but, yeah, I think you could look at it and allow for it.

COMMISSIONER DEASON: Do you know what the rule in Florida is concerning CAIC? In all honesty, I don't know if that rule is still in effect or not. I think it is; at least in my rule book it says it's still in effect.

A No, sir; I'm not familiar with that. I know the --

COMMISSIONER DEASON: It's five times annual revenue, annual base rate revenue in a simplistic form, that if the cost of providing service, of extending service exceeds that, that that amount in excess of five times annual base rate revenue can be collected from customers.

A Okay.

COMMISSIONER DEASON: So you don't think that would have a material impact especially in some of the low density areas?

A Is that in the form of you charge an additional monthly charge or is that just --

COMMISSIONER DEASON: It can be collected upfront in cash or it can be collected over a period of years in additional surcharges on the bill.

A I think that if that is applied regularly, you know, I think it should be looked at, to answer your question. I know that it's troublesome public policy to colle.c those.

COMMISSIONER DEASON: Well, we've talked -- I know we're dealing in theoretical and we're talking about building a system which has even been characterized as falling out of the sky. But in reality, if we were building a new system for all those high cost customers, they would be expected to pay some of that additional cost above some certain level and that would we not be asking other customers to subsidize them. And, in fact, if the company received that NCIAC and then also received in universal service, it appears to me that there may be the possibility of a double recovery; do you agree with that?

A Oh, I agree. I think we need to look at it and see what level of contributions in aid of construction are occurring. I think it should reflect that. I do not support recovering the same costs twice.

COMMISSIONER DEASON: Moving to page 6 of the result section of your exhibit.

A Well, Why don't you go ahead and ask your question. I'm not sure I'm -- Okay. Here I am.

COMMISSIONER DEASON: Do you have that?

A Yes, I do.

COMMISSIONER DEASON: I'm looking at the line data section. And this information is provided by density zones.

A Correct.

COMMISSIONER DEASON: And I was curious as to the number of residential lines in various density zones as compared to the number of households in various density zones. And the information to me -- Well, for example, in your 5,000 to 10,000 zone, you show data of 56 households and no residential lines. And then for the zone greater than 10,000, you show 5,660 households and 11,948 residential lines. That doesn't appear on its face to be rational. Can you explain that?

A Not entirely, I don't think. I'll tell you what I know, Commissioner. We provided inputs to the model of actual working lines by wire center. The model itself then distributes those to the density zones based on the Bureau of Census data.

It appears like there's -- The 56 to zero is -- I don't know what that is. It's kind of small. But an expectation of having more lines to households is my expectation in more dense areas but not by the factors shown here. So I cannot explain that.

COMMISSIONER DEASON: Well, in the least dense area it shows that there is about two-thirds -- the ratio of residential lines to household is about two-thirds. Do you consider that to be representative nationally of low dense zones?

A I don't think it's that great nationally. I think that occurs, but I don't know that I would say that's represented nationally.

COMMISSIONER DEASON: Okay. Do you have an explanation for the greater than 10,000, why it appears that every household there has at least two lines or the vast majority of every household has two lines?

A In the greater than 10,000?

COMMISSIONER DEASON: Yes, greater than 10,000.

A I don't know for certain. You heard a lot of discussion about households versus housing units. It could be that what we're seeing here is working lines that we're still billing for that aren't considered a household unit in the Bureau of Census because they are snow birds.

COMMISSIONER DEASON: And I'm looking at the, towards the end of your result section show the results in costs per line per month for the various wire centers. And I'm looking at page 1 of 2 of that particular section.

A Yes.

COMMISSIONER DEASON: Can you tell me where the wire center designated ELFD is located? It has a cost per line per month of almost $8,300.

A Let me look at something for a minute. I think I looked at this earlier. I think that's on a military facility.

MR. REHWINKEL: That's Eglin field.

A And I don't think this materially affects my statewide results, but I would allow -- I don't stand by that number.

The problem was we don't have the access line count because they had the switch.

COMMISSIONER DEASON: Commissioner Garcia said he would move there and he'd agree not to take telephone service if you would pay him $8,300 a month.

Out of curiosity, could you tell me where HRFD wire center is located?

MR. REHWINKEL: That's Hurlburt Field.

COMMISSIONER DEASON: That's another military installation?

MR. REHWINKEL: Yes.

COMMISSIONER DEASON: Okay. Thank you.

COMMISSIONER CLARK: I had one question. I noticed you answer on the cost of capital used in your study, you say as provided in the FCC Order, the FCC authorized rate of return is 11, 11.25% was used. Are we compelled to use that in our cost study, your FCC authorized? I know we had testimony on it, but I have to say I didn't read the testimony.

A No, I don't think you are compelled to use it. I'm not certain if you would ask the FCC to also use your model and your calculation to calculate your federal, that stipulation may apply. But if you're just trying to determine your Florida without necessarily asking the FCC to use that same calculation at the federal level, I think you're free to do whatever you deem best.

COMMISSIONER CLARK: Why did you use it?

A Because we believe -- Well, one, I think our cost of money witness, Dr. Billingsley, I think his analysis of forward-looking cost of capital shows it to be very much in line with what he predicts to be a proper level of cost of capital for a forward-looking environment. So that's really why we used it.

The FCC has endorsed it for federal universal and it's supported by our cost of money expert's analysis.

COMMISSIONER CLARK: I'm not clear. Is that for you or for the general universal service fund?

A I think to the extent that you're looking at the forward-looking cost of capital in a competitive environment for service providers, I think you could use that cost of money for all, for the total pool, if you will.

COMMISSIONER CLARK: So cost of capital wouldn't be a company-specific input?

A I would say probably not.

COMMISSIONER CLARK: Okay.

CHAIRMAN JOHNSON: Redirect.

MR. REHWINKEL: No redirect, Madam Chairman.

CHAIRMAN JOHNSON: Exhibits.

MR. REHWINKEL: Sprint would move -- And I've lost track of the -- 80 and 81.

CHAIRMAN JOHNSON: Show those admitted without objection.

(Exhibits 80 and 81 admitted.)

MS. KEATING: Staff moves 82.

CHAIRMAN JOHNSON: Show that admitted without objection.

(Exhibit 82 admitted.)

MS. KEATING: Actually, I believe there was an 83.

CHAIRMAN JOHNSON: It's the Late-Filed

MR. REHWINKEL: We're going to take a 15-minute break.

(Brief recess.)

CHAIRMAN JOHNSON: We're going to go back on the record.

Preliminary matter, I understand that there's another witness that maybe the parties have reached agreement on.

MR. MELSON: Yes. I believe we can stipulate in Mr. Laemmli, if I'm pronouncing it right.

CHAIRMAN JOHNSON: Mr. Laemmli.

MR. REHWINKEL: Yes.

CHAIRMAN JOHNSON: Commissioners, will there be any questions for Laemmli or can we just stipulate?

Okay. Then we can excuse Mr. Laemmli.

Do we need to take care of it right -- I guess we could take care of it right now.

MR. REHWINKEL: Yes.

CHAIRMAN JOHNSON: Do you want to go ahead and do everything now?

MR. REHWINKEL: Yes.

CHAIRMAN JOHNSON: Okay.

MR. REHWINKEL: Like we did it earlier, we could just move Mr. Laemmli's testimony and exhibits into the record.

CHAIRMAN JOHNSON: Okay. We'll insert his testimony into the record as though read.

MR. REHWINKEL: Yes.

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

REBUTTAL TESTIMONY OF CARL H. LAEMMLI

ON BEHALF OF SPRINT-FLORIDA, INCORPORATED

DOCKET 980696-TP

SEPTEMBER 2, 1998

Q. **Please state your name, business address, employer and current position.**

A. My name is Carl H. Laemmli. My business address is 4220 Shawnee Mission Parkway, Suite 203A, Fairway, Kansas 66205. I am presently employed as Senior Manager – Network Costing for Sprint/United Management Company. I am testifying on behalf of Sprint-Florida, Incorporated (hereafter referred to as "Sprint" or the "Company").

Q. **Please describe your educational background and business experience.**

A. I received a Bachelor of Science degree in Business Administration from Central Missouri State University in 1983.

I have 22 years of experience in Local Loop planning, design, construction, costing and Customer Service Operations in rural, urban and suburban environments. My experience includes Line and Staff responsibilities for local loop design; new technology evaluation and support, Operational Support System (OSS) design and implementation; Network and Operations Policy development, Policy development and implementation of Network and Operational support for Competitive Local Exchange Carriers (CLEC's) for both ILEC and

CLEC operations. I am currently responsible for network and operations costing for unbundled network elements, universal service fund and other product offerings.

From 1976 to 1978 I performed contract engineering design work of urban local loops for Southwestern Bell Telephone Company and rural multi-party elimination projects for United Telephone in Missouri. (Sprint).

From 1978 to 1985, I was employed by United Telephone (Sprint) with responsibility for local loop planning, design, costing and construction, including copper loops, Digital Subscriber Loop Carrier (DLC), as well as local and interoffice fiber optic cable.

I worked on United Telephone's (Sprint's) Texas operations staff from 1985 to 1987 with responsibility for Customer Service Operations methods and OSS implementation.

From 1987 to 1994, with United Telephone (Sprint) in New Jersey, I held positions of Network Engineering Manger, (Responsible for Outside Plant (OSP) and Special Circuit Engineering), Service Center Manager (Responsible for Dispatch, Assignment, Testing and the Repair Call Center) and Area Service Manager (Responsible for Residential and Small Business Customer Installation, Repair and Network Maintenance).

From 1994 to the present I have held several corporate staff positions with Sprint/United Management Company. I have had responsibility for: Network Support of Access Restructuring; New network technology assessment/implementation; OSS development, Network and Operations Policy Development; Results development, Operations and Network Policy and Methods development for Unbundled Network Element and Resale implementation. I have also been responsible for the development of the Operations infrastructure for Sprint – National Integrated Services, Sprint's CLEC. I am currently responsible for network and operations costing for unbundled network elements, universal service fund and other product offerings.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to respond to the direct testimony and exhibits of Mr. James W. Wells testifying on behalf of MCI Telecommunications Corporation and Mr. Don J. Woods testifying on behalf of AT&T Communications of the Southern States and MCI Telecommunications with respect to the validity of certain HAI Model assumptions and inputs.

My rebuttal testimony:

- Discusses proper geographic sizing of Carrier Serving Areas (CSA) and the impact that this sizing will have on enhanced services and USF model outcomes.
- Identifies realistic structure sharing opportunities; shows that the HAI structure sharing inputs are completely unsupported, based on pure conjecture, and are not achievable today or in the future.
- Demonstrates that the HAI national default plant mix percentages are irrelevant and inappropriate to Florida conditions, and are not supported by fact.
- Shows that AT&T and MCI's assumption of using copper "T1" to serve remote customers is not forward-looking and will deprive rural customers of access to enhanced services.

In addition, my testimony identifies instances in which AT&T and MCI misquote, omit key information and misapply technical references; instances in which AT&T and MCI state one set of assumptions in their documentation and then fail to apply those assumption in the HAI model; and instances in which model assumptions are not followed consistently. The impact of these omissions and changes is to consistently understate USF costs. All citations identified by footnotes are provided in Exhibit CHL Rebuttal 1.

Carrier Serving Area (CSA) Sizing

Q. Have you had the opportunity to review the HAI *Model Description* and HAI Inputs Portfolio (HIP) filed by Mr. Don Wood and Mr. James Wells relative the engineering design of Carrier Serving Areas (CSAs)?

A. Yes.

Q. Does Sprint have any concerns regarding the CSA engineering design principles used by the HAI Model?

A. Yes. In defining the engineering principles behind CSA design, Bellcore states that:

> The evolution of the network that can provide digital services using distribution plant facilities has led to the development of the CSA Concept. A CSA is a geographical area that is, or could be served by, a DLC from a single remote terminal site and within which all loops, without conditioning or design, are capable of providing conventional voice-grade message service, digital data service up to 64 kbs, and some 2-wire, locally switched voice-grade special services[1] [Footnotes are included as endnotes in Exhibit CHL-1].

Essentially, Bellcore defined the "forward-looking technology" that serves as the basis for both the HAI and BCPM cost proxy models. At issue is the proper CSA geographic size. That is, what is the furthest distance that a customer should be from the Digital Loop Carrier? Sprint supports 12,000 feet (12 kft). AT&T and MCI, through the HAI model inputs, support 18,000 feet (18 kft).

This issue is important because it has an impact on network cost and the ability of the network to support advanced services. In general, the larger CSA's proposed by AT&T and MCI will result in lower costs, since there are fewer DLC's required. However, that will impede the provision of advanced services because of the longer distances from the DLC to the customer.

AT&T and MCI support an 18,000 foot CSA based on a single reference to a Bellcore document. In their documentation, AT&T and MCI misrepresent a statement supporting 18,000 foot CSAs to be a direct quote from the referenced Bellcore document. The Bellcore reference is clearly taken out of context. It refers to a plant design that requires load coils and is, therefore, clearly not forward-looking nor relevant to this proceeding.

Furthermore, the quotation has been materially altered from the original source which actually recommends CSA placements beginning at 24,000 feet, not 18,000 feet.

Finally, 18,000 foot CSA sizes are inconsistent with industry practice, and other Bellcore and AT&T documentation.

Q. On page 36 of the HIP, section 2.7.6, AT&T and MCI provide a direct quote from Bellcore document, *BOC Notes on the Network – 1994, p.12-4*[4] as supporting an 18,000

foot maximum distance from the Central Office to the customer. Does this document, in fact, support an 18,000 foot maximum distance?

A. No, it does not. This reference has been taken completely out of context and is actually referring to a network design that is not forward-looking and has no relevance to this proceeding.

The AT&T/MCI citation refers *only* to the "Revised Resistance Design" (RRD) method of designing local POTS loops, not to CSA design. The RRD method is not a forward-looking design method, as it recommends load coils on pairs that extend between 18,000 feet and 24,000 feet from the central office. In its order in the USF Docket, the FCC specifically states that load coils are inconsistent with the required forward looking network design. ..he order states, "Load coils should not be used because they impede the provision of advanced services."[3]

Additionally, in what is represented by AT&T and MCI to be a direct quote from this Bellcore document, the quotation has been materially altered to support their position. AT&T and MCI represent the document as saying, "Loops exceeding ***18 kft*** in length should be implemented using Digital Loop Carrier". In fact, the document reads, "..loops longer than ***24 kft*** should be implemented using Digi..al Loop Carrier…". Furthermore, AT&T and MCI have made a significant omission. The statement, "…loops 18 kft to 24 kft in length (including bridged-tap) should be loaded and have loop resistances less than or equal to 1500 ohms." has been omitted from the middle of the direct quote. The actual paragraph, which does not support 18,000' CSAs reads:

RRD guidelines recommend that loops 18 kft in length and less, including bridged-tap, should be non-loaded and have a loop resistance of 1300 ohms or less; loops 18 kft to 24 kft in length (including bridged tap) should be loaded and have loop resistances less than or equal to 1500 ohms; loops longer than 24 kft should be implemented using Digital Loop Carrier (DLC) as a first choice or by CREG or MLRD as second choices" [4] [5]

HAI's incomplete and inaccurate reference to this Bellcore documents clearly provides no support for their position.

Q. Does the document *Bellcore Notes on the Network* - referenced by HIP - provide *any* support relative to the use of either 12,000' or 18,000' maximums for Carrier Serving Areas?

A. Yes, on the next page, in section 12.1.4 *Bellcore Notes on the Networks*[6], speaks at length to Carrier Service Area Design and to the need for a 12,000' maximum loop to support enhanced services. It states:

The evolution of the network that can provide digital services using distribution plant facilities has led to the development of the CSA Concept. A CSA is a geographical area that is, or could be served by, a DLC from a single remote terminal site and within which all loops, without conditioning or design, are capable of providing conventional voice-grade message service, digital data service up to 64 kbs, and some 2-wire, locally switched voice-grade special services (see Figure 12-2). ***The maximum loop length in a CSA is 12 kft for 19-, 22-, or 24-guage cable and 9 kft for 26-gauge cables.***

Additionally, Table 7-11 entitled *Loop Design Plans*[7] (page 7-70) summarizes CSA, RRD and MLRD design plans. In the column for Carrier Serving Area design, it clearly states that the maximum loop length should be 12 kft. The accompanying text[8] reiterates that the reason for this limit is to facilitate the provision of digital services.

Q. Does the document *Bellcore Notes on the Network* - referenced by HIP - provide *any* support relative to the use of either 12,000 feet or 18,000 feet maximums for Customers served from a Central Office?

A. Yes. Section 12.1.4 *Bellcore Notes on the Networks* further states that this 12,000' limit is also applicable to customers served directly out of the central office.[9] The Bellcore document reads:

> The area around the serving central office within a distance of 9kft for 26 gauge cable and 12 kft for 19-, 22-, and 24-gauge cable, although not a CSA, is compatible with the CSA concept in terms of achievable transmission performance and supported services."

Q. Are there other published documents supporting an industry standard 12,000' CSA design instead of 18,000'?

A. Yes. In AT&T's *Outside Plant Engineering Handbook*, on page 13-1 under the heading *Carrier Service Area (CSA) Philosophy* it clearly states that CSAs should be designed based on a maximum12,000' distance from the Customer to the Digital loop carrier. It states:

> The boundaries of the CSA are based on [cable] resistance limits of 900 ohms for the distribution plant beyond the RT [Remote Terminal]. These limits basically equate to 9,000 feet (2743.2 m) of 26-gauge cable and 12,000 feet (3657.6 m) for 19-, 22- or 24-gauge cable including bridged tap.[10]

Also, the same handbook, on page 3-16, under the section headed *Carrier Serving Area (CSA) Design*, states:

> To meet the 64 kb/s transmission rate, the secondary system cables [distribution cables] within a CSA must not exceed 9,000 feet (2743 m) in 26-gauge (.4 mm) design area and 12,000 feet (3658 m) in a 24/22/19-gauge (0.5/0.6/0.9 mm) area. If there is a concentration of special services in the area these limitations may have to be reduced.[11]

Q. What cable gauge does the HAI model utilize?

A. AT&T and MCI state that all feeder and distribution cables 400 pairs or larger are assumed to be smaller, less costly 26-gauge cable. As noted above, a predominantly 26 gauge design would further limit CSA size to 9,000 feet. AT&T and MCI need to increase cable costs to reflect 24-gauge or larger cable, or reduce their CSA sizes to 9,000'.

Q. Please summarize your testimony regarding CSA size.

A. The size of Carrier Serving Areas that are assumed in a forward-looking proxy model materially impact network cost and the ability to support or impede the provision of enhanced services. AT&T and MCI have changed assumptions as needed to produce the lowest cost.

Sprint has proposed the industry standard CSA size of 12,000 feet. This size is supported by Bellcore and AT&T engineering guidelines, and will not impede the delivery of enhanced services.

AT&T and MCI support a CSA size of 18,000 feet. The only support provided for 18,000 foot CSAs is a misquote of a Bellcore document that refers to a loaded loop design, which is by de..ition, not a forward-looking plant design. The cited Bellcore document, in fact, supports 12,000 foot CSAs, in order not to impede the deployment of advanced services.

AT&T and MCI's CSA sizes are inconsistent with the cable gauges that they use for the purposes for developing cable prices. These assumptions are mutually exclusive. Finally, the unsupported selection of an 18,000 foot CSA size serves only to artificially reduce the network cost produced by the proxy models and to thereby reduce support.

II. Structure Sharing - Introduction

Q. What is "Structure"?

A. For modeling purposes, "Structure" is considered to be poles, underground conduit and the "hole in the ground" (plowed, backhoed, trenched, etc.) into which a buried cable is placed.

"Underground Cable" is cable that is placed in an underground conduit. "Buried Cable" is cable that is placed directly in the ground.

Q. What is structure sharing?

A. Structure Sharing occurs when more than one company shares the use and the cost of a structure, such as attaching to the same pole or sharing a trench.

Q. Why is it important to get the correct input values for structure sharing?

A. Structure cost is one of the largest costs of building the outside plant network. While there are many real opportunities for sharing, there are also many limitations. These may be driven by regulation, physical limitation, the economics of different utility networks, weather, soil conditions and many other factors. Incorrectly evaluating these factors can result in unachievable structure sharing percentages and dramatically different model costs.

Structure sharing inputs must be based on sound, factual information that reflects actual conditions. For instance, it is far more economical for a power company to place aerial cable than to place buried, whereas the opposite tends to be true for telephone. It is not unusual for a power company to be 80% aerial in an area, where telephone is 80% buried. It would be inappropriate to assume that they would suddenly, perfectly coincide. This is because each is responding to its own economic realities, not because either is making poor network decisions.

Q. Have you had the opportunity to review the testimony and structure sharing inputs sponsored by Mr. Wells (MCI Telecommunications Corporation) and Mr. Woods

(AT&T Communications of the Southern States and MCI Telecommunications) in this proceeding?

A. Yes, I have.

Q. Does Sprint agree with the structure sharing inputs proposed by the AT&T and MCI?

A. No. A comparison of the structure sharing inputs proposed by Sprint and the HAI sponsors is attached to this testimony as Exhibit CHL-3. In general, AT&T and MCI propose levels of sharing that are significantly higher than those proposed by Sprint. These inputs are not achievable today, or at any point in the future. Use of the AT&T/MCI inputs will result in a significant understatement of the cost of providing universal service to customers in Florida.

In reviewing the inputs and testimony I have determined that:

1) HAI inputs are unsupported by any data and do not appear to have been validated.
2) The HAI structure sharing percentages, improperly apply the "rebuilt network principle" by unrealistically assuming not only a complete reconstruction of the telephone network, but also of every other power, CATV, water, gas and sewer company's infrastructure.
3) The HAI modelers do not correctly apply the underlying assumptions that they describe in the HAI Inputs Portfolio and Model Description.
4) AT&T and MCI recognize that there is additional cost incurred in order to share a pole, but fail to add the additional cost when sharing underground conduit and buried cable.

5) The HAI model inputs fail to properly recognize the safety code issues.

6) The HAI model inputs inaccurately portray the economics of sharing.

These input values have too significant an impact on model outcomes to use unsupported numbers.

Q. AT&T's response to a Sprint data request[12] (see Exhibit CHL-4) demonstrates that AT&T and MCI believe that power and telephone will share virtually 100% of all telephone network structure. Is there any basis provided for this conclusion?

A. No. This is simply not a reasonable assumption. It is not supported with any facts and is 180° out of sync with experience. It is in direct conflict the AT&T and MCI's HIP which states that power cannot share feeder to the extent that it shares distribution[13]. Power company networks are predominately aerial while telephone networks are predominately buried.

In order to accept this assumption, one must believe that for every single inch of plant in the network, if telephone is aerial, power will be aerial. For every inch of plant in the network, if telephone is buried, power will be buried. For every foot of telephone feeder conduit, power will abandon their existing facilities and choose to bury cable.

The reality of the situation is this; the economics of power and telephone networks are different. It is far more expensive for a power company to bury a cable than it is for them to place aerial wire. This because of the far more expensive buried conductors, deeper trench required, and more expensive transformers, etc. that must be used. In contrast, because the cost varies less and there are significant maintenance savings, Sprint finds burying cable to be the far more economical alternative. Each provider is going to make network decisions that are in their own economic interests.

The net result is that Florida Power Corporation is 81%[14] aerial while Sprint is 78% buried. Sprint is 17% underground and Florida power has no underground facilities. Structure sharing does not overcome the economics driving this mix and it is not expected to change significantly in the future.

Q. Do AT&T and MCI follow the model assumptions for structure sharing that they describe in their Hatfield model documentation?

A. No. The HIP states that, due to technical constraints, power and telephone cannot share a feeder trench to the same degree that they can share a distribution trench. The HIP reads:

> In addition, LEC shares of buried feeder structure are larger than buried distribution structure shares because a LEC's ability to share buried feeder structure with power companies is less over the relatively longer routes that differentiate feeder runs from distribution runs. This is because power companies generally do not share trenches with telephone facilities over distances exceeding 2500 ft.[15]

However, in the model, AT&T and MCI actually assume that the telephone company will share a trench with power 100% of the time in both feeder and distribution, even though their documentation states that this is not technically possible.

Sprint Exhibit CHL-4, provided by AT&T in response to a Sprint data request, clearly demonstrates that for buried trenches, AT&T and MCI assume:

1. 100% of Distribution trenches are occupied by telephone, *power* and 1 "other"
2. 60% of Feeder trenches are shared by telephone, *power* and one "other"
3. The remaining 40% of feeder trenches are shared by telephone and *power*.

AT&T and MCI have not followed their model assumptions.

Q. Has AT&T published other recommendations for joint trenching with power?

A. Yes. AT&T has stated, "Joint trenching with power facilities should be employed only for distribution cables and service wires, not for feeder or trunk cables."[14] AT&T now apparently recommends that *all* feeder be placed with power.

Q. Are AT&T and MCI's below ground structure sharing percentage based on a reasonable assumption relative to the "rebuilt network standard?

A. No. AT&T and MCI's below ground feeder sharing inputs assume that, not only is the entire telephone network being reconstructed, but evidently the entire power, cable, water, gas and sewer infrastructure as well. To accept these inputs, one must be willing to believe that there are 1 to 2 other companies with a need to build a network at the same time and in the same place, for every single foot of Sprint's Florida network. AT&T and MCI have stretched the rebuilt network standard to the point of absurdity.

AT&T's overlay of the fictitious assumption that the entire United States utility infrastructure are being reconstructed simultaneously reduces the proxy model approach to pure fantasy.

Q. Are the AT&T and MCI structure sharing inputs achievable today?

A. MCI's witness, Mr. Wells, does not believe so. In previous testimony[17], Mr. Wells stated that, to his knowledge, no local exchange company (incumbent or new entrant) has been able to achieve a sharing factor of the magnitude that AT&T and MCI support. Mr. Wells acknowledged that the two most likely candidates for sharing support structure with a LEC, the electric and CATV companies, already have networks in place, and presumably have no interest in sharing the cost of the support structures necessary to reconstruct the telephone network.[18] Finally, Mr. Wells admitted that the sharing fraction proposed by AT&T and MCI has not been achieved today, and cannot be achieved today.

Sprint, as well, believes that the AT&T and MCI structure sharing inputs are not achievable today, nor in the foreseeable future.

Q. What empirical evidence do AT&T and MCI provide to support the HAI structure sharing inputs?

A. In response to a Sprint Data Request[19] regarding support for aerial feeder and distribution structure percentages, AT&T responded:

The HAI Model Default input values for aerial feeder and distribution structure percent assigned to the telephone company are based on the expert opinion of a team of engineers with extensive experience. Questionnaires were not sent to vendors, contractors, nor to any other party to determine the default input values for aerial feeder and distribution structure assigned to the telephone company.

When asked[20] to provide copies of structure sharing contracts that were used as a basis for developing structure sharing inputs, AT&T responded:

A specific contract or contracts were not explicitly sourced in deriving the structure sharing default values in the HAI model.

AT&T and MCI provide no empirical evidence to support the HAI structure sharing inputs. Instead, AT&T and MCI rely upon opinion. These inputs have a significant impact on total cost. Development of these costs cannot be based solely on unvalidated opinion.

In the HIP[21], AT&T and MCI refer to the current structure sharing percentages in New York City's, Nynex owned Empire City Subway as supporting underground sharing percentages, even stating that "..well over 30 telecommunications providers" now occupy Nynex ducts. However, when asked to provide documentation in support of this assertion[22], AT&T responded, "…that information would undoubtedly be considered proprietary by Bell Atlantic, and is not available to AT&T and its consultants." [emphasis added by Sprint]

Furthermore, the Empire City Subway support is actually irrelevant to this proceeding. The cited example represents leasing or renting of duct space from an ILEC. The HIP (Appendix

B page 152) specifically – and correctly - states that the Hatfield Model does not assume leased conduit to be "shared" for modeling purposes. Since both BCPM and HAI cost out only the actual conduit used by the LEC, and not the cost of the additional, leased conduit, the cost of the additional conduit cannot be "shared away".

Q. Is Mr. Wells familiar with how the structure sharing inputs were developed?

A. No. On page 24 of his testimony, beginning on line 22, Mr Wells states, "The HAI Model OSP Team has done a more thorough job than any other model proponent in documenting assumptions and validating input values…"

However, in the North Carolina USF proceeding, Mr. Wells stated that these inputs were developed before he joined the HAI Model Outside Plant Engineering Team[23]; that he had no knowledge of: who proposed this group of inputs, the extent to which the inputs were discussed, or any information as to how they were developed.[24] Mr. Wells indicated that he was unaware of any documentation that reflects this process[25] and was sure that if any documentation existed, he had not seen it.[26]

Q. Has AT&T demonstrated that it has done anything at all to validate these critical structure sharing inputs?

A. No. On page 24, line 21 of his direct testimony, MCI witness, Mr Wells states that, "…there are many ways to validate expert opinion". Based on his direct testimony and AT&T responses to data requests, AT&T has not used any of these "many ways" to validate the opinions of the HAI engineering team.

Structure Sharing – Buried Cable

Q. Is there any direct correlation between structure sharing percentages that can be attained on aerial pole lines and the percentages that can be attained for buried facilities?

A. Clearly not. As a practical matter, one would normally expect to see higher sharing of poles than of trenches. A pole line will be in place and accessible to all parties for as long as it exists. A trench can only be used within a short window of days that it remains open. Therefore sharing only occurs to the extent another company has a need to build facilities along that same identical route at the same identical time. This is not at all comparable to an asset that is available and accessible for sharing at any time over many years.

Q. Do HAI inputs supported by AT&T and MCI for Buried and Underground Structure ·sts include the additional costs that would be incurred in order to "share" the structure.

A. No. They include the additional cost for poles, but not for buried or underground structure.

The HAI national default inputs assume that a 40' pole is used at every pole location. If a pole was placed solely for a single telephone company's use, it is likely that a 25' or 30' pole would be adequate. So, in the case of "Pole Structure", the model clearly recognizes the need to add the higher cost of "shared" structure –in this case a larger pole - before reducing this higher cost by the structure sharing percentage for poles.

However, in the case of underground conduit or buried cable, the cost of the structure is not increased to reflect this additional cost before applying the sharing percentage. In order to share a trench with power, Sprint must pay a higher cost of trenching due to deeper and/or wider trenches, additional back filling and material handling.

Nowhere in the HAI national default input documentation is it demonstrated that these increased costs are considered. As such, AT&T's inputs for underground construction costs are clearly conceptually inconsistent pole sharing assumptions and further understated when used in conjunction with their unrealistically high assumptions for structure sharing.

Q. Do AT&T and MCI fail to consider construction codes that must be followed when placing cables?

A. Yes. National Electrical Safety Code® (NESC) specifies rules for placing buried power and communications cables. The (NESC) is a technical publication of the Institute of Electrical and Electronics Engineers, Inc. (commonly known as the IEEE). It established rules for the purpose of "..the practical safeguarding of persons during the installation, operation or maintenance of electric supply and communications lines and associated equipment. These rules contain the basic provisions that are considered necessary for the safety of the employees and the general public *under specified conditions* [emphasis added by Sprint]."[27]

The current edition of the code is NESC C2-1997. It contains 256 pages of technical specifications, most of which is specific to particular situations or conditions. When referencing the code, it is always necessary to understand the specific context of a citation as well to read the entire relevant sections.

Q. Do Sprint construction practices conform to the NESC rules?

A. Yes.

Q. Does the NESC prescribe rules regarding the placement of buried communications cable and buried power lines?

A. Yes. The NESC has clearly defined rules that require vertical and horizontal separation of communications cable and power lines. This means that communications and power cables cannot be simply thrown into the same trench and covered in one operation – at no additional cost – as modeled by AT&T and MCI.

It requires physical separation for the electrical protection of workers and the public. It is intended to ensure that each company can access their cable for maintenance without causing damage and service interruptions to other companies' facilities and customers. The code does allow exceptions to these rules with additional requirements of the power company. They also require the agreement of *all* involved parties. Placing power and telephone cables directly together in the same trench is commonly called, "random lay".

Placing buried power and communications facilities together without any physical separation is hazardous to workers and the public and does not provide adequate space to maintain each companies facilities. Sprint's workers are not trained, licensed nor equipped to work in the immediate proximity of high voltage power lines. Furthermore, Sprint's customers would not be tolerant of the delays in service restoration time that would result from having to wait for the power company to show up to move and de-energize the power cable before Sprint could begin service restoration.

The NESC requires the agreement of all parties before allowing exceptions to the separations rules. If a power company, CATV company or communications provider does not want to put their facilities at risk by placing them all together, they can effectively prevent Sprint from doing so. Clearly, Sprint is not the sole decision-maker on matters of joint, buried construction. There are no power companies in Florida that have agreed to allow Sprint to use "random lay".

Q. Why don't power companies agree to do random lay?

A. Power companies don't agree to do "random lay" because *they* have nothing to gain and much to lose.

There is no upside: The power company will receive essentially the same structure sharing dollars whether the telephone company places their facility in the bottom of the trench with the power cable or throws in 12" of dirt and then places their telephone cable.

There is a lot of downside: "Random Lay" requires the power company to spend more money for hardware and labor cost to meet NESC bonding and grounding requirements and requires additional coordination. The power company's exposure to increased future maintenance cost goes up dramatically as does its exposure to potential liability problems.

Power companies have a vested interest in maintaining code-required separation. They act reasonably and in there own self-interest when they refuse to do "random lay". Telephone companies cannot force a power company to agree to do random lay.

Q. What are the NESC rules relative to placing buried power and communications cable?

A. The NESC rules for buried cable are defined in section 35. Beginning on Page 186, the relevant rules are the following:

Rule 351A1: Cables should be located so as to be subject to the least disturbance practical. Cables to be installed parallel to other subsurface structures should not be located directly over or under other subsurface structures, but if this is not practical, the rules of separations in Rule 352 should be followed.

Rule 351A3: Cables are to routed so as to allow safe access for construction, inspection and maintenance.

Rule 352A: Horizontal separation. The horizontal separation between direct-buried and other underground structures should be not less than 300mm (12 in) to permit access to and maintenance of either facility without damage to the other. Installations with less than 300mm (12 in) horizontal separation, shall conform with the requirements of Rule 352C, Rule 354 or both.

Rule 352B4: Crossings. Adequate vertical separation shall be maintained to permit access to and maintenance of either facility without damage to the other. A vertical separation of 300mm (12 in) is, in general, considered adequate, but the parties involved may agree to a lesser separation.

Rule 352C: Parallel Facilities. When conditions require a cable system to be installed with less than 300mm (12 in) of horizontal separation, or directly over and parallel to another underground structure (or another underground structure installed directly over and parallel to a cable), it may be done providing all parties are in agreement as to the method. Adequate vertical separation shall be maintained to permit access to and maintenance of either facility without damage to the other.

Rule 354D: Supply cables ["supply" refers to power cables] and communications cables or conductors may be buried together at the same depth with no deliberate separation between facilities, provided all parties involved are in agreement and the applicable rules in 354D1 are met and either Rule 354D2 or 354D3 is met. (Note: These rules reference additional bonding, grounding and protection requirements.)

Q. Do these rules apply to fiber optic cables as well?

A. Yes. Fiber optic cable can be purchased with a shield and central strength member that is made of a metal material or made of non-metallic material such as Kevlar®. (The "shield" surrounds the bundles of glass fibers and provides mechanical protection, the central strength member makes the cable more rigid and allows it to be pulled without damaging the fibers). The HIP[28] suggests that fiber optic cables without metallic components would be exempt from NESC buried cable separation requirements. This statement demonstrates a lack of understanding of network operations, and a misunderstanding of the purposes of the NESC buried cable separation rules.

Telephone companies generally do not bury fiber optic cables that do not have metallic components. Without a metallic component, the cable can not be easily located or identified. The fiber optic cables are the backbone, the high traffic carriers of the network. A Bellcore summary of all major service outages reported to the FCC for the year ending June 30, 1997, found that fully 79% were caused by fiber cuts. Companies must clearly be able to locate their fiber cables in order to keep the network healthy and functioning.

Secondly, the intent of the separation rule is not just to provide electrical isolation, but it is to permit access to and maintenance of either facility without damage to the other. (NESC 352A, 352C) It's hard to imagine a more certain guarantee of a service outage than a fiber cable that can't be located, lying right beside someone else's cables.

Q. In Florida, do developers provide free trenches and place telephone cables at no cost to the telephone company?

A. In the HIP[29], AT&T and MCI state that in new subdivisions, builders, "...usually dig trenches at their own expense, and place power, telephone and CATV cables in the trenches, if the utilities are willing to supply the materials. Thus, many buried structures are available to the LEC at no charge."

There is no requirement in Florida that builders in new subdivisions provide a trench at no cost to the telephone company. Developers in Florida will not do Sprint's network construction at no cost to Sprint.

Structure Sharing - Underground Conduit

Q. Do you agree with AT&T and MCI that Sprint should be able to recover one-half to two-thirds of the cost of Underground conduit trenching cost?

A. No. As previously noted, Sprint and AT&T/MCI agree that leasing of individual ducts is not appropriately considered "structure sharing" for modeling purposes.[30] This leaves sharing the cost of the "hole in the ground" for the conduit system as the only opportunity to share cost.

AT&T and MCI suggest that LEC's can readily share the costs of constructing conduit, "...with other telecommunications companies, cable companies, electric, gas or water utilities, particularly when new construction is involved."[31] However, there is actually almost no opportunity for sharing of the magnitude AT&T and MCI suggest.

1) It requires that another company needs to build the same route at the same time.

In order to achieve the AT&T and MCI sharing percentages one must assume that there will be 1 or 2 other companies that need to build in the exact same location at the exact same time – 100% of the time. This is, frankly, an utterly absurd assumption that is completely without any basis in experience or fact.

2) It is more economical to lease space than to share structure cost.

A telecommunications provider or CATV provider has two options when deciding to place additional plant along a new telephone company conduit run. They can either lease a conduit from the ILEC or they can pay 50% of the cost of the trench. AT&T and MCI correctly point out in the HIP[32] that the Telecommunications Act *requires* non-discriminatory access to ILEC structures at *Economic* prices.

The economic cost of leasing one duct will clearly be a fraction of the cost of paying for 50% of the trench. For example, in a 12 conduit system, the economic cost would be about 1/12th of the conduit system cost. No reasonable provider will ever opt to share the cost of the trench when they can lease a duct.

This is evidenced by the HIP indication that "...well over 30 telecommunications occupy conduits owned by Empire City Subway in New York. AT&T and MCI further acknowledge this saying, "...use of existing conduits is a much more economical alternative than excavating established street and other paved areas[33]"

3) Code standards make sharing conduit structure uneconomical and unattractive.

As a practical matter, other utilities do not seek to build next to Telephone Company conduit systems as is implied by the AT&T and MCI structure sharing percentages. In fact, they deliberately avoid placing their facilities in close proximity to a telephone company conduit system because of the tremendous liability associated with potential damage.

Additionally, the National Electrical Safety Code (NESC) significantly restricts the construction of other sub-surface structures near underground conduit systems.

Specifically, the NESC states that Conduit systems extending parallel to other sub-surface structures should not be located directly over or under other sub-surface structures.[34] Where this is not practical, rules for physical separation are provided. In general these rules state that separation between a conduit system and other underground structures paralleling it should be large enough to permit maintenance of the system without damage to the paralleling structure.[35] Specifically, conduits occupied by power must be separated by 3" of concrete, 4" of masonry, or 12" of earth.[36] The NESC requires that water mains be located as far away as practical to protect the conduit from being undermined if the water main breaks.[37] Conduit should have sufficient separation from fuel lines to allow the use of pipe maintenance equipment.[38]

In actual practice, this means that a conduit system might be built in proximity to an *existing* utility line, but when building two new facilities, one would never build by placing another utility's line directly above or below a conduit system. It means that, the two new facilities would actually be placed side by side, with a minimum of 12" to 24" separation to allow each company access to maintain their facilities. There is no cost savings to this approach.

4) Sharing increases overall cost.

Finally, AT&T and MCI assume that – in the unlikely event that someone is willing to share 50% of the cost of the excavation – the overall cost does not go up! Clearly, if another utility is to share the trench, it must be either deeper or wider, at additional cost. This cost must be added to the total cost before the sharing percentage is applied. HAI includes these additional sharing costs for poles, but ignores them for underground conduit and buried cable.

Additionally, a conduit system requires a large excavation, 24"- 36" wide and 36"-60" or more deep. Clearly, another conduit system could not occupy this same space, so the only facility that might possibly share the trench would be a buried power cable or communications cable. Such a cable would require an excavation only 3" wide and 24"-30" deep. AT&T and MCI provided an analysis of pole sharing cost in which they conclude that the companies share cost based on the relative amount of space they occupy.[39] However, when determining the sharing of costs for conduit trenches, they assume that the company that takes 3" of the space will be willing to split the cost 50/50 with the company that requires 24" of space. AT&T Practice 917-356-100, page 15, provides a detailed description of the calculations to be used to fairly apportion the cost of a jointly used trench between the occupants. The method apportions cost based on actual usage, not on equal shares to all occupants as the HAI model does.

The effect of AT&T and MCI's inconsistent approach is to always share away the greatest percentage of the cost.

Q. Are Sprint and the HAI sponsors in agreement that commercial electrical power lines are not candidates for sharing of ducts conduit systems?

A. Yes. AT&T and MCI indicate that for safety reasons, telephone company conduits cannot be shared with power lines.[40]

Q. In light of these obstacles and practical realities, does the assumption by AT&T and MCI that a telephone company can share away one half to two thirds of the cost of the trench for every foot of underground conduit systems, seem in anyway credible or achievable?

A. No, absolutely not. The FCC's requirement that telephone companies lease conduit on a non-discriminatory basis to CLECs, *at economic cost*, makes leasing space more attractive for telecommunications providers and CATV companies than offering to share in the cost of the trench. Sprint and the HAI supporters agree that leasing is not relevant to the modeling of structure sharing.

The NESC allows conduit to be placed in close proximity to other underground structures on such a limited basis, that it is fanciful to assume that this will happen 100% of the time.

AT&T and MCI fail to acknowledge the obvious fact that the trench must be wider or deeper to accommodate another company in the trench with a conduit. They fail to increase the cost accordingly before they apply their sharing fraction, although they clearly recognize the need to include the additional costs for poles.

Finally, AT&T and MCI assume that occupants of a pole will share on a pro rata basis based on the space that they use. However, for underground conduit they assume that the cost shared on an equal basis, regardless of the space that is used. It is unrealistic to think that this would be true. In fact AT&T documentation provides a formula for calculating pro-rata sharing of trench costs.

Structure Sharing – Aerial Cable

Q. Sprint and HAI inputs for pole sharing are relatively close. Does this mean that Sprint is in agreement with the assumptions used by HAI in their development?

A. No. Sprint's structure sharing input for poles is simply a modeling issue. Both BCPM and HAI model the pole line by assuming 100% joint use poles large enough to accommodate multiple providers. Since Sprint would rarely need to use this large a pole for our sole use, Sprint must logically share away a large portion of the cost to get a reasonable structure cost out of the model. The pole sharing factor, a factor derived to accommodate model constraints, cannot be compared to actual feeder structure sharing percentages.

Q. Does HAI inappropriately share the cost of anchors and guys?

A. Yes. In the HIP[41], AT&T and MCI indicate that the costs for anchors and guys material and labor are included in the HAI labor costs for placing poles. As such, this cost would be shared along with the cost of the pole when the structure sharing percentage is applied.

Anchors and guys are designed only to support the telephone facilities on one cable strand. As such, 100% of their cost should be allocated to the telephone company. HAI inappropriately assigns as little as 25% of the anchor and guy cost to the telephone company.

III. Plant Mix Inputs

Q. Have you had the opportunity to review the HAI *Model Description* and HAI Inputs Portfolio (HIP) filed by Mr. Don Wood and Mr. James Wells relative the selection of aerial, buried or underground cable – generally referred to as plant mix?

A. Yes.

Q. Does Sprint have any concerns regarding the Plant Mix inputs that are proposed by AT&T and MCI in the HAI Model inputs?

A. Yes. AT&T and MCI have proposed national default values instead of Florida specific input values for Plant Mix. Because the AT&T and MCI national defaults are not Florida specific they are not appropriate for use in this proceeding.

National default values are simply not representative of the particular conditions that exist in Sprint's Florida exchanges. In particular, the ease of burying cable in Florida's soil and the obvious need to significantly storm-proof Sprint's network causes Sprint to place large amounts of buried cable.

In contrast to AT&T and MCI's national defaults, Sprint has used actual Florida plant mix data as the source of the Plant Mix input.

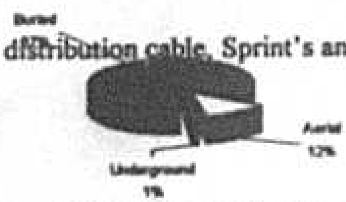
In comparing Sprint's actual Florida data with AT&T and MCI's national default data, we find that the AT&T and MCI national defaults are heavily skewed toward aerial cable which may have a lower initial cost. In fact, the HAI model itself reflects a bias toward aerial cable. While it contains an algorithm that will place buried cable instead of aerial in certain conditions, it will not do the opposite when long term costs for buried are lower than aerial.

The maintenance costs for aerial cable and poles is significantly higher than the maintenance costs for buried cable. These maintenance costs, along with customer service levels and protection of the network must be considered in selecting aerial or buried cable.

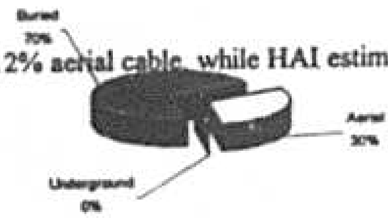
Q. In general, how do the results of the Sprint analysis compare to the HAI's national default inputs?

A. In general, the HAI national default inputs tend to assume significantly more aerial cable than Sprint's analysis shows is actually the case. For example, looking at the 201-650 Density zone - which contains the largest number of Sprint customers - for distribution cable, Sprints analysis finds the following differences:

For distribution cable, Sprint's analysis finds 12% aerial cable, while HAI estimates 30%.

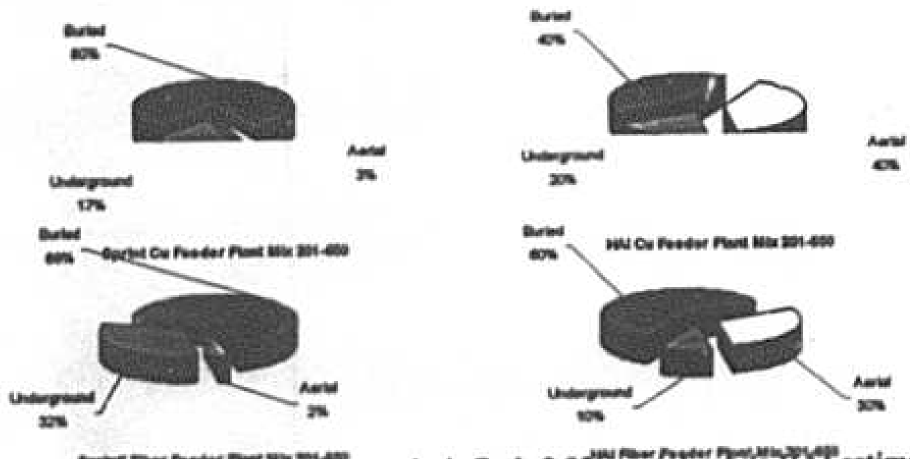


Sprint Distribution Plant Mix 201-650



HAI Distribution Plant Mix 201-650

For Cop, : Feeder cable, Sprint's analysis finds 3% aerial cable, while HAI estimates 40%.



For Fiber Feeder cable, Sprint's analysis finds 2.0% aerial, while HAI estimates 30%.

A complete comparison is included in my testimony as attachment CHL-2.

Q. What is the impact of this inappropriate bias for placing aerial over buried cable?

A. The HAI model, with the national default inputs, will understate the cost of the telephone network in Florida, and the level of support that is required to support Florida's high cost customers.

Q. What factors does an engineer consider when deciding whether to place aerial, buried or underground cable?

A. The decision to place aerial buried or underground cable is impacted by a multitude of factors. The *AT&T Outside Plant Engineering Handbook*~ provides a very good discussion of these factors. They include such issues as; Initial cost, Maintenance Cost, Growth Rates, Access to right-of-way, Availability of poles or conduit, Governmental requirements or restrictions, Future reinforcement requirements, condition of existing plant, trees, rock, potential for service disruptions, aesthetics and many other factors.

As OSP Engineers design Sprint's Florida network, they have to consider all these factors and make the appropriate decisions for every foot of cable that is placed. While no proxy model could hope to develop the same sophistication in decision making that comes from this level of review, a model can approximate the outcome with the correct inputs.

This is easily done by taking the composite result of this engineering work – the existing plant mix – and applying it to the model. This is exactly what Sprint has done.
By using existing plant mix as a guide, Sprint is able to reflect all of the weather, soil, regulatory, service level and other impacts that are specific to Florida and drive an appropriate and efficient Plant Mix for this market.

Q. Do AT&T and MCI provide any fact-based support for the Plant Mix inputs used in the HAI model?

A. No. There are no studies, surveys, analysis, statistics, trend analysis, summary of current national plant mix nor any other support provided for national defaults that AT&T and MCI represent as being applicable to the Florida. These are the same national defaults that are used by AT&T and MCI in every market in the U.S., regardless of any regulatory, geographical or weather conditions that may exist.

Q. Does HAI's "Shifting Algorithm", which ostensibly changes the plant mix to reflect local rock conditions, cause HAI to more accurately portray plant mix?

A. No. On Page 6 of his testimony, beginning on line 14, Mr. Wells states that the HAI model, "...automatically adjusts the buried and aerial structure percentages to account for varying maintenance costs and placement costs occasioned by local Florida soil conditions and bedrock." This would seem to suggest that the model could place *more* buried plant than the Buried Plant percentage input, if total long run costs were lower. However, HAI does not do this.

The HAI model *will* shift from buried cable to aerial cable. But regardless of the long run costs, it will never place more buried cable than the buried cable percentage input. Therefor, HAI does not adequately adjust the default inputs to reflect local conditions. In fact, even in some CBG's in Florida without any rock, HAI inexplicably shifts the plant mix from buried to aerial. Sprint performed a sensitivity analysis in which we reduced buried structure cost to "$0". One would think that this would result in a significant shift of the plant mix toward this very inexpensive option. In fact, changing the cost to bury cable to "$0" caused the model to place only .4 % (4/10th of one percent) more buried cable. (HAI reduced the amount that it had already shifted from buried to aerial.)

Q. Is the HAI Model, with national default inputs, able to recognize the need for, and plan a network that will withstand the extreme weather conditions that are encountered in Florida?

A. No. With one national set of inputs, AT&T and MCI's HAI model will build the exact same network regardless of the incidence of hurricanes, and the subsequent need to storm-proof the telephone network.

Other Issues

Q. Have you had the opportunity to review the HAI documentation regarding the use of Copper T1 carrier to serve remote clusters instead of fiber optic cable and DLCs?

A. Yes, I have.

Q. Does Sprint have any concerns about the validity of this approach to serving remote customers?

A. Yes. USF models are supposed to identify the costs of serving high cost customers. When these high cost customers are encountered in the HAI model, AT&T and MCI change the rules to artificially generate an unrealistically low cost. AT&T and MCI selectively apply different modeling standards for "forward-looking technology", "least-cost" and "provisioning of advanced services". Under the AT&T and MCI approach, rural customers will not be afforded th. .ame quality and access to advanced services.

This clearly distorts the intent of this effort. Sprint has these specific concerns:

1) Copper T1 Carrier is not forward-looking technology.

T1 Carrier running on copper cable pairs and Fiber Optic cable are both technologies that can be used to connect Digital Loop Carriers to host central offices. T1 carrier technology is over 25 year old. It is very high cost to maintain and has inherently limited bandwidth. Sprint has not placed new T1 carrier routes for many years.

In the HAI Model Description's discussion of options for feeder technology[43] there is no mention of Copper T1 Carrier being considered as an alternative feeder technology. Only fiber optics and regular copper pairs are considered, even though T1 is technically a completely viable alternative. Apparently T1 carrier over copper pairs is not considered to be forward-looking technology, so it is not considered as an option.

In the HIP[44] discussion of potential wireless alternatives to copper distribution, AT&T and MCI indicate that HAI assumes fiber optic feeder to the remote radio sites. T1 carrier would certainly work in this application. But again, apparently T1 carrier over copper cable pairs is not considered to be forward-looking technology, so it is not considered to be an option.

So how can T1 carrier over copper pairs suddenly become forward-looking technology? Are governments, schools and businesses clambering for "copper"? No, they want fiber. Are long distance companies wooing customers with television commercials touting their modern "all copper" networks?

Copper T1 is not forward-looking technology in any application.

2) Copper T1 is not "Least-cost" technology.

The migration from copper to fiber is driven by fiber's inherently lower long-term cost. Copper T1 is very expensive to own and operate. Instead of only two active electronic components, as in a fiber optic network, it also has electronic repeaters every 3,000'. It is susceptible to electrical interference, it has no remote provisioning, remote maintenance or other OAM&P

capability. It requires technicians on site, to complete virtually all maintenance and management functions.

AT&T and MCI apply the same percentage of maintenance cost to T1 over copper as they apply to NGDLCs that have almost 100% remote administration capability.

3) Copper based T1 carrier will not support advanced services.

Think of it this way. The total bandwidth available to serve all 24 customers that could be served over a T-1 carrier is 1.544 mb/s. Customers operating out of NGDLCs can receive 1.544Mb/s each, and more.

4) The models already cap investment.

Both models recognize that there may be future alternative technologies available at lower cost and provide a user adjustable cap on per line investment. There is no need to additionally constrain investment by changing the rules for the level of service that will be provided to rural customers.

Q. Have AT&T and MCI assumed that all loop carrier will be NGDLCs - and that no copper T1 carrier will be placed – when it creates a more favorable cost outcome for them?

A. Yes, they have. When developing Non-Recurring Charges for the installation of services in a forward-looking environment, AT&T and MCI assume that 100% of the digital loop carrier network will be served using Next Generation Digital Loop Carrier (NGDLC), and that there will be no copper based T1 carrier used. NGDLCs have remote provisioning capabilities that allow trips to the carrier site to be avoided when installing new service. Copper based T1's do not have this capability. Changing their network assumption in this instance allows AT&T and MCI to assume a lower cost for service installation and lower non-recurring charges.

Q. Do AT&T and MCI understate the material cost of cable by using unreliable means to estimate cost rather than simply obtaining price quotes?

A. Yes, rather than simply obtaining price quotes, AT&T and MCI use two different methods to estimate the cost of cable, depending on the size of the cable. Both of these methods grossly underestimate the cost of cable.

For cable from 12 pairs to 400 pairs, AT&T and MCI use the formula: Cable Cost = $.30 + (Pairs * $.007). This formula understates the cost of cable for every cable size. For instance, for 400 pair cable, Sprint's actual cost is $2.75 per foot. The AT&T and MCI formula generates a cost of $.58, which is only 21% of the actual cost.

Most importantly, one cannot simply rely on an unvalidated formula. Some "reasonableness test" should be applied to ensure that the formula is producing valid results. The obvious way to do that is to simply obtain the prices. Certainly companies the size of AT&T and MCI would have relationships with manufacturers and distributors that would have allowed them to obtain the actual costs for 17 sizes of cable. AT&T and MCI state that they did, in fact, obtain actual price quotes for 6- and 12-pair cables[41]. The price quotes did not support the AT&T and MCI formula. So, AT&T and MCI changed the input values. Presumably, AT&T and MCI could have obtained price quotes for the other sizes of cable as well.

For cables larger than 400 pairs, AT&T states, "A review of many installed cable costs around the country were used…."[46] However, when asked by Sprint to produce source documents used in this "review", AT&T responded that none existed and that the values were based solely on expert opinions[47]. AT&T and MCI could certainly have obtained the actual costs of these cables along with the 6- and 12- pairs cables that they claim to have externally validated.

In summary, rather than use readily obtainable, actual costs, AT&T relies on formulas and "opinion" which grossly understate costs. In the only instance in which they acknowledge attempting to validate cost, the actual numbers proved the formula wrong. Rather than revisiting their assumptions, AT&T and MCI simply change the input values and assume that the remaining values are correct.

Q. Do AT&T and MCI understate the cost of indoor SAIs?

A. Yes, the AT&T and MCI costs for Indoor SAIs are significantly underestimated. Furthermore, if one attempts to validate AT&T and MCI's input values by using data provided by AT&T and MCI, one can easily demonstrate that this fact.

Indoor SAIs are "built" on site. The costs include material and labor for splicing cables, placing terminating blocks (66 Blocks), tying down cables on the terminating blocks, cost for protection, placing protection and splicing protection, as well as placing jumper wires and testing of the installation. Sprint was able to determine the AT&T and MCI model costs for the protection, the cost of the 66 blocks and the jumper running. These items represent a small portion of the total cost of an indoor SAI. When only these few costs are totaled, they exceed the total

AT&T and MCI input values for each indoor SAI. The following table demonstrates this calculation for a 7200 pair SAI. Source data is footnoted. Sprint has used an estimated labor rate times an AT&T/MCI work time for jumper running.

7200 Pair Indoor SAI	Unit Cost	Quantity	Total
Protection, per pair[48]	$2.00	3,100	$6,200
66 Blocks, bracket and cover[49]	$8.00	288	$296
Place Jumpers[50]	$1.34	2,480	$3,323
Total from Documentation			$9,819
AT&T and MCI Input			$9,656

Using AT&T component cost data, it is clear that AT&T and MCI have not accounted for much of the cost of an Indoor SAI.

Q. In support of distribution span length inputs, the HIP[51] quotes the book, *Outside Plant, ABCs of the Telephone Series* as stating in part, "...where conditions permit open wire spans can approach 400 feet in length...". What is "open wire"?

A. "Open Wire" refers to individual Iron or Copper alloy wire conductors strung between poles on glass insulators attached to pins or wooden 10-Pin cross arms. One frequently sees "open wire" depicted in photos of telecommunications plant from the 1920's and 30's. The green glass insulators may be purchased at antique stores. Sprint does not consider "open wire" to be forward-looking technology.

Q. Please summarize your testimony.

A. AT&T and MCI have presented National Default inputs in this proceeding that are not representative of the costs or realities of providing telephone service in Florida.

AT&T and MCI have misquoted, misrepresented and omitted key pieces of technical references in order to make them appear to support their inputs, when in fact the documents do not. This has included support for:

- Carrier Serving Area size
- Using the longer possible "open wire" spans to support cable span lengths
- Existing conduit leasing to support sharing of trenches
- Network capability to support enhanced services

AT&T and MCI change key model assumptions when doing so allows the model to generate lower universal service costs. Assumptions are changed for:

- Degree to which power can share feeder trenches
- Whether Copper based T1 is, or is not, forward-looking
- Whether the network is 100% NGDL or a mix of NGDLC and copper
- Formulas for calculating cable costs

- Whether a network must be able to support enhanced services
- Plant mix should shift to reflect conditions...except for aerial to buried

AT&T and MCI rely on opinion and conjecture, and have not provided any empirical support, validation or accurate technical documentation:

- CSA sizes
- Copper based T1 carrier
- Structure Sharing and Plant Mix
- Cable Cost
- Ability of network to support advanced services
- Florida Costs

AT&T and MCI ignore factual realities related to:

- National Electrical Safety Code restrictions on structure sharing
- 80% of Power network is aerial;
- The timing and availability of potential sharing partners
- Weather in Florida

The HAI Model and AT&T and MCI inputs will not accurately estimate the costs that will be incurred to provide universal service to Florida customers.

Q. Does this conclude your rebuttal testimony?

A. Yes.

MR. REHWINKEL: Mr. Laemmli had four rebuttal exhibits: CHL Rebuttal 1 through 4; would ask that those be identified as a composite exhibit.

CHAIRMAN JOHNSON: What was that title again? You said --

MR. REHWINKEL: CHL Rebuttal 1 through 4.

CHAIRMAN JOHNSON: Composite Exhibit 84.

(Composite Exhibit 84 marked for identification.)

CHAIRMAN JOHNSON: Want to go ahead and move that in?

MR. REHWINKEL: We would ask those be moved into the record.

CHAIRMAN JOHNSON: It will be admitted without objection.

(Exhibit 84 admitted.)

CHAIRMAN JOHNSON: And the witness is excused.

I think we're prepared now for the next witness, MCI's witness.

MR. HENRY: Madam Chairman, MCI calls James W. Wells. Mr. Wells hasn't been sworn yet.

* * *

WHEREUPON,

JAMES W. WELLS

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

CHAIRMAN JOHNSON: Thank you; you may be seated.

DIRECT EXAMINATION

BY MR. HENRY:

Q Mr. Wells, are you the same James Wells that caused to be filed direct testimony consisting of 25 pages and 4 exhibits on August 3rd, 1998?

A Yes.

Q And did you also cause to be filed rebuttal testimony consisting of 78 pages and 3 exhibits on September 2nd, 1998?

A Yes.

Q And did you further cause to be filed on October 1, 1998 a revised version of your rebuttal testimony?

A Yes, for redaction purposes.

Q Okay. Can you tell us what that revision was?

A Staff suggested that we had been overzealous in redacting and asked us to in essence unredact some of the redactions. And so that's what that was.

Q Okay. Now if I ask you the questions that are in your direct and rebuttal testimony today, would your answers be the same?

A Yes.

MR. HENRY: Madam Chairman, I would move Mr. Wells' direct and rebuttal testimony into the record.

CHAIRMAN JOHNSON: It will be so inserted.

BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY OF

JAMES W. WELLS, JR.

ON BEHALF OF

MCI TELECOMMUNICATIONS CORPORATION

Docket No. 980696-TP

August 3, 1998

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is James W. Wells, Jr., and my office address is 5280 Laithbank Lane, Alpharetta, GA 30022

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

A. I am the President of J. W. Wells, Inc. Currently, I am providing consulting expertise in Outside Plant (OSP) infrastructure planning, design and construction, including costing aspects of the local loop.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of MCI Telecommunications Corporation.

II. PURPOSE

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to describe the engineering and cost aspects of telecommunications Outside Plant (OSP) and explain how they have been incorporated into the modeling methodology and input values of the local loop portion of the HAI Model, formerly known as the Hatfield Model.

My testimony is complemented by the testimony of Mr. Don Wood, which addresses the overall HAI Model. There are two attachments to Mr. Wood's testimony, which provide detailed explanations in support of my testimony:

- The HAI Model Release 5.0a Model Description (MD) and
- The HAI Model Release 5.0a Inputs Portfolio (IP).

Q. HAVE YOU PROVIDED OTHER TESTIMONY IN THIS PROCEEDING?

A. No.

III. QUALIFICATIONS AND EXPERIENCE

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND OSP WORK EXPERIENCE.

A. I have Bachelor of Engineering (Electrical Engineering) and Master of Business Administration degrees and certification as a Project Management Professional. I have gained OSP experience in the following assignments with:

- South Central Bell Telephone Company (now BellSouth) in Birmingham, AL: OSP Construction Foreman - 1 year, OSP Facilities Engineer - 4 years, OSP Planning Engineer - 2 years,
- Western Electric and AT&T Network Systems (now Lucent Technologies): Technical Representative for OSP Products - 5

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

- AT&T Local Infrastructure and Access Management: District Manager OSP Engineering and Construction - 1 year,
- AT&T Local Services Division: District Manager Outside Plant Cost Engineering - 1 year, and
- J. W. Wells, Inc.: OSP Consultant - 1 month.

IV. OVERVIEW OF TESTIMONY

Q. PLEASE PROVIDE AN OVERVIEW OF YOUR TESTIMONY REGARDING THE OSP PORTION OF THE HAI MODEL.

A. My testimony falls into two basic categories: (1) OSP modeling methodology and (2) OSP input values. In regards to the HAI Model OSP modeling methodology my testimony addresses the engineering assumptions used to ensure that the local loop network designed by the HAI Model meets OSP requirements and captures all the efficiencies available today to outside plant engineers. In particular, this testimony addresses significant enhancements incorporated into Release 5.0a of the HAI Model (HM 5.0a) and the least-cost, most-efficient loop design standards from the wire center to the customer's premise. My testimony with regard to the HAI Model OSP inputs addresses the costs of an efficient provider of telecommunications services building a network today, as well as the manner in which OSP engineers developed and validated these cost inputs.

Q. HOW HAVE THE OSP MODEL ASSUMPTIONS AND OSP INPUT VALUES TO THE HAI MODEL BEEN DETERMINED?

A. A team of experienced OSP Engineers utilized their collective expertise in determining the OSP assumptions and input values to the HAI Model. This HAI Model OSP Engineering Team, of which I am a member, has over 187 years of OSP experience with Incumbent Local Exchange Carriers (ILECs). A summary of our qualifications and experience is detailed in Exhibit ___ (JWW-1) attached hereto.

The OSP Engineering Team reviews the HAI Model based on information gathered, feedback from various sources and our own experiences as witnesses in support of the model. Our recommendations are passed to the HAI Model's sponsors and developers for implementation in subsequent releases. As a member of this team, I support each of the OSP modeling methodology assumptions and input values to the HAI Model.

Q. HOW DOES AN OUTSIDE PLANT ENGINEER GAIN KNOWLEDGE AND EXPERIENCE REGARDING THE DESIGN AND COSTS OF OUTSIDE PLANT?

A. The job of outside plant engineers is to design local loop networks and estimate their cost for approval within generally accepted outside plant engineering methods and procedures. In addition to this acquired fundamental level of OSP knowledge, the members of the HAI Model OSP Engineering Team have also developed a wealth of additional experience in areas such as planning, procurement, operations review, methods and procedures, and management of all aspects of OSP. Application of this experience is critical to determine the efficiencies available today to a local telecommunications provider, and is what separates a true least-cost, most-efficient model from an "embedded" cost proxy model that reflects outdated, inefficient ways of doing business.

V. OSP MODELING METHODOLOGY

Q. HOW HAS THE OSP ENGINEERING TEAM PARTICIPATED IN THE DEVELOPMENT OF THE OSP MODELING METHODOLOGY?

A. OSP modeling entails the determination of the most appropriate methods for planning and designing the local loop and conversion of those methods into a mathematical format that can be run on a computer. In developing the OSP modeling methodology that the HAI Model uses to model the local exchange network, the OSP engineering team applied the principles set forth in paragraph 250 of the FCC's Universal Service Order along with our knowledge of and experience with local loop outside plant engineering concepts. These principles require that the OSP network design be based upon:

- the least-cost, most-efficient, reasonable technology currently available;
- existing wire center locations, wire center line counts and average loop length; and
- sound local loop transmission and design practices.

A detailed explanation of the entire HAI Model's OSP modeling methodology is included in the <u>HAI Model Release 5.0a Model Description</u> (MD), attached to the Direct Testimony of Mr. Wood. OSP enhancements included in the HAI Model Release 5.0a are discussed below.

Q. WHAT ARE THE OSP IMPROVEMENTS IN RELEASE 5.0a OF THE HAI MODEL AND HOW DO THEY ENHANCE THE MODEL'S ABILITY TO CAPTURE REAL-WORLD NETWORK DESIGN EFFICIENCIES?

A. The following significant model enhancements have been made to the OSP portion of the HAI Model in Release 5.0a:

<u>Dynamic Aerial and Buried Structure Selection</u>: A substantial portion of the costs of deploying outside plant facilities is the cost of placing and maintaining those facilities (as opposed to the costs of the materials themselves). Depending on terrain features, the cost, for example, of burying telephone cable (buried plant) or placing it on poles (aerial plant) may be dramatically different. OSP engineers carefully consider these differences, in light of existing technologies and demand, in designing efficient networks. For this reason, HM 5.0a automatically adjusts buried and aerial structure percentages to account for varying maintenance costs and placement costs occasioned by local Florida soil conditions and bedrock. The amount of one type of structure substituted for another depends both on differences in placement cost and on a life-cycle analysis of maintenance and capital

carrying costs of the two types of structure (ref. MD 6.2.5 and IP 2.5). This enhancement (from a fixed user defined mix of plant structure by density zone) was requested by the Federal Communications Commission (FCC), and it more realistically represents the real-world decision process of an OSP Engineer.

<u>Carrier Serving Area (CSA) Size Limitations</u>: Optimum Carrier Serving Area size and location are key characteristics of an efficiently designed universal service network. CSAs are the geographic customer areas that are served by a single remote site of Digital Loop Carrier (DLC) equipment. OSP engineers situate CSAs to serve clusters of customers efficiently. In addition, OSP engineers size CSAs to take advantage of the capabilities of currently available DLC equipment technologies. If a model fails to design to the capabilities of currently available DLC technologies, it may deploy too much expensive DLC equipment to too many remote terminal sites and place too much feeder cable to carry telephone signals to this equipment.

The HAI Model 5.0a designs the universal service network consistent with the requirements of the most-efficient CSA design given the technologies available today. The HAI 5.0a, however, places two necessary and realistic limitations on CSA design to ensure the quality service Florida consumers expect and the FCC Order requires:

- First, there is a transmission requirement that no load coils be used in the design of the universal service network because they would inhibit advanced services utilizing digital signals. Additionally, the maximum distance over which copper cable can carry a quality analog signal without adding load coils is 18,000 feet. Therefore, HM 5.0a ensures that no point in a CSA may be more than 18,000 feet from the centroid of the main cluster, which is the location of the DLC remote terminal.

- Secondly, the number of lines served by a single CSA cannot exceed 90% utilization of the capacity of the largest currently available DLC terminal units (ref. MD 5.5.1 and 6.2).

Digital Technology to Outlying Areas on Separate Cables: One important challenge faced by OSP engineers is the task of serving small pockets of isolated customers in a cost-effective manner. HM 5.0a addresses this by connecting these "outlier clusters" (i.e., fewer than five lines) to larger "main clusters" (ref. MD 6.3.2 and IP 2.8).

Dynamic Selection of Copper-to-Fiber Crossover: OSP engineers designing networks also must make decisions concerning the use of fiber or copper cable in the feeder portion of the loop (the large "pipelines" carrying telephone signals from the switch to the distribution portion of the network). Copper cable is generally more expensive than fiber, but the electronics required when using fiber cable are also rather expensive. In general, an OSP engineer finds that after a certain distance (i.e., the copper-to-fiber crossover point), the cost of several thousand feet of copper is so high that use of fiber and electronics is the clear choice. HM 5.0a makes this decision on a cluster by cluster basis, as an OSP engineer should. If the model determines that use of copper feeder is a technically acceptable option, it then performs an analysis of the relative life-cycle costs of copper versus fiber feeder to determine which feeder technology should be used to serve the given main cluster (ref. MD 6.3.5). This dynamic selection function of the model more accurately reflects the decision process of an OSP Engineer based on the economics of serving each particular cluster.

Optional Cap on Distribution Investment: The HM 5.0a also incorporates an optional, user-adjustable "cap" on distribution investment per customer at the request of the Federal Communications Commission. This cap is structured to reflect the potential substitution of the most cost efficient to two types of wireless distribution technologies (point - point or broadcast) for a wireline distribution network in high cost, low customer density areas (ref. MD 6.3.4 and IP 2.11).

Other local loop models also employ such "caps" on distribution investment; however, they offer only vague references as to the alternative wireless technology. In sharp contrast, HM 5.0a provides descriptions of two alternative wireless technologies and dynamically selects the most cost efficient for each particular customer geographical area.

Feeder Route Steering: At the user's option, the HM 5.0a "steers" feeder routes toward the preponderant location of main clusters within a given wire center quadrant. This, too, permits HAI 5.0a to model outside plant the way an OSP engineer would. Importantly, the HAI 5.0a feeder route steering algorithm exhibits two key characteristics necessary to model accurately the efficiencies achievable through feeder steering in the real world. First, when this steering is invoked, the user may also apply an adjustable route-to-airline distance multiplier to the amounts of cable placed along these "steered" feeder routes (ref. MD 6.3.6). Use of a route-to-airline multiplier recognizes the fact that rarely can an OSP engineer deploy cable facilities directly from point to point. Generally, an OPS engineer will follow public rights-of-way or encounter obstacles requiring detours necessitating increased route distance. Second, HM 5.0a recognizes that the true efficiencies obtainable from feeder steering occur when the main feeder is steered to minimize the distance from the main feeder to the carrier serving areas associated with that feeder, thereby minimizing the costs of expensive subfeeder connections.

<u>Increased Costs for Placing Manholes in Water</u>: HM 5.0a increases manhole placement costs by a user-specified amount whenever the local water table depth is less than the user-specified threshold to more accurately reflect the higher costs associated with such placements.

<u>New Indoor NID</u>: HM 5.0a more accurately models the indoor Network Interface Device (NID) at the customer demarcation point in high rise building environments. Previous releases of the Hatfield Model provided an outdoor interface enclosure with station protection at these locations. The model now more realistically designs station protection cost at the building entrance terminal through increased cost for the indoor Serving Area Interface (SAI) (ref. IP 2.1).

Station Protection at the Entrance of Multi-Tenant Buildings: In HM 5.0a the station protection for multi-tenant buildings is more accurately and cost-effectively modeled as multi-station protection at the building entrance terminal (i.e., indoor SAI). In previous versions of the Hatfield Model, station protection had been costed individually for each customer location in a building (ref. MD 6.3.8 and IP 2.9).

Increased Riser Cable Costs: The engineered, furnished and installed (EF&I) cost for riser cable has been increased by approximately 25% because ongoing validation efforts identified previous cost to be understated. In most states riser cables are the responsibility of the ILEC as the provider of last resort. If riser cable is not the responsibility of the ILEC, then the HAI Model will overstate loop cost in urban service environments and some loop cost adjustments may need to be applied (ref. IP 2.3.3).

Defined Clusters Instead of Census Block Groups: Knowledge of customer locations is essential to an accurate, cost-efficient design of outside plant. AT&T witness Don Wood addresses in his testimony the HM 5.0a model enhancement to customer location and the modeling of distribution plant to those locations.

VI. OSP INPUT VALUES

Q. WHAT ARE OSP INPUT VALUES, AND HOW ARE THEY DETERMINED?

A. Once the OSP modeling methodology has been determined and the mathematical formulas developed, the HAI Model needs input values along with demographic data to determine local loop costs for a specific area. OSP input values include such items as material costs, labor rates, quantities, fill factors, plant mix, etc. The HM 5.0a default OSP input values have been determined by the HAI Model OSP Engineering Team based on our collective knowledge and experience and subsequent validation efforts. Descriptions of and supporting information for the OSP input values are contained in the HAI Model Release 5.0a Inputs Portfolio (IP), which is attached to the Direct Testimony of Mr. Wood. As noted above, application of engineering team expertise and judgment is critical to the formation of credible universal service cost proxy model OSP inputs.

Q. PLEASE EXPLAIN IN MORE DETAIL HOW THE OSP ENGINEERING TEAM DETERMINED APPROPRIATE INPUT VALUES.

A. The input values to the HAI Model were derived directly from the judgment of the OSP Engineering Team. The highly experienced members of the HAI Engineering Team gave their collective expert judgment on what they perceived to be cost effective, forward-looking costs that could be reasonably achieved, and these judgments were then used to determine the default values in the model. Each of the team members then used a variety of methods to perform their own validation of the default values.

Perhaps an analogy would best illustrate how the HAI Model Outside Plant Engineering Team considers a HM 5.0a input value or modeling assumption to be "reasonable:"

Suppose, for example, that my wife and I decide to buy a car for our teenage daughter. Based solely on our experience and knowledge of basic requirements for safe, reliable transportation and current automobile prices, we determine that $15,000 is a reasonable amount for us to budget. Our daughter, however, says that we "just don't understand," and that $15,000 is unreasonable because "everybody else's parents are spending more for their sons' and daughters' cars."

First we discuss with her and come to a clear understanding of what the basic requirements are by including anti-lock brakes and airbags and eliminating the moon roof, CD player and a few other amenities. Then we say, "Let's go look around and just see what cars that meet these requirements cost these days." We find one for $12,000, two for about $14,000, several in the range of $15,000 - $18,000 and even more in the $20,000 - $25,000 range. The average cost comes out to be $20,000. "See," she says, "you have underestimated the amount;" and furthermore, she claims that we have not included some of her really desirable cars, which are over $30,000 and would raise the average amount even higher.

We say no; that we have been "reasonable" because there are indeed three cars for less than $15,000 that satisfy the requirements, and if she wants a nicer car, the extra costs will have to come out of her pocket.

This illustration is intended to show how the HM 5.0a outside plant engineering assumptions and input values have been developed and validated by the HAI OSP Engineering Team. HM 5.0a input values are generally lower than average costs because the modeling criteria are to be "least-cost." However, they are certainly not the absolute lowest cost obtainable from any source.

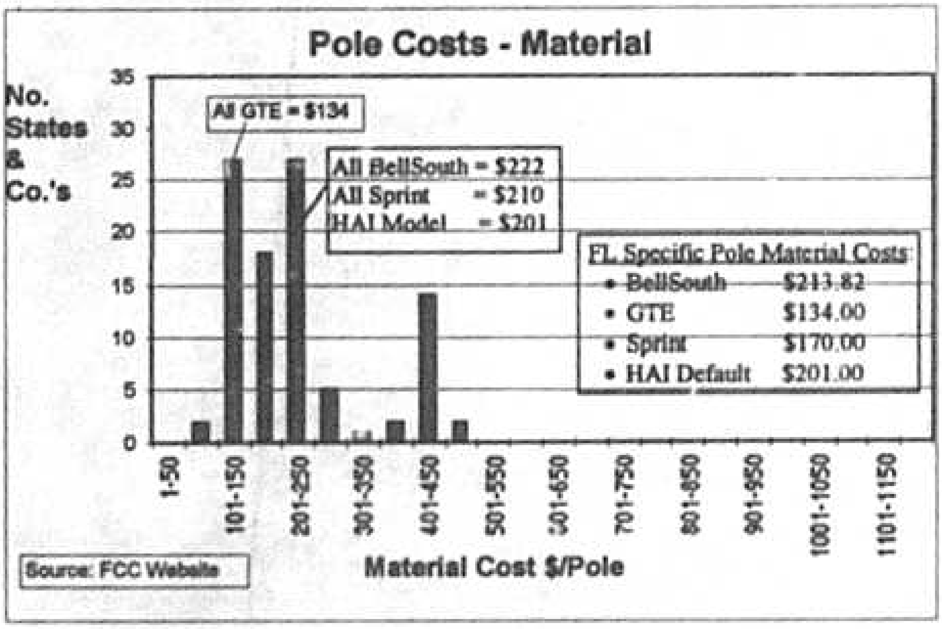
Q. WHAT HAS BEEN DONE TO VALIDATE INPUTS AND ASSUMPTIONS PERTAINING TO THE OSP PORTION OF THE HAI MODEL?

A. A considerable amount of validation of the OSP portion of the HAI Model has taken place, which includes the following:

- Pole costs have been validated via comparison to ILEC pole cost data gathered by the Federal Communications Commission (FCC).
- Other input values have been validated by contacting a variety of material vendors and contractors of OSP services.
- Assumptions and input values have been compared to those of the ILECs by members of the OSP Engineering Team who have been permitted to review proprietary ILEC cost data.

Q. HOW WAS FCC DATA USED TO VALIDATE THE INPUT VALUES FOR POLE COSTS IN THE HAI MODEL?

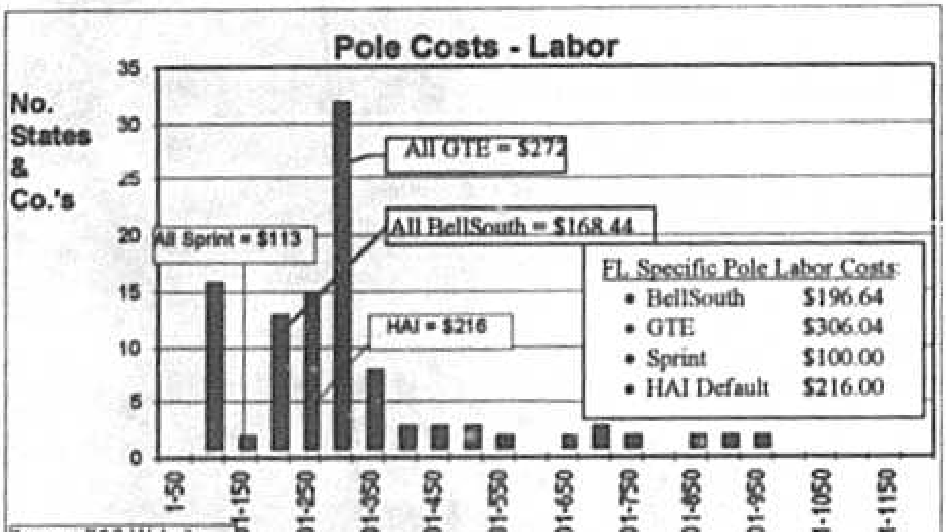
A. ILEC pole cost data was obtained from the FCC's Internet Site (http://www.fcc.gov/Bureaus/Common_Carrier/Comments/da971433_data_request/datareq.html). In August 1997, the FCC issued a data request regarding pole costs to the major telephone companies. Part of the information provided in response to that data request was the material and installation cost of a 40-foot Class 4 Pole, which is included as Exhibit ___ (JWW-2) to this testimony. A histogram appears below for pole material costs.



This information validates that the default pole material cost employed by the HAI Model is indeed reasonable for Florida because it falls within the range of the costs of the three ILECs. A more thorough review of the data reveals that the costs within an individual company can vary significantly.

Q. WHAT DOES THE FCC DATA REVEAL ABOUT POLE LABOR COSTS?

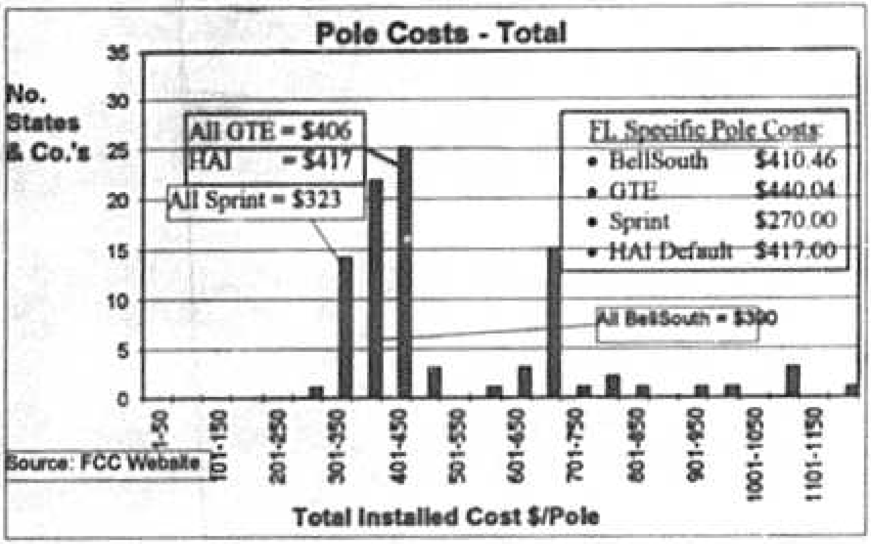
A. Compared to the results observed for pole material costs, there is an even wider range in values for pole labor costs. There is no clear productivity advantage shown by larger companies, and geographical differences do not correlate with the large variation. The following histogram illustrates labor productivity.



This information validates that the default pole labor cost employed by the HAI Model is reasonable for Florida because it once again falls within the range of values for the three ILECs.

Q. WHAT DO THE INSTALLED TOTALS OF MATERIAL PLUS LABOR REVEAL?

A. Once again, the data reveal a very wide range of ILEC costs and confirm that the default input value for installed pole cost employed by the HAI Model is valid for Florida, as illustrated below:



Q. IN YOUR OPINION, WHAT SHOULD BE DONE WITH REGARD TO THE WIDE RANGE IN ILEC COSTS FOR THE INPUT VALUES TO LOCAL LOOP COST MODELS?

A. The relevant criterion for these cost models is "least-cost." Therefore, cost modelers should employ a very common approach used in business -

especially large business - called "best in class" analysis, which essentially says that an organization should review performance data, and set a reasonable benchmark based on "best in class." For example, if Sprint has the lowest forward looking pole costs, then other companies should review Sprint's methods and procedures to emulate them, and even better them. The data show that the best price quoted in response to the FCC data request on pole costs was $270 for a 40 foot Class 4 pole by Sprint-Florida, while the highest was $1,161 for a 40 foot Class 4 pole by Bell Atlantic-Massachusetts. This rather astoundingly shows the potential for cost improvement and the fallacy of simply accepting ILEC cost data from their embedded network.

Q. HOW DOES THIS RELATE TO THE DEFAULT VALUES FOR POLES IN THE HAI MODEL?

A. Instead of using average costs, the HAI Model OSP Engineering Team has reviewed ranges of costs and recommended default values that can reasonably be expected to be realized by a cost efficient telephone company on a large project basis. The wide variance in pole values demonstrates that it is inappropriate and inaccurate to use average cost information in order to develop a least-cost, most-efficient model. The HAI Model approach produces accurate results from a least-cost, most-efficient perspective. The default values recommended in the HAI Model are not the lowest costs available, but are deemed readily achievable in practice.

Q. HOW CAN THE USE OF HAI MODEL NATIONAL DEFAULT OSP INPUT VALUES PRODUCE RESULTS APPROPRIATE FOR FLORIDA?

A. The way that the HAI Model utilizes the national default OSP input values produces results that are very specific to Florida at the customer geographic level for the following reasons:

- First of all, the labor content of the national default value is adjusted by a factor of .68 to reflect appropriate labor costs adjusted for Florida (ref. IP 7.0).
- Secondly, structure costs are increased as appropriate to account for the terrain characteristics of each Census Block Group in Florida.
- Next, the customer location and clustering methodologies of the HAI Model determine cable lengths and sizes specific to customers in Florida.
- Fourth, the dynamic selection algorithms of the HM 5.0a exercise sound OSP Engineering judgment in selecting copper versus fiber feeder and aerial versus buried structure.
- And finally, no one seriously could argue that material costs in today's economy are unique to a specific state, region of a state or company. All companies today buy nationally, if not internationally. Therefore, material prices clearly are national in scope.

Q. DID THE HAI MODEL OUTSIDE PLANT ENGINEERING TEAM ALWAYS USE THE LOWEST DEFAULT INPUT VALUES?

A. Absolutely not. Some have wrongly accused the HAI Model OSP Engineering Team of using unrealistically low default input investment costs, but that is just not the case. The proof of the reasonableness of the team's judgment is evident by looking at the validation numbers obtained by Mr. Dean Fassett, a member of the team, who contacted a number of suppliers and contractors. The information obtained by Mr. Fassett is summarized in Exhibit ___ (JWW-3) and is also displayed in the <u>HAI Model Release 5.0a Inputs Portfolio</u> (IP), attached to the testimony of Mr. Wood, in the form of bar charts that show the range of values obtained in Mr. Fassett's validation efforts. As the following information shows, of the 30 charted ranges of validation values in the HAI Inputs Portfolio binder, 28, or 93% of the default values recommended by the Engineering Team for the HAI Model, are not the lowest validation number obtained. In fact, the default values in the model average 81% higher than the lowest validation numbers. Any statement that the HAI Model OSP Engineering Team routinely took the lowest number is simply contrary to the evidence.

HAI Model OSP Input Values Validation Numbers

	Item	High	Low	Default	% High to Low	
1	Residential NID Without Protector	$11.90	$6.85	$10.00	46%	
2	NID Protector Block per Line	$4.80	$3.05	$4.00	31%	
3	Business NID (6 Pair) without Protector	$28.65	$23.44	$25.00	7%	
4	Business NID Protector Block per Line	$4.80	$3.05	$4.00	31%	
5	Rural Buried Drop Excavation/ft.	$1.75	$0.55	$0.60	9%	
6	Suburban Buried Drop Excavation/ft.	$2.10	$0.63	$0.75	19%	
7	Aerial Strand Mounted Block Terminal	$72.15	$58.55	$60.00	2%	
8	Buried Pedestal Block Terminal *	$93.00	$39.61	$90.00	127%	
9	2 Pair Aerial Drop Wire Material/ft.	$0.113	$0.095	$0.095	0%	←
10	3 Pair Buried Drop Wire Material/ft.	$0.197	$0.140	$0.140	0%	←
11	Pole Material, 40 ft. Class 4 *	$402	$134	$201	50%	
12	Pole Labor: Rural *	$902	$150	$216	44%	
13	Pole Labor: Suburban *	$902	$170	$216	27%	
14	Pole Investment: Total *	$1161	$170	$417	145%	
15	Duct Material/ft.	$0.648	$0.515	$0.600	17%	
16	Rock Saw / Trenching Ratio *	4.6	1.3	3.5	169%	
17	Manhole Material *	$4,720	$1,700	$2,340	38%	
18	MH Excavation/Backfill: Rural	$4,000	$850	$2,800	229%	
19	MH Excavation/Backfill: Suburban	$4,500	$1,250	$3,500	180%	
20	MH Excavation/Backfill: Metro	$8,500	$1,700	$5,000	194%	
21	Normal Trench/ft. with Backfill: Rural: 24" depth*	$5.0a0	$2.00	$2.89	45%	
22	Normal Trench/ft. with Backfill: Rural 36" depth *	$6.00	$1.50	$2.89	45%	
23	Normal Trench/ft. with Backfill: Suburban: 24" depth *	$11.00	$2.40	$3.35	40%	
24	Normal Trench/ft. with Backfill: Suburban: 36" depth *	$15.0a0	$2.00	$3.35	75%	
25	Trench/ft. in Pavement w/ Restoral: Metro: 24" depth*	$60.00	$7.50	$31.22	316%	
26	Trench/ft. in Pavement w/ Restoral: Metro: 36" depth*	$63.00	$7.40	$31.22	322%	
27	Plow Cable/ft.: Rural: 24" depth *	$1.50	$0.40	$0.80	100%	
28	Plow Cable/ft.: Rural: 36" depth *	$2.00	$0.50	$0.80	60%	
29	Plow Cable/ft.: Suburban: 24" depth *	$3.50	$0.85	$1.20	41%	
30	Plow Cable/ft.: Suburban: 36" depth *	$4.00	$0.90	$1.20	33%	
	Average % above lowest quote (# at lowest of 30 items)				***81%***	*(2)*

Q. WHAT IS THE PURPOSE OF VALIDATION AS USED BY THE HAI MODEL OSP ENGINEERING TEAM?

A. The primary reasons for validation by the HAI Engineering Team are to determine that the input values are reasonable and to continually review and improve the model.

Q. DID THE HAI MODEL OSP ENGINEERING TEAM FIND ANY SIGNIFICANT FLAWS AS A RESULT OF ITS VALIDATION EFFORTS?

A. No. In several cases we found that some of our assumptions used in the past were too conservative. For example, in the past, we used the common planning assumption that the installed cost of copper cable is a linear "a + bx" type of straight line. After examining a variety of validation values and listening to concerns that the model produced high costs for larger cables, the OSP Engineering team members came to realize that it did not take 42 times as long to engineer a 4200 pair cable than to engineer a 100 pair cable. Therefore, appropriate changes were made.

Q. DID EACH MEMBER OF THE HAI MODEL OSP ENGINEERING TEAM PARTICIPATE IN THE VALIDATION PROCESS, AND DID THEY EACH DO IT THE SAME WAY?

A. Yes, each member participated, but not in the same way. It is significant to note the depth and breadth of experience and knowledge of the members of this team as detailed in Exhibit ___ (JWW-1). Each member of the team used different approaches to validate the HAI Model OSP methodology, assumptions and input values.

Mr. Fassett took the lead since he had a large number of successful contacts with vendors and contractors. The information he obtained is extensive, and is reproduced in Exhibit ___ (JWW-3).

Among his many areas of OSP expertise, Mr. Riolo is eminently qualified to address the pricing of poles and cable. For eight years he was responsible for purchasing all poles and all outside plant cable for the New York Telephone Company.

Mr. Donovan has attended trade shows, questioned exhibitors, and called vendors for detailed price and technical information. In addition, Mr. Donovan has a wide range of experience that includes negotiating contracts for millions of dollars worth of contract labor, including excavation, pole placing, electronic equipment installation, cable placing, and splicing. He is eminently qualified to address electronic costs. In his last ILEC employment, he was responsible for purchasing over one million dollars per day in electronic equipment for the entire NYNEX Company. Other work included the design of construction job pricing methods and procedures.

Besides an extensive outside plant career in Bell Canada, after retiring as a General Manager, Mr. Carter did detailed engineering design of Digital Loop Carrier Systems for a major RBOC. He has exceptional depth of knowledge in detailed engineering aspects of IDLC as used in the HAI Model. He has validated prices in the HAI Model based on his recent experience, and has contacted a number of vendors to obtain detailed technical and costing information that confirms the default values in the model.

I have had a variety of OSP experiences with BellSouth and AT&T and have extensively reviewed ILEC modeling methodology, assumptions and input values in fourteen USF and UNE dockets as detailed in Exhibit ___ (JWW-4). My contribution to the validation effort involved the detailed design of ten Census Block Groups in Georgia to validate the accuracy of the distribution plant design for Hatfield Model Releases 3.1 and 4.0.

Perhaps the most credible form of validation has been the numerous comparisons of HAI OSP input values to those of the ILECs. The members of the HAI OSP Engineering Team have been witnesses in approximately fifty USF and UNE hearings in the past two years. We have seen (under non-disclosure agreements) literally thousands of ILEC OSP input values, often from two or more ILECs in the same docket. Comparisons have consistently shown the HAI Model input values to be "reasonable."

The discussion above is intended to highlight the fact that there are many ways to validate expert opinion. The HAI Model OSP Engineering Team has done a more thorough job than any other model proponent in documenting assumptions and validating input values against least-cost benchmarks based on currently available technology.

VII. CONCLUSION

Q. HOW WOULD YOU SUMMARIZE YOUR TESTIMONY CONCERNING HAI's COST MODELING OF OUTSIDE PLANT FOR THE LOCAL LOOP?

A. The HAI Model Release 5.0a correctly employs outside plant design methodology, assumptions and input values that reflect how an outside plant engineer should design a local loop network employing the following FCC criteria:

- a network based upon least-cost, most-efficient, reasonable technology that is currently being deployed,
- existing wire center locations, wire center line counts and average loop length, and
- local loop network transmission standards and design practices.

Therefore, I recommend the Florida Public Service Commission adopt the HAI Model Release 5.0a as the appropriate local loop cost basis for determining Universal Service Funding.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

REBUTTAL TESTIMONY OF

JAMES W. WELLS, JR.

ON BEHALF OF

MCI TELECOMMUNICATIONS CORPORATION

Docket No. 980696-TP

September 2, 1998

(REDACTIONS REVISED 10/1/98)

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is James W. Wells, Jr., and my office address is 5280 Laithbank Lane, Alpharetta, GA 30022

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

A. I am the President of J. W. Wells, Inc. In this proceeding, I am providing consulting expertise in telecommunications Outside Plant ("OSP") infrastructure planning, design and construction, including costing aspects of the local loop.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of MCI Telecommunications Corporation.

II. PURPOSE

Q. WHAT ARE THE PURPOSES OF YOUR TESTIMONY?

A. The purposes of my testimony are to:

- analyze the OSP input values of the Incumbent Local Exchange Carriers ("ILECs") in comparison to those of AT&T/MCI,
- examine the OSP modeling methodology and assumptions of the Benchmark Cost Proxy Model Release 3.1 ("BCPM 3.1") in comparison to those of the HAI Model Release 5.0a ("HM 5.0a"), formerly known as the Hatfield Model, and
- rebut specific OSP portions of the direct testimonies of the ILEC witnesses.

Q. HAVE YOU PROVIDED OTHER TESTIMONY IN THIS PROCEEDING?

A. Yes. I filed direct testimony in this proceeding.

III. <u>QUALIFICATIONS AND EXPERIENCE</u>

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND OSP WORK EXPERIENCE.

A. I have Bachelor of Engineering (Electrical Engineer'ng) and Master of Business Administration degrees and certification as a Project Management Professional. I have gained OSP experience in the following assignments with:

- South Central Bell Telephone Company (now BellSouth) in Birmingham, AL: OSP Construction Foreman - 1 year; OSP Facilities Engineer - 4 years, OSP Planning Engineer - 2 years,
- Western Electric and AT&T Network Systems (now Lucent Technologies): Technical Representative for OSP Products - 5 years and District Manager - OSP Engineering and Construction - 5 years,
- AT&T Local Infrastructure and Access Management: District Manager OSP Engineering and Construction - 1 year,
- AT&T Local Services Division: District Manager Outside Plant Cost Engineering – 1 year, and
- J. W. Wells, Inc.: OSP Consultant – 2 months.

IV. <u>SYNOPSIS</u>

Q. HOW DOES YOUR TESTIMONY FIT INTO THE OVERALL CASE?

A. My area of expertise is the OSP portion of the local loop, which is the network infrastructure from the main distributing frame in the wire center to the network interface device at the customer's premise. My testimony is complemented by the testimonies of:

- Mr. Don Wood, which addresses the HM 5.0a methodology, design and several of the inputs, and
- Mr. Brian Pitkin, which addresses the overall BCPM 3.1.

Q. WOULD YOU PLEASE PROVIDE AN OVERVIEW OF YOUR CONCERNS REGARDING THE BCPM 3.1?

A. I have reviewed the OSP portions of the prefiled direct testimonies of the ILEC witnesses in this proceeding and the BCPM 3.1 Model Methodology (April 30, 1996 Edition). I have also participated in workshops where ILECs have presented the BCPM. In Release 3.1, the BCPM modelers have taken steps to evolve their model by incorporating several of the concepts of earlier releases of the Hatfield Model plus some additional ideas to improve the accuracy and cost efficiency of their local loop model. However, upon thorough investigation, I have found that in the actual implementation of these ideas the <u>BCPM 3.1 still falls well short of being the least-cost, most-efficient, forward-looking and reasonable local loop cost model based on currently available technology</u> in the following ten areas:

- The input values filed by BellSouth, GTE and Sprint vary widely, and in numerous instances the ILECs have utilized unreasonable OSP input values. The OSP input values filed by AT&T/MCI for the HM 5.0a in this proceeding will be shown to be reasonable by comparison.

- The ILEC witnesses make misleading claims of superior transmission quality based on adhering to the constraints of the Carrier Serving Area ("CSA") Concept. However, BCPM 3.1 very clearly does not adhere to those constraints. Both models appropriately design distribution to a maximum length of 18,000 feet from the Digital Loop Carrier Remote Terminal ("DLC RT") by employing range extension cards as required.
- BCPM 3.1 now models customer locations to the much smaller Census Block ("CB") level instead of the Census Block Group ("CBG") level. However, the HM 5.0a employs a superior customer location methodology to BCPM 3.1 in that it models most customer locations (70% for Florida) far more precisely by latitude and longitude geocoding of their addresses. The remaining customers are located by HM 5.0a at the CB level of precision, which is the maximum level of precision that BCPM 3.1 attains for any customer. More precise customer location produces a more accurate and cost efficient network design.
- BCPM 3.1 arbitrarily segments natural clusters of customers (i.e., customers located in the same neighborhood or town) based on a fixed grid overlay. However, 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.
- The BCPM 3.1 overstates costs because it models an excessive number of DLC RTs in locations serving geographical areas and numbers of

customers that are far too small for a least-cost model. DLC RT locations are costly, and thus it is more cost effective to fully utilize the capacity and transmission capabilities of currently available DLC systems, which is exactly what HM 5.0a does.

- BCPM 3.1 does not perform a quality check to determine if a loop exceeds 18,000 feet in length from the DLC RT. This is important because when a loop exceeds 18,000 feet, the quality of voice grade becomes substandard. In Florida and other states, the BCPM 3.1 has indeed modeled customer locations that are more than 18,000 feet from the DLC RT. By way of comparison, HM 5.0a performs a quality test to assure that none of the loops it models exceed this limit.
- BCPM 3.1 uses a fixed copper/fiber breakpoint and also automatically deploys fiber feeder and DLC for grids where customer demand exceeds the capacity of a single copper cable. However, fiber with DLC is clearly not the economical alternative to copper feeder cables for short loops. HM 5.0a methodology is far superior in its use of dynamic selection of copper versus fiber feeder based upon comparative life cycle economics of these two alternatives.
- BCPM 3.1 still overstates distribution cable length and cost by modeling square lots even though it is clearly more economical and realistic for cities and subdivisions to be modeled based on rectangular lots. The HAI Model has always been more real world and cost efficient in its modeling of 1 wide by 2 deep rectangular lots.
- The BCPM 3.1 modeling methodology oversizes distribution cables by:

1. first sizing for the <u>ultimate</u> demand by providing up to two copper cable pairs to all houses, including empty houses,
2. then <u>increasing the ultimate</u> number of pairs required by a cable sizing factor; and
3. finally rounding up this double inflated pair requirement to the next largest discrete cable size.

- The BCPM 3.1 has three significant, but <u>rather arbitrary</u>, OSP network design assumptions which cannot be readily subjected to sensitivity analysis because they are only user adjustable via the cumbersome and time consuming preprocessing application. These assumptions are:
  1. The maximum threshold of 999 lines for determining Carrier Serving Area size.
  2. The distance of 10,000 feet from the wire center in <u>every</u> feeder route in the state of Florida as being the appropriate distance where it is economical and feasible to split a feeder route. Also, this is the arbitrary distance from every wire center where the spacing of lateral subfeeder routes suddenly goes from approximately every 1,600 feet to approximately every 13,000 feet.
  3. The sizing of the road reduced area in the distribution quadrant based on a 500-foot buffer along each side of the roads within that distribution quadrant.

As will be demonstrated in much greater detail in the remainder of this rebuttal testimony, the HM 5.0a is clearly the most appropriate model for determining the cost of the local loop network in Florida based on the relevant criteria of being:

- reasonable,
- least-cost,
- most-efficient, and
- based on currently available technology.

V. CONCERNS REGARDING THE OSP PORTION OF BCPM 3.1

Q. WHAT CONCERNS DO YOU HAVE REGARDING THE OSP INPUT VALUES FILED BY THE ILECs?

A. My analysis of the OSP input values filed by BellSouth, GTE, Sprint and AT&T/MCI in this proceeding contradicts the following three representations generally promoted by the ILECs:

1. The ILECs somehow possess the only true knowledge of local loop network costs in Florida and have also figured out how to appropriately apply their cost data to a bottoms-up model.
2. Because an input value reflects the ILEC's actual experience in its service territory, it is therefore indisputably the least-cost, most-efficient input value.
3. HM 5.0a is populated with unrealistic and low input values because the HAI OSP Engineering Team developed these input values on a national basis.

ILECs have been building local loop networks for decades and do indeed have a great deal of data and experience with studies that perform top-down allocations of the embedded costs in their local loop networks which have been deployed under rate base regulation. However, BellSouth, GTE and Sprint are clearly grappling with how to utilize a bottoms-up, forward-looking, least-cost, most-efficient model for a local loop network based on currently available technology under a "scorched node" assumption.

Q. HAVE YOU COMPARED THE INPUT VALUES PROPOSED BY THE ILECs FOR BCPM 3.1 WITH THOSE OF HM 5.0a?

A. Yes. This docket has created yet another opportunity for a side-by-side comparison of input values for the same model in the same state in the same time frame from three independent ILECs. The following analysis will once again show that:

- There are a number of significant differences among the input values of the three ILECs for the same item.
- ILECs have adopted the BCPM national default input values for several items rather than determine their Florida-specific input values.
- In many areas there is a great deal of consistency between the input values of the ILECs and AT&T/MCI.
- In several instances, the input values of AT&T/MCI to HM 5.0a are significantly more costly than the same input value for the ILECs to BCPM 3.1 because they reflect real world OSP Engineering judgment.
- There are several major differences between the input values of AT&T/MCI to HM 5.0a and the input values of the ILECs to BCPM 3.1

in those areas where there are significantly differing modeling assumptions.

- There are numerous examples of ILEC incorrect and illogical input values having been derived by top-down accounting methods absent direction, or at least a reasonableness check, by OSP Engineers.
- There appears to be no consistent patterns in these differences.

Thus, there is no substantiation to representations that ILEC input values are always the correct values and HM 5.0a input values always drive unreasonably low costs. My conclusions are based on a side-by-side comparison of the national default input values for the BCPM 3.1, with the BCPM 3.1 input values filed by BellSouth, Sprint and GTE on August 3, 1998, and the AT&T/MCI input values to the HM 5.0a in this proceeding. This comparison is detailed in the attached Exhibit ___(JWW-4). The following are examples of some of the anal, s of these input values by category:

Pole Costs: The input value comparison for the per unit installed cost of a pole with anchors and guys in density zone 650 - 850 is:

BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
$775.20	$406.77	$596.14	$801.11	$417.00

There is no explanation as to why GTE's input value is 96.9% higher than BellSouth's for Florida-specific installed pole cost. GTE used a mix of 30-foot non-shared poles and 40-foot shared poles. However, Sprint appears to have used only 45- foot poles, which are too tall and much too costly, especially for approximately half of the poles that Sprint does not share. There are obviously major inconsistencies among the ILECs on how to properly model and cost poles using BCPM 3.1.

The relevant question is "What is a reasonable input value in Florida for pole costs?" For a benchmark, the Federal Communications Commission ("FCC") has gathered pole cost data from the ILECs regarding material and labor costs for 40-foot class 4 poles, which is summarized in Exhibit ___ (JWW-2) of my Direct Testimony in this proceeding. Even though it adds costs, HM 5.0a utilizes only 40-foot class 4 poles in order to accommodate sharing on any pole. However, there is very little supporting documentation to ascertain the size and class of the pole(s) being modeled by the ILECs or any underlying data regarding how pole costs were derived or may have been validated.

The total pole costs submitted to the FCC for Florida were BellSouth - $410.46, Sprint - $270.00 and GTE - $440.04. Note that the input values filed by Sprint and GTE in this proceeding are considerably higher.

The unweighted arithmetical mean of the FCC pole cost data is $500.75 nationwide and $373.49 for the three Florida ILECs. The nationwide median cost is $422.14. Therefore, my conclusion is that the input value for pole costs for HM 5.0a of $417.00 (even though it is indeed a national default value) is actually quite reasonable for Florida based on the ILEC data collected by the FCC and the Florida-specific costs filed by BellSouth.

Buried Distribution Structure: The input value comparisons for normal buried distribution structure cost in density zone 0 - 5, which is the most rural and therefore most critical in this Universal Service Fund (USF) case, and the most urban density zone of 10,000 + are:

Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
0 - 5	$ 1.47	$ 3.19	$ 2.31	$1.47	$ 1.77
10000+	$ 8.84	$ 7.77	$ 2.85	$8.84	$45.00

GTE has utilized BCPM national default values rather than its Florida-specific sts for burying cable, even though it is local contractors that typically bury cables. BellSouth's buried distribution structure cost in the lowest density zone (0 - 5), where USF funding is most applicable, is overstated by at least 75%.

BellSouth has not figured out how to, or for other reasons has chosen not to, differentiate buried cable structure costs by type for input into the BCPM 3.1 bottom-up model. Specifically, BellSouth has filed the same cost of $3.06 per foot for plow, rocky plow, trench and backfill, rocky trench, backhoe trench and hand dig for each density zone. This is simply wrong. It cost much less per foot to plow cable than it does to trench and backfill.

Sprint has also made this same erroneous simplification in Florida, though it was able to provide costs specific to each type of buried cable trench in another state. However, it should be possible to derive these differing costs by type of buried structure from the ILEC's contracts.

The consequences of this inability, or refusal, of the ILECs to differentiate their buried structure costs are profound in the most rural density zone where the USF Fund would be applied. The reason is that the predominant method of burying cable in rural areas is plowing (e.g., 96% in BellSouth's filing, Bates Stamp 000196), and plowing is by far the least costly of the BCPM 3.1 buried structure types. Thus, ILEC buried cable structure costs are substantially overstated in rural areas because the average cost for buried cable structures of all types of placing methods has been used as the input value.

Note that the HM 5.0a input value in this comparison is inside the range of the ILECs in the lowest density zone. However, in the most urban density zone, the HM 5.0a input value is far more costly than the three ILECs. This is because the HAI Model OSP Engineering Team has more reasonably determined that there are much higher costs for burying cable when the density is more than 10,000 lines per square mile. This is just one clear demonstration that the HM 5.0a input values are more realistic and have not been derived to produce unreasonably low costs for the local loop network.

Further analysis of the ILEC input values for below ground structure shows that BellSouth's buried and underground structure costs in density zone 10,000+ are illogically lower than the same costs in density zones 2,550 – 5,000 and 5,000 – 10,000. It certainly appears that BellSouth has made input value entry errors which overstate structure costs in density zones 2,550 – 5,000 and 5,000 – 10,000. Also, Sprint's underground structure costs are approximately 10% less than its buried structure costs in each density zone. This is illogical because a conduit trench is wider than a buried cable trench, and the trench depth should be comparable.

These few examples clearly demonstrate that the ILECs are using accountants to unrealistically spread ILEC top-down cost data for input into the bottom-up BCPM 3.1 without applying the judgment of OSP Engineers. Furthermore, it is apparent that even with access to the same pool of OSP Contractors in Florida that Sprint models buried cable structure at less than half the cost of BellSouth.

Underground Feeder Structure: The input value comparisons for underground feeder structure cost in density zone 0 - 5 and the two most urban density zones are:

Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
0 - 5	$ 2.76	$ 8.51	$ 2.02	$ 2.76	$10.29
5000 -10000	$ 8.22	$16.51	$ 2.58	$ 8.22	$50.10
10000+	$ 8.84	$14.88	$ 2.58	$ 8.84	$75.00

Since the ILECs have access to the same pool of contractors in Florida who place underground structure, why would BellSouth's costs for placing underground structure in the most rural density zone be more than four times that of Sprint? In going from the 5,000 - 10,000 density zone to the 10,000+ density zone, the HM 5.0a input value increases by 49.7%, GTE's input value (i.e., the BCPM national default value) increase by 7.5%, Sprint's input value remains constant, but the BellSouth input value inexplicably drops by 9.9%. Unfortunately, there is no supporting ILEC documentation (e.g., the HM 5.0a Inputs Portfolio) that would help to explain such huge discrepancies.

The HM 5.0a input values in the urban area are far more costly compared to those of the three ILECs. This is because the HAI Model OSP Engineering Team has more reasonably determined that there are extra costs for placing conduit when the density is more than 5,000 lines per square mile. This clearly shows again that the HM 5.0a inputs have been derived from realistic OSP Engineering judgment and certainly do not produce unreasonably low costs.

Note also that GTE's input values for both buried cable and for underground conduit structure in the three highest density zones are identical to each other (Exhibit ___ (JWW-4), Pg. 1). However, the cost for underground conduit structure should definitely be higher than for buried structure because it takes a wider trench for conduit placement, plus several other cost in general.

<u>Conduit</u>: The input value comparison for the material cost of 4-inch conduit is:

BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a

$0.83	$2.24	$0.73	$1.39	$0.60

The HM 5.0a Inputs Portfolio shows validation data ranging from $0.52 to $0.65, which supports the HM 5.0a input value of $0.60. However, BellSouth's input value of $2.24 per foot for 4-inch conduit purchased in large quantities is at least 150% too high. Once again, however, there is no ILEC supporting documentation to explain why Sprint can obtain 4-inch conduit at a much more reasonable cost than BellSouth or GTE in Florida.

Structure Sharing (% Paid by Telco) - Aerial: The input value comparisons for the sharing of aerial structure (after weighting for poles, anchors and guys) in the most rural and most urban density zones are:

Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a Model
0 - 5	56.45%	45.70%	46.89%	55.11%	50.00%
10000+	60.53%	49.60%	55.48%	55.11%	25.00%

There is consistency among all input values in the most rural density zone. However, HM 5.0a shows considerably more structure sharing (i.e., a lower percentage paid by the telephone company) in the urban area than in the rural area. This is because there are, and certainly will be in the future, more utilities to share with in the urban area than in the rural area. The ILECs, on the other hand, have modeled little difference in the sharing in the urban area than the rural area. There is no supporting documentation to explain the ILEC's modeling logic, which appears lacking in sound OSP Engineering judgment.

<u>Structure Sharing (% Paid by Telco) – Buried Distribution Cable and Underground Feeder Conduit</u>: The input value comparisons for the percentage paid by the telephone company for underground feeder structure in the most urban density zones are:

Type of Structure	Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Buried Dist	10000+	80.0%	96.0%	99.9%	100.0%	33.00%
UG Feeder	10000+	85.0%	99.0%	95.0%	97.2%	33.00%

These input values represent a most significant difference of OSP Subject Matter Expert opinion regarding least-cost, most-efficient, forward-looking modeling of the local loop network. In the most urban areas for below ground structures, the forward-looking view of the HAI Model OSP Engineering Team is that the telephone company will be able to share underground costs with two other utilities on the average (HM 5.0a IP, App. B).

In sharp contrast, BellSouth, GTE and Sprint foresee virtually zero amounts of sharing. However, the Lucent (formerly AT&T) OSP Engineering Handbook that "reflects standard engineering guidelines" supposedly modeled by BCPM 3.1 (Bowman Direct, Pg. 7) states that "[i]n areas where both power and telephone utilities plan to bury their facilities, a joint trench is usually advantageous" (Bowman Direct, Exhibit RMB 3, Pg. 5).

The ILECs' viewpoint in regards to virtually zero below ground structure sharing is based on backward-looking, embedded network experience and is <u>totally unreasonable for a least-cost, most-efficient, forward-looking model</u>. In a competitive environment, telephone companies will seek to lower their costs by sharing structure costs with other utilities. In a forward-looking environment, there will also be additional utilities out there that will be more willing to share structure costs.

Pole Spacing: The input value comparisons for pole spacing in the most rural and urban density zones are:

Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
0 - 5	250	250	250	175	250
10000+	150	150	150	175	150

There is total agreement between the HM 5.0a, the BCPM national default values and two ILECs on these input values and on virtually all of the pole spacing input values in the intermediate density zones. GTE has determined that its Florida-specific pole spacing is 175 feet. However, in typical top-down accounting fashion, GTE used the same 175-foot pole span input value in all density zones, even though it is common knowledge that poles are further apart in rural areas.

This demonstrates an appalling lack of OSP Engineering oversight. This also results in GTE's cost for aerial plant in rural areas to be overstated because too many poles are modeled per aerial cable route distance.

Copper Cable: BellSouth, GTE and Sprint all have input values for 3000, 3600 and 4200 pair 24 gauge cables. However, 24 gauge cables are simply not manufactured in sizes larger than 2400 pairs. Therefore, it is rather obvious that the ILECs are not using the actual existing prices that they pay for specific size cables, since they could not possibly have purchased these particular cables for which they have provided input values. Again, it is obvious that accountants are determining the BCPM 3.1 input values for the ILECs without the input or oversight of competent OSP Engineers.

The comparisons of the total cost input values for the smaller sizes of 24 gauge buried cables, which would be used extensively in rural areas, are:

Cable Size	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
200 pair	$4.45	$4.35	$4.51	$4.35	$4.42
50 pair	$2.50	$1.30	$2.55	$1.89	$1.70
25 pair	$2.08	$0.78	$2.27	$1.41	$1.24
12 pair	$2.05	$0.78	$1.98	$1.39	$0.79
6 pair	$1.97	$0.78	$1.73	$1.34	$0.66

HM 5.0a models 6 and 12 pair 24 gauge cables when they satisfy cable size requirements because they represent currently available technology alternatives that have lower installed cost and are more efficient in terms of cable utilization than 25 pair cables. BellSouth has defaulted to the 25 pair cable costs for 6 and 12 pair cable sizes. The rationale is that current (i.e., BellSouth's embedded) operating practices do not allow these small cables in their inventories.

The relevant criteria for determining USF support are least-cost and most-efficient based on currently available technology. The latest input values filed by BellSouth in the BCPM 3.1 for 6 and 12 pair 24 gauge cable does not satisfy these relevant criteria. Furthermore, the greatest manifestation of this excessive cable costing will be in the most rural areas where the smallest cables are more prevalent and where the USF support will be most required. BellSouth should provide appropriate input values for 6 and 12 pair 24 gauge copper cables in BCPM 3.1 for the purpose of determining appropriate local loop costs for USF support, which is what Sprint and GTE have done.

BellSouth utilizes the same copper cable prices for feeder and distribution cable applications. However, BellSouth's cable prices include cable terminals via a loading factor (BellSouth's Model Inputs and Assumptions, Bates Stamp 000157). Feeder cables simply do not have cable terminals, yet BellSouth's feeder cable costs obviously include a loading factor for terminals. This is a prime example of misapplying top-down costing principles in a bottom-up costing model without OSP Engineering judgment direction or oversight.

Another seemingly illogical phenomenon of BellSouth's cable costing is that its 26 gauge aerial cable costs are higher than its 24 gauge buried cable cost for each pair size. Also, BellSouth's cost for 25 pair 26 gauge aerial and buried cables are higher than for the same cables in 24 gauge. Because 26 gauge copper conductors are smaller than 24 gauge, 26 gauge cables are less costly than 24 gauge cables in the same pair size for the same application.

For some unexplained reason, Sprint's underground cable costs (i.e., without structure) are significantly higher than its aerial and buried cable cost for the same pair size and gauge of cables. This contradicts the appropriate relationship demonstrated by the comparable input values for HM 5.0a and the other ILECs.

Fiber Cable: The input value comparisons for aerial fiber cable total costs are:

Fiber Strands	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
144	$9.85	$9.96	$7.82	$10.33	$9.50
48	$5.27	$3.71	$4.15	$4.37	$4.70
12	$3.04	$1.37	$2.83	$1.90	$2.90

Thus, the HM 5.0a fiber cable costs are shown to be very reasonable. Also, HM 5.0a has a maximum size fiber cable of 216 strands versus 288 strands for the BCPM 3.1 and the three ILECs. Thus, HM 5.0a will incur even higher fiber cable costs than BCPM 3.1 when the fiber strand requirements exceed 216 because HM 5.0a will place an additional fiber cable with supporting structure at multiples of 216 required strands instead of at multiples of 288 required strands

Serving Area Interface ("SAI", also known as Feeder Distribution Interface): The input value comparison for the installed (i.e., material and installation) cost of a 3600 pair indoor SAI is:

BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
$19,605	$73,534	$32,175	$19,605	$4,928

There are obviously incredible differences. The HM 5.0a input value is described in Section 2.9 of the HM 5.0a Inputs Portfolio. There is no similar do· ·mentation to explain the ILEC's costs. The material components consist of a plywood backboard, modular protector units, connecting blocks and jumper wire. BellSouth's cost level could cover several weeks of engineering and labor plus $14,418 in supply costs, all of which are exorbitant. Note that GTE has defaulted to the BCPM national input value rather than ascertain its Florida-specific costs.

Only BellSouth furnished detailed SAI costs (Exhibit ___ (JWW-4), Pg. 15 – 18). Note how the "engineering" costs have been applied linearly based on the pair count of the SAI. For example, BellSouth has costed $312.66 to engineer a 100 pair indoor SAI and $13,131.68 to engineer a 4200 pair indoor SAI (i.e., 42 times more). However, real world engineering costs for an indoor SAI vary little by pair size. This is an example of the top-down accounting application of ILEC cost data without OSP Engineering judgment.

Drop Wire Placement – Aerial and Buried: The comparisons of ILEC input values for the aerial and buried total drop wire costs are:

Drop Type	Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Aerial	0 – 5	$ 0.77	$ 0.26	$ 0.80	$0.62	$0.26
Aerial	10000+	$ 0.77	$ 0.26	$ 0.80	$0.62	$0.33
Buried	0 – 5	$ 0.77	$ 0.70	$ 0.74	$0.62	$0.74
Buried	10000+	$ 0.77	$ 0.70	$ 0.74	$0.62	$5.14

HM 5.0a appropriately reflects the real world by modeling higher drop costs for the urban versus rural areas, 27% higher for aerial drops and 595% higher for buried drops. The ILECs model the same cost per foot in all density areas by drop type. This shows a lack of OSP Engineering judgment and also results in higher drop costs in rural areas because the average drop cost is being applied.

Drop costs have a major impact on total loop costs because they represent a significant amount of investment that occurs at virtually each customer location. The impact of inappropriate drop costing on a per foot basis is even more profound in rural areas because of generally longer drops lengths.

Buried drops simply cost more than aerial drops. Note that BellSouth more than doubles its installed cost for buried drops versus aerial drops, while HM 5.0a increases range from 184% to 1458%. In contrast, Sprint's costing of aerial drops higher than buried drops is astonishingly illogical.

Note that GTE's buried and aerial drop input values (i.e., the BCPM 3.1 national default values) are the same, and they are at the much higher buried drop cost level. This is because GTE is modeling 100% buried drop costs, which cost more than aerial drops. This is a clear violation of the FCC Criteria No. 1 that the model be "reasonable" and "least-cost" based on currently available technology.

The drop wire input values of the HM 5.0a are clearly realistic and reasonable compared to those of the ILECs. Furthermore, in urban density zones, the HM 5.0a drops costs are significantly higher. This reflects sound OSP Engineering judgment of real world higher costs that has been consistently incorporated into the HM 5.0a input values as appropriate.

Network Interface Device ("NID"), Protector and Interface: The input value comparison for the total costs of NID, Protector and Interfaces is:

NID Type	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Residential	$30.73	$56.61	$58.95	$29.49	$29.00
Business	$30.73	$56.61	$99.85	$29.49	$44.00

BellSouth and GTE utilize the same cost for residential and business NIDs, whereas Sprint and HM 5.0a appropriately reflect lower cost for residential NIDs. Why are Sprint's business NID costs so much higher? HM 5.0a costs are within the range of the ILEC costs.

Digital Loop Carrier: The comparisons of ILEC input values for digital loop carrier costs are:

Cost Type	Line Size	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Fixed	25	$19,204	$ 19,204	$ 23,159	$ 23,754	$18,300
Fixed	673	$96,859	$ 96,859	$128,569	$113,125	$88,500
Per Line	0 – 192	$94.00	$94.00	$98.59	$72.39	$100.00
Per Line	192 – 2016	$89.11	$89.11	$68.02	$72.39	$ 77.50

Why does GTE input the same cost for low density and high density line cards? The ILEC's fixed costs for DLC RT locations are extremely high considering that these locations would be generally much smaller than 999 lines, the BCPM 3.1 threshold. In other words, the smaller size DLC RTs modeled by BCPM 3.1 should be housed predominantly in cabinets and not require more expensive huts or controlled environment vaults ("CEVs"). It appears that ILEC accountants have loaded DLC RT site input values reflecting the embedded network investment including huts and CEVs. There is no supporting documentation that would reflect appropriate OSP Engineering judgment.

Why are high density DLC system costs per line significantly less for Sprint and GTE than for BellSouth? The conclusion of the Staff of the Louisiana Public Service Commission was that the BCPM inappropriately modeled the expensive REUVG range extension line card for high density DLC systems (Louisiana Staff's Final Recommendation, Docket No. U-20833, March 27, 1998, Pg. 14). BellSouth has adopted the BCPM national default value that still includes the exorbitant REUVG range extension line cards; whereas, Sprint and GTE appear to have made the appropriate adjustment to the lower cost RUVG2 range extension line card.

HM 5.0a models sufficient costs for range extension line cards as required. For the CSAs requiring low density DLC Systems, HM 5.0a models the Advanced Fiber Systems UMC 1000. HM 5.0a has costed these systems with 100% utilization of UMC Remote Terminal Range Extension RST POTS Channel Units (R-EPOTS or simply EPOTS), even though the less expensive standard RPOTS card is sufficient for loops up to 12,000 feet from the DLC RT. Note that this is reflected in the HM 5.0a low density per line costs, which are higher than those of the ILECs.

For high density CSAs, HM 5.0a models the DSC Litespan 2000 DLC System. HM 5.0a incorporates costs for the DSC Litespan 2000 RPOTS channel unit for customers served by large DLC RT units to a distance of 17,600 feet. DSC recommends the use of the RUVG2 card for those customers exceeding 17,600 feet in distribution length. Since the maximum distribution length in limited to

18,000 feet in HM 5.0a, the number of customers requiring this card from a high density DLC system is de minimis.

To add some further perspective to the debate over range extension requirements and appropriate costs, BCPM 3.1 recommends range extension only for loops exceeding 13,600 feet from the DLC RT (BCPM 3.1 Description, Pg. 55). According to Mr. Brian Pitkin, an AT&T/MCI Witness in this proceeding, the HM 5.0a network designed for Florida has less than 0.05% of its loops exceeding 13,600 feet in distribution length from the DLC RT. Furthermore, most of these loops will be served by low density DLC systems, which have 100% range extension line cards in HM 5.0a. My conclusion is that HM 5.0a models more than sufficient costs for the required range extension line cards.

Fiber/Copper Breakpoint: The input value comparison for the fiber/copper breakpoint is:

BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
12,000	12,000	12,000	12,000	9,000

The explanation for the 3,000 foot difference between BCPM 3.1 modeled by the ILECs and HM 5.0a is that BCPM 3.1 is measuring the longest total loop length in a CSA whereas HM 5.0a is measuring the feeder distance from the wire center to the Feeder Distribution Interface ("FDI"). The overall impact of this difference in modeling methodologies is not that significant. However, the latest dynamic copper versus fiber feeder selection methodology employed by the HM

5.0a (HM 5.0a Methodology, Sec. 4.5) is the one that replicates the process utilized by a real world OSP Engineer.

Plant Mix - Distribution: The input value comparisons for the percentage of distribution plant are:

Type of Plant	Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Underground	10000+	90.00%	90.00%	1.50%	1.96%	10.00%
Buried	0 – 5	60.00%	60.00%	87.50%	78.11%	75.00%
Aerial	10000+	0.00%	0.00%	13.20%	73.90%	5.00%

BellSouth has adopted the BCPM 3.1 national default input values for all of its plant mix inputs because it cannot ascertain from its own Florida-specific data the appropriate mix of plant in Florida. There are huge differences among the ILEC input values.

The BCPM 3.1 national default input, which BellSouth has adopted, is 90% underground distribution plant in the 10000+ density zone. However, in this most urban, high density zone, most feeder cables go into buildings, and most of the distribution cables are either inside of or attached to buildings or placed in ducts provided by property owners. Thus, when BellSouth models 90% of the distribution plant as underground, it is adding substantial costs for underground conduit and manholes that are simply not required.

In sharp contrast, HM 5.0a has a more reasoned input value of 10% as described in the HAI Model Release 5.0a Inputs Portfolio Section 2.5. Also, note that Sprint and GTE have even smaller input values of less than 2.0% for underground distribution plant in urban areas.

Another example of flawed modeling logic is the fact that BellSouth, again using the BCPM national default input value, shows 0.00% for aerial plant in the most urban density zone. Moreover, Sprint has modeled 83.5% of its distribution cables in the highest density zone as buried plant, which would be cost prohibitive, if not impossible, to place in a congested urban area. Neither of these ILEC input values reflects sound OSP Engineering judgment.

Plant Mix – Fiber Feeder: The input value comparisons for the percentage of fiber feeder plant are:

Type of Plant	Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Underground	0 - 5	10.00%	10.00%	23.50%	86.91%	5.00%

GTE's high input value of 86.91% for underground fiber feeder percentage in the rural areas is simply ridiculous. Feeder routes in rural areas consist of only one fiber cable that will never need to be reinforced. Such situations clearly call for less costly buried or aerial plant. No cost-efficient telephone company would incur the exorbitant cost of building a conduit and manhole system for 86.91% of its fiber feeder in rural areas. This is an even more profound issue given that the

BCPM 3.1 also models excessive fiber feeder to far too many DLC RT locations (detailed elsewhere in this testimony). The impact of this egregious error in plant mix is to greatly inflate GTE's rural costs, which results in an artificially high Universal Service Fund.

Investment Loop Cap: BCPM 3.1 employs an investment loop cap to allow for a maximum individual loop investment based on either potential regulatory policy or a wireless technology alternative (BCPM Methodology, Pg. 56). The default value is $10,000, which has been commonly accepted in numerous proceedings by all parties. In this proceeding however, BellSouth has filed an Investment Loop Cap of only $4,350, without any explanation or supporting documentation.

BellSouth's In-Plant Loading Factors: BellSouth's engineering and labor costs are derived from BellSouth's in-plant loading factors that convert the material prices to an installed investment. Having analyzed BellSouth's in-plant loading factors in UNE Cost Dockets in eight states, including Florida, I believe that BellSouth's OSP loadings are not forward-looking and, instead, are utilized to recover the costs of BellSouth's embedded methods of operation. I have several concerns with BellSouth's cost modeling methodology base on its use of top-down loading factors.

BellSouth applies a material loading factor to the inflated (Caldwell Direct, Pg. 9) direct material cost for copper and fiber cables in its OSP Field Reporting Codes. These material loading factors are modeled primarily to recover telecommunications engineering and labor, vendor engineering and installation, exempt (i.e., minor) material, and sales tax (Caldwell Direct, Pg. 11). BellSouth's methodology is to calculate a ratio of these associated expenses to its non-exempt (i.e., major) material investments for the year 1995, and then multiply this ratio by the inflated direct cable material cost.

I do not believe that BellSouth's ratio of material loading expenses to cable investment in 1995 should be considered least-cost, most-efficient, or forward-looking based on currently available technology. Mr. William Zarakas, BellSouth's Cost Modeling Witness in the UNE Cost Dockets, stated in his deposition in Louisiana that, "our assumption there would be that *the cost of installing a pole in the future would basically be the same as it was in the past*, because we see no change in the technology. *And we did that for each individual factor or loading*" (Zarakas Deposition, LA Docket U-22022/U-22093, 8/19/97, Pg. 110, with italics added for emphasis). However, the BCPM proponents contradict this statement by saying that "the Model does not rely upon embedded costs for facilities, functions or elements" (BCPM Methodology, Pg. 12).

Going beyond the fundamental methodology question and looking into the data provided on the material loading factors raises additional questions. These material loading factors for cable are huge contributors to the total loop investment. The following examples of these in-plant loadings will demonstrate how they are used to drive enormous underlying costs that make up BellSouth's input values to the BCPM 3.1:

- A prime example of the impact of these loadings can be found in the BellSouth's application of in-plant loading factors to SAIs. In BellSouth's costing of a 4200 pair indoor SAI, $13,689 worth of material becomes $85,789 in installed costs. Thus, the in-plant loading factors account for 84% of the total costs.
- ILEC Engineering and placing costs have been allocated based on cable size or material costs. For example, BellSouth's placing input values for 24 gauge underground cable are $1.03 for 100 pair and $22.96 for 2400 pair. Likewise, BellSouth's engineering input values for these same cables are $0.15 and $3.37. It simply does not cost 22 times as much to engineer or place a 2400 pair underground cable than a 100 pair underground cable. In reality, there is very little difference in the costs to engineer and place an underground copper cable based on its pair size.
- BellSouth has double counted placing costs for buried copper and fiber cables because it zeroed out the splicing column instead of the placing column in its buried cable tables. Buried cable placement costs are appropriately included in the buried structure costs and should not be included in the cost of the buried cables themselves. Furthermore, based on a comparison of these additional buried placement costs to the splicing cost for aerial and underground cables, this double-counting does not seem to have been a simple matter of BellSouth putting its splicing costs in the placing costs column. Thus, BellSouth's installed buried cable costs are overstated.

- There are a significantly higher supply costs for aerial versus buried and underground copper cables of the same gauge and pair count as shown in the following table:

BellSouth's Copper Cable Supply Costs

Size/ Type	24 Gauge Cables			26 Gauge Cables		
Pairs	4200	900	25	4200	900	25
Aerial	$22.64	$4.87	$0.30	$19.72	$4.50	$0.34
Buried	$13.32	$2.86	$0.13	$12.70	$2.81	$0.17
UG	$18 21	$5.63	$0.12	$16.68	$4.02	$0.11

The explanation cannot be that BellSouth includes terminal costs as a cable loading factor because there are no comparable supply costs for buried cables that also have terminals. Furthermore, comparable supply costs have been applied to the larger size cables, which rarely have terminals. Also, the explanation cannot be due to strand and pole line hardware costs because there are no comparable supply costs for aerial fiber cables?

- BellSouth's costs for splicing aerial cables are unrealistically higher than splicing costs for underground cables of the same pair size and gauge.
- BellSouth's filing also shows that it is more costly to place 26 gauge underground cables than larger and heavier 24 gauge cables of the same pair size.
- BellSouth's engineering costs vary considerably between 24 and 26 gauge cables of the same pair size and type of plant.

- Furthermore, since fiber cable sheaths are the virtually the same regardless of fiber count, there is no rationale for BellSouth to model a much higher cost to place a fiber cable of higher fiber count. This discrepancy causes BellSouth's fiber cable placement costs for larger fiber cables to be overstated.

These are but a few examples where BellSouth has taken an illogical, top-down accounting approach to deriving input values that simply contradict real world OSP Engineering. BellSouth's filing shows a lack of OSP Engineering judgment in the determination or review its cable input values. Noteworthy is the observation that GTE and Sprint simply did not file the underlying costing details for their cable input values for analysis.

Drop Wires: Responses to Data Requests in this proceeding show that ILECs serve fewer than xxxx lines per residence. Yet, BCPM 3.1 assumes five-pair buried drops for both residences and businesses. While ILECs can certainly choose to invest in five-pair buried drops to every residence to preclude ever having to reinforce any of them, it does not seem reasonable that the Universal Service Fund should fully support the excessive spare capacity. Furthermore, the availability of two-channel DSL Systems provides a viable alternative for up to four subscriber lines on a two-pair buried drop for those residential customers who may someday require more than two lines. My recommendation, for the purpose of USF costing, is that all residence buried drops should be two pair.

Lack of Real World Variation in Input Values: The ILECs have filed in BCPM 3.1 input values in a manner that totally disregards clearly understood differences by density zone. There is no appropriate variation in many of the ILEC input values by density zone for such input values as pole structure sharing, aerial and buried drop costs, or distribution fill factors. The following examples will further illustrate the lack of OSP Engineering judgment in deriving ILEC input values:

- BellSouth utilizes the same costs per foot for conduit installation and cost per foot for buried cable installation for each trenching method: Trench and Backfill, Rocky Trench, Backhoe Trench and Hand Dig Trench. Sprint does likewise. Furthermore, BellSouth does not vary its buried cable trenching costs for differing terrain conditions of normal, soft rock and hard rock.
- Sprint even uses the same base cost per foot installed for both conduit and cable placement for all methods, all soil types, and all density zones. Sprint's explanation is that "the contract does not differentiate among these activities" (Sprint's Response to AT&T's First Set of Interrogatories, Att. 24). As an OSP Engineer, I find that statement rather amazing. As an example of the impact of these simplified input values, For Hard Rock – Feeder Conduit Trench and Backfill, BellSouth has filed a base cost per foot installed of $60.98 compared to Sprint's filing of $1.90, a difference of 3,209%. This contradicts real world OSP costing, because trench costs vary considerably by method, density zone and type of soil condition.

BCPM 3.1 contains extensive input value tables that have been developed to appropriately differentiate pole, buried cable and underground conduit placement costs by type of method, by density zone, and by soil conditions. The ILECs may rationalize that by populating these input tables with average values that "it all averages out." However, the abject failure of the ILECs to populate the cells of these input value tables with realistic costs raises considerable doubt regarding the validity of BCPM 3.1 output in any particular density zone.

<u>Contract Prices</u>: Ms. Caldwell states that "BellSouth's structure placement costs (contractor costs) for placing conduit, trenching/plowing buried cable, and placing poles are based on an average of the ten existing BellSouth contracts with outside plant contractors in Florida" (Caldwell Direct, Pg. 9). ILECs use such "Master Contracts" to award day-to-day small-scale routine work and smaller-scale projects. However, in accordance with the "least-cost, most-efficient" assumptions of FCC Criterion 1, the appropriate contractor costs for these models should be lower than these averages to reflect <u>only</u> large-scale projects that are put out for competitive bids. This would produce more appropriate contractor costs consistent with the underlying "scorched node" assumption of these models.

The supposedly proper application of the "scorched node" assumption by BCPM 3.1 has been testified to by Dr. Staihr when he stated that, "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*" (Staihr Direct, Pg. 7 with italics added for emphasis). The averaging of Master Contract costs by the ILECs to determine input values to BCPM 3.1 does not conform with this very key assumption.

Summary Regarding Input Value Comparisons: These input value comparisons are rather clear examples of the ILECs having the data but not seeming to know how to identify and/or correctly apply their data as input values into a bottom-up, least-cost model. It is also apparent that the ILEC OSP input values for many items have been derived via accounting methods that have not been subjected to a reasonableness check by OSP Engineers.

Some BCPM witnesses have frankly admitted this. One stated that, "GTE does not necessarily maintain data that can be easily translated into all of the input values for the BCPM or HAI models" (Robinson Direct, NC Docket P-100, SUB 133b, 12/10/97, Pg. 5). Another ILEC witness has testified that "it is difficult and time consuming to make all model default inputs company-specific. Therefore, in producing costs using a cost proxy model, GTE must rely on many default inputs" (Collins Direct, TX Docket 18515, 2/17/98, Pg. 4).

It is indeed difficult for the ILECs to properly define and properly apply OSP input values, even though they have volumes of state-specific cost data. On the other hand, HM 5.0a employs national default input values developed by the HAI OSP Engineering Team that work within the HM 5.0a to produce Florida-specific outputs because:

- The labor content of OSP costs are reduced from national levels by a Florida-specific factor of 68% (HM 5.0a IP, Sec 7.)
- Placing costs are increased appropriately for difficult terrain, surface texture, rock depth, rock hardness and water depth statistics that are Florida-specific at the CBG level.
- Customer and wire center locations are Florida-specific at the individual location level.
- Material costs for a least-cost model representing large ILECs should not vary significantly from nationwide material costs.

Q. HAS THE BCPM 3.1 ACHIEVED THE MOST REALISTICALLY ATTAINABLE LEVEL OF ACCURACY FOR IDENTIFYING CUSTOMER LOCATIONS?

A. No. One of the primary goals of a superior local loop model is precise customer location because this is the basis for accurate and cost-efficient network design. The BCPM 1.0 and the Hatfield Model up through Release 4.0 located or assigned customers at the CBG level. The BCPM 2.0 and now BCPM 3.1 use housing and business line data at the CB level to better locate customers. On average, there are about 30 CBs per CBG (BCPM 3.1 Description, Pg. 6). However, the HM 5.0a is much more precise in locating customers through latitude and longitude geocoding to six decimal places of the customer's addresses (HM 5.0a Description, Sec. 5.4.3).

The overall geocoding success rate for HM 5.0a, as calculated by Mr. Pitkin, was 70% of the Florida customers in this proceeding. It is higher in the urban areas because customer locations have more geographically definite addresses and lower in rural areas for the opposite reason.

BCPM 3.1 does not actually locate any customers. In essence, it locates roads and then assumes that customers in the CB are uniformly distributed along those roads (Duffy-Deno Direct, Pg. 3). The testimonies of Messrs. Pitkin and Wood critique the BCPM 3.1 grid based customer location methodology in detail.

Q. HOW WELL DOES THE BCPM 3.1 GROUP CUSTOMERS AS AN OSP ENGINEER WOULD IN DESIGNING A LOCAL LOOP NETWORK?

A. Not nearly as well as HM 5.0a. The BCPM 3.1 translates the CB level customer information into a microgrid that has its boundaries based on fixed latitude and longitude lines. As these microgrids are subsequently combined into ultimate grids, or CSAs, for the purpose of modeling the OSP network, their boundaries are still arbitrarily fixed. The BCPM 3.1 CSAs are then divided into four Distribution Area ("DA") quadrants.

One unintended consequence of this BCPM 3.1 modeling methodology is that some natural clusters of customers (e.g., a small town or subdivision) will be arbitrarily segmented into different DAs, CSAs or feeder routes in contradiction to the way that they would in reality be engineered. As an OSP Engineer, I thus take exception to the assertion that "BCPM designs a network the way actual telephone companies design networks" (Bowman Direct, Pg. 6). Furthermore, the current FCC Public Notice states that, "we consider a model platform that groups customers using a clustering approach because it appears to have advantages over gridding approaches" (FCC Public Notice DA 98-1587, 8/7/98, Pg. 4).

The BCPM 3.1 road-reduced DA (BCPM 3.1 Methodology, Pg. 49) is based on two questionable assumptions:

1. That simply designating "a 500 foot buffer along each side of the roads within the distribution quadrant" in all density zones will model the correct size DA for distribution cable design. Because the arbitrariness of this assumption can result in oversizing the DA, the BCPM 3.1 has had to add a check to constrain the area of the DA so that it does not exceed the actual area of the microgrid itself (BCPM 3.1 Methodology, Pg. 49, Footnote 36).
2. The center of each quadrant's DA should be placed at the road centroid of the quadrant because customers are uniformly distributed along the roads. While this is an improvement over locating them at the centroid of a CBG, in reality the road centroid could be in the middle of a lake, on top of a mountain, or in any number of inaccessible places.

On the other hand, HM 5.0a clusters its more precisely located customers like an OSP Engineer would do in designing a local loop network (HM 5.0a Description, Sec. 5.5) based on:

- assuring a reasonable proximity of the customer locations to each other (i.e., two miles),

- maximizing the copper distribution length up to 18,000 feet from the DLC RT based on fully utilizing the capabilities of currently available technology,
- maximizing the customer line size of the DLC RT up to 1,800 lines based on 90% utilization of a 2,016 line DLC system,
- designing the shortest distance between customer clusters (however, based on right angle routing to assure sufficient cable length), and
- efficiently linking "outlier clusters" to main clusters.

"One of the major challenges of building a proxy model is clustering customers in a fashion that integrates engineering practices based on this CSA approach" (BCPM 3.1 Methodology, Pg. 24). I certainly agree, and conclude that the HM 5.0a methodology of grouping customer locations into clusters based on OSP Engineering principles is clearly superior to the BCPM 3.1 methodology of assembling and dividing grids with fixed boundaries at various latitude and longitude lines.

Q. DOES EITHER BCPM 3.1 OR HM 5.0a ACTUALLY DESIGN DISTRIBUTION CABLES TO EACH AND EVERY CUSTOMER LOCATION?

A. No. Each model sizes and centers its DAs using different methodologies. Each model then effectively lays out a grid of backbone and branch distribution cables to serve the defined DAs areas from the defined DA centers. However, "[t]he [BCPM 3.1] road-reduced area is *not used to locate customers*, but as a *modeling tool* to determine *likely cable distances required to serve customers* in the distribution quadrant" (BCPM 3.1 Methodology, Pg. 20, with italics added for emphasis). Dr. Duffy-Deno helps to further clarify the BCPM 3.1 distribution cable modeling methodology by stating:

> It is important to make clear that *BCPM does not locate customers within the road-reduced areas. Estimated customer locations* reside in the microgrids and *are not "moved"* to the road-reduced areas. Rather, the road-reduced area is used as a *tool to estimate the amount of cable needed to serve the estimated customer locations* that reside within the microgrids in populated distribution quads (Duffy-Deno Direct, Pg. 20, with italics added for emphasis).

Claims that either model "moves customers" or "comes up short" of reaching a particular customer location must be evaluated with the above understanding of what these two models do, and do not do, in regards to distribution cable modeling. For example, the BCPM 3.1 Model Methodology makes the following false and very misleading statement when it states that, "*BCPM places cable to the actual customer locations, rather than moving the customers to some hypothetical distribution cable network*" (BCPM 3.1 Methodology, Pg. 34, with italics added for emphasis). The truth is that neither model designs a distribution cable to each and every precise customer location, and neither model physically "moves customers."

The relevant issue then is to determine which model has the most accurate, most reasonable, least-cost, most-efficient methodology based on currently available technology for modeling sufficient distribution cable and structure investment to serve all of the customers located in the CSA/DA. The relevant evaluation criteria are:

- precisely locating customers,

- clustering customers into CSA/DAs in a manner consistent with that of an OPS Engineer,
- cost-effectively sizing the CSA/DAs,
- realistically shaping the CSA/DAs,
- determining the center of the CSA/DAs relative to the customer locations,
- determining the number of FDIs needed,
- laying out the distribution cable grid in realistic and cost-efficient configuration (e.g., rectangular lots),
- sufficiently sizing the distribution cables to serve existing customers only with appropriate administrative and maintenance spare capacity, and
- conforming to transmission requirements for loop resistance and loss.

The CSA/DA modeling methodology, assumptions and input values of HM 5.0a are superior to those of BCPM 3.1 in regards to each of the above criterion.

Q. **DOES THE BCPM 3.1 METHODOLOGY FOR MODELING CSAs PRODUCE THE LEAST-COST, MOST-EFFICIENT, FORWARD-LOOKING AND REASONABLE LOCAL LOOP MODEL BASED ON CURRENTLY AVAILABLE TECHNOLOGY?**

A. Absolutely not. There are two major shortcomings in the BCPM 3.1 methodology for modeling CSAs that result in an overestimate of network costs with an excessive number of DLC RT locations. The BCPM 3.1 CSAs are:

- too small geographically because they are designed far beneath the maximum distribution cable distance reachable with currently available technology, and
- too small in terms of the number of customers served because the maximum line threshold for an ultimate grid CSA is well below the capacity of the DLC RT to serve customers in a CSA.

There is a major difference between HM 5.0a and BCPM 3.1 regarding the design of distribution cable lengths from the DLC RT. The ILEC proponents incorrectly emphasize that BCPM 3.1 designs an outside plant network that maximizes loop lengths for copper at 12,000 feet. For example, the BCPM 3.1 proponents make the following partially true statements (with italics added for emphasis):

> The engineering protocols most central to the design of this model include a *maximum* loop length for each CSA that is *less than 12,000 feet*. To *ensure attainment of this standard*, the maximum ultimate grid size is typically constrained to 1/25th of a degree of latitude and longitude... (BCPM 3.1 Description, Pg. 42).

> BCPM 3.1 *constrains* the size of the ultimate grids to be no larger than approximately 12,000 feet by 14,000 feet. The *rationale for this constraint* on the ultimate grid size is to *limit copper loop lengths from the DLC to the farthest customer to approximately 12,000 feet* (Bowman Direct, Pg. 4).

> By utilizing the DSC architecture and the *maximum 12 Kft copper loop*, BCPM3 *assures* that the requirements for advanced telecommunications service access for remote rural customers is reasonably comparable to the enjoyed by urban customers, as mandated by the 1996 Act (Bowman Direct, Exhibit RMB 3, Pg. 9).

The whole truth in regards to this matter is that BCPM 3.1 routinely designs copper loops in excess of 12,000 feet in length from the DLC RT because it adds partial grids to the 12,000 x 14,000 foot ultimate grids. This is quite evident from the following statements from the BCPM 3.1 Model Methodology itself (with italics added for emphasis):

> BCPM 3.1 – *Tends to limit* average copper loop lengths from the DLC to the customer by *generally limiting* the maximum ultimate grid size to 12,000 feet by 14,000 feet, latitude and longitude. *If copper cable lengths from the DLC to the customer exceed 12,000 feet*, the cable gauge is reduced to 24 gauge cable and extended range plug-ins are installed on *loops extending beyond 13,600 feet*. The ultimate grids are designed such that *copper loop lengths from the DLC to the customer are unlikely to exceed 18,000 feet.* (BCPM Description, Pg. 125).

> The design of the ultimate grids *ensures that the maximum copper loop length from the DLC site to the customer for any individual customer should not exceed 18,000 feet.* (BCPM 3.1 Description, Pg. 42)

Thus, BCPM 3.1 clearly allows for copper loops of up to 18,000 feet, and occasionally even further, from the DLC RT in its distribution network. It is an indisputable fact that currently available DLC technology will support distribution cable lengths up to 18,000 feet from the DLC RT. And, both HM 5.0a and BCPM 3.1 design loops to this limit.

The telling difference is that HM 5.0a designs up to 18,000 foot copper loops purposefully because it conforms to network transmission design standards and produces a least-cost network design. On the other hand, BCPM 3.1 designs up to 18,000 foot copper loops on an exception basis due to the arbitrarily fixed dimensions of its grid structure.

Q. DOES BCPM 3.1 "ENSURE" SUPERIOR TRANSMISSION QUALITY AND "ASSURE...ADVANCED TELECOMMUNICATIONS SERVICES" BY "CONSTRAINING" COPPER LOOPS TO 12,000 FEET?

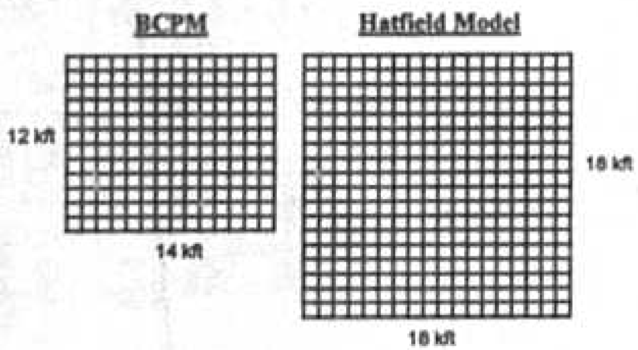
A. No. Not only has this been incorrectly stated by the ILEC proponents, but it begs a question regarding the quality of service the proponents of BCPM 3.1 believe they would be providing to those customers who are actually modeled by BCPM 3.1 to be more than 12,000 feet from the DLC RT.

BCPM 3.1 states as an objective the minimization of the distribution portion of the plant (BCPM 3.1 Methodology, Pg. 24), which is contrary to a least-cost, most-efficient network design. On the other hand, HM 5.0a seeks to maximize the distribution portion of the plant in order to minimize the number of costly DLC RT locations and the additional subfeeder cable and structure required to reach them. Sensitivity runs of HM 5.0a with the maximum distribution cable length constrained to 12,000 feet have actually produced higher loop costs. This is because the expected reductions in distribution cable investment are more than offset by increased investments in feeder cable and structure and additional DLC RT sites.

It is commonly understood in the local loop telecommunications industry that the ultimate minimization of distribution cable length is achieved by putting fiber feeder further into the network and closer to the customer in what is known as Fiber-to-the Curb ("FTTC") architecture. However, ILECs have not deployed FTTC on a wide scale basis for the simple reason that it is a very costly network architecture. This is even more true for the basic types of narrowband services to be supported by these networks, especially in rural areas.

OSP Engineering design guidelines typically state limits that assure quality transmission performance of the network. Both BCPM 3.1 and HM 5.0a agree that the maximum limit for copper distribution cable is 18,000 feet from the DLC RT. HM 5.0a very purposefully designs non-loaded copper distribution loops out to 18,000 feet from the DLC RT and models subsidiary remote terminals on T1 extensions to "outlier clusters" on copper cable far beyond 18,000 feet (HM 5.0a Description, Sec. 6.2 and HM 5.0a, IP, Sec. 2.8) because this is the least-cost, most-efficient network design utilizing currently available technology.

The following diagrams compare the geographical coverage of just the copper distribution cables for these two differing modeling assumptions:



Furthermore, the effective geographical area covered from a single DLC RT by the HM 5.0a is actually even more than 93% greater than the 12 Kft x 14 Kft CSA of the BCPM 3.1 (as illustrated above) when the road cables on the T1 extensions to "outlier clusters" are taken into consideration.

The conclusion from these diagrams is that the BCPM 3.1 must model many more CSAs to cover the same geographical area. The consequences of this aspect of the BCPM 3.1 modeling methodology are excessive fixed investments and recurring operations and maintenance cost for many more DLC RTs. These costly consequences are even more profound in the extensive rural geographical areas, which are the primary areas for support from the Universal Service Fund.

Q. HOW DOES THE BCPM 3.1 ASSUMPTION LIMITING THE MAXIMUM NUMBER OF LINES SERVED IN EACH CSA TO 999 RESULT IN EXCESSIVE COSTS?

A. The second costly flaw in the CSA modeling methodology of BCPM 3.1 is that the maximum number of lines modeled for each CSA is simply too few based on the most economic application of currently available technology. The BCPM 3.1 preprocessing program limits ultimate grids (i.e., CSAs) to a maximum of 999 lines (BCPM 3.1 Description, Pg. 119).

A BCPM 3.1 witness states that "a Carrier Serving Area *typically* contains no more than 1,000 living units, while a Distribution Area *typically* contains 200 to 600 living units" (Bowman Direct, Pg. 6 with italics added for emphasis). This statement clearly shows that the BCPM 3.1 modeling methodology for sizing CSAs and DAs is based on the backward-looking inefficiencies of the embedded network in violation of the long-run, least-cost principles in the FCC guidelines for these models. This preprocessing assumption drives excessive costs into the BCPM 3.1 network because it models many more CSAs and with excessive fixed investments and recurring operations and maintenance cost for many more DLC RTs than does HM 5.0a.

A "least-cost, most-efficient" network design based on "currently available technology" would seek to maximize the utilization of the 1,800 line capability (i.e., 90% of 2,016 line capacity) of the DLC RT serving a CSA without exceeding the limitation of 18,000 feet of copper distribution cable. The BCPM 3.1 modelers do support a DLC RT site capable of 2,016 lines and do agree that 2,016 line DLC systems optimize the utilization of fiber feeder cables (BCPM 3.1 Description, Pg. 49). However, BCPM 3.1 has a maximum threshold of 999 lines per CSA, which is far below the "most-efficient" 2,016-line capacity of a DLC RT site. Thus, the BCPM 3.1 modeling assumption of a 999 line maximum CSA results in a network design that is certainly not "least-cost, most-efficient."

All of the unnecessary additional DLC RT sites modeled by the BCPM 3.1 drive excessive costs, because each one has incremental investment associated with:

- site acquisition and preparation,
- cabinetry (or perhaps huts and CEVs),
- common equipment,
- standard and emergency power source,
- additional strands in the main fiber feeder cables,
- subfeeder fiber cables with associated structure
- and optical patch panel.

According to Mr. Pitkin, the BCPM 3.1 networks modeled by the ILECs for Florida in this proceeding include 223 CSAs that have only one customer location. Thus, BCPM 3.1 models each of these customer locations with the exorbitant costs of its own dedicated feeder fibers and its own dedicated DLC RT. The cost-effective HM 5.0a alternative for narrowband services is to model isolated individual and tiny groups of customers as "outlier clusters" on T1 road cables from a "main cluster" CSA. BCPM 3.1 is definitely not the "least-cost, most-efficient" network model for isolated customer locations based on "currently available technology," and thus it inflates the loop cost basis for the Universal Service Fund.

Furthermore, there are greater operational expenses resulting from having a larger number of DLC RT sites (e.g., maintaining service during a power failure). Thus, the BCPM 3.1 does not use the forward-looking, least-cost, most-efficient engineering design for determining the number of CSAs and DAs, particularly when compared to HM 5.0a.

CSAs and DAs in a forward-looking model should be modeled based on:

- clustering customer locations that are within reasonable proximity to one another,
- keeping natural clusters of customers together,
- utilizing the transmission design capabilities of currently available technology, and
- allowing the cost-efficient utilization of the maximum size of IDLC system (2,016 lines) and FDI (7,200 pairs).

The CSA/DA modeling methodology, assumptions and input values of HM 5.0a are superior to those of BCPM 3.1 in regards to the above criteria.

Q. WHAT IS THE CARRIER SERVING AREA CONCEPT?

A. The CSA Concept is an OSP Engineering guideline that was formulated around 1980 and has been documented as a part of the record for this proceeding (Bowman Direct, Exhibit RMB 3, Pg. 6). The source document for the CSA design criteria used by the BCPM modelers is the Lucent Technologies (formerly AT&T) Outside Plant Engineering Handbook (BCPM 3.1 Description, Pg. 18). Incidentally, I was a member of the AT&T OSP organization that did the 1994 update of the handbook. The relevant parts of the CSA Concept for this proceeding are (with italics added for emphasis):

- No loop can exceed 900 ohms of resistance, which generally equates to:
  - *9,000 feet of 26 gauge copper cable* or
  - 12,000 feet of 24 gauge copper cable. [Note: cables with 26 gauge copper conductors are smaller, less costly and have greater resistance and loss than 24 gauge cables.]
- *Extended range line cards* are available *which extend the range of the DLC remote terminal beyond 12,000 feet.*

Q. DOES BCPM 3.1 CONFORM TO THE CSA CONCEPT?

A. No. The ILEC proponents have incorrectly implied that BCPM 3.1 is designed around and conforms to the CSA Concept as evidenced by the following statements (with italics added for emphasis):

> *CSA engineering guidelines* do not recommend *copper loop lengths greater than 12,000 feet*...The 26/24 gauging used in the distribution takes into account the *industry standard 900 ohm Carrier Serving Area (CSA) design criteria of no more than 12,000 feet of copper regardless of gauge*. (BCPM Description, Pg. 18)

> These *engineering constraints conform to the specifications* of a forward-looking, efficient network design. That efficient network is *based on the designation of a Carrier Serving Area*. A Carrier Serving Area is a *standard telephone design concept* that consists of a geographic area that can be served by a single digital loop carrier (DLC) site. (Bowman Direct, Pg. 4)

> The *Carrier Serving Area (CSA) concept* was specifically designed to allow for *access to advance telecommunications services* within the context of an efficient local exchange distribution network. (Bowman Direct, Exhibit RMB 3, Pg. 7)

Yet, the truth is that the BCPM 3.1 does not conform to the "constraints" of the CSA Concept as evidenced by the following enlightening statements from the ILEC testimonies (with italics added for emphasis):

> BCPM 3.1 uses *24 gauge cable only when the copper loop from the DLC to the furthest customer exceeds 11,100 feet*. This distance is based on *complying with engineering standards* for the maximum dB loss permissible to maintain adequate service quality. An *extended range line card is included for loops that extend beyond 13,600 feet* from the DLC to the customer. This *also is an engineering standard*, but is a user adjustable input in the model. (Bowman Direct, Pg. 5)

> BCPM 3.1 uses 26/24 gauge cable in distribution. 12,000 ft of 26 gauge copper has resistance value of *999.6 ohms* (83.3.ohms per thousand feet @ 68deg.), well within the 1500 ohm supervisory limit of today's digital switches. The 26/24 gauging used in the distribution takes into account the industry standard *900 ohm* Carrier Serving Area (CSA) design criteria of no more than 12,000 feet of copper regardless of gauge. In the *few cases where BCPM 3.1 finds grid Quadrants with copper loops greater than 12,000 and up to 18,000 feet in the distribution network*, it uses the *Extended CSA (ECSA) design* with 24 gauge cable throughout that quadrant. *Extended range line cards* are used to serve all customers in the distribution area (Grid quadrant) for *distribution distances over 13,600 feet*. (BCPM 3.1 Methodology, Pg. 18 - 19)

> Within a grid, if the length of copper from the DLC to the last lot in a quadrant is *less than 11,100 feet, 26 gauge cable is used* to serve all customers. In those circumstances where the distance from the DLC to the last lot is *greater than 11,100 feet, 24 gauge wire is used in all cables*

to and within the quadrant. Where distances exceed 13,600 feet, *extended range plug-ins are installed on lines that exceed 13,600 feet.* (BCPM 3.1 Methodology, Pg. 54 - 55)

Thus, BCPM 3.1 clearly violates the CSA Concept in the following four ways:

- BCPM 3.1 models 26 gauge cable out to 11,100 feet from the DLC RT, which clearly exceeds the 9,000 foot limit on 26 gauge cable of the CSA Concept. The 9,000 foot CSA Concept limit on 26 gauge cable is based on cable loss, not 900 ohms of resistance. Therefore, BCPM 3.1 would appear to be modeling customers that are located 9,000 to 11,100 feet from the DLC RT with excessive loss and thus poor quality service. There is no BCPM 3.1 supporting documentation (like the HAI 5.0a Inputs Portfolio) that explains how or why the BCPM developers changed the CSA Concept maximum loop distance for 26 gauge distribution cable from the DLC RT from 9,000 feet to 11,100 feet.
- BCPM 3.1 models loops between 12,000 and 13,600 feet from the DLC RT without range extension line cards in violation of the CSA Concept requirement that all loops in excess of 12,000 feet should have range extension line cards. Do these particular BCPM 3.1 customers have substandard quality service and/or impeded access to advanced services on a reasonably comparable basis? Again, there is no BCPM 3.1 supporting documentation for this deviation from the CSA Concept.
- BCPM 3.1 actually models the Extended (or Expanded) CSA Concept, which supports the design of loops out to 18,000 feet from the DLC RT.
- BCPM 3.1 allows the distance at which the extended range line cards are applied to be a user adjustable input, instead of conforming to the CSA

Concept requirement of 12,000 feet or any particular standard. The statement is made that the 13,600 foot distance to begin employing range extension cards "also is an engineering standard," but there is no supporting documentation for this deviation from the CSA Concept.

Q. DOES BCPM 3.1 MODEL DISTRIBUTION CABLE REALISTICALLY AND COST-EFFECTIVELY?

A. No. When a single lot in a DA exceeds 11,100 feet distance from the DLC RT, BCPM 3.1 then designs all of the distribution cables to and within the DA from 26 gauge to more costly 24 gauge conductor cables. This is a grossly oversimplified and needlessly costly modeling assumption. In the real world, OSP Engineers do not simply increase the gauge of every single cable in a DA to satisfy the transmission requirements of the longest loop when only a few customers exceed the limit for 26 gauge cables. In the real world of OSP Engineering, the larger distribution cables closer to the DLC RT would remain 26 gauge, and the smaller cables closer to the customer would be 24 gauge such that the combined 26/24 gauge loop resistance and loss would be within transmission limits.

In comparison, HM 5.0a models 24 gauge copper conductors for cables less than 400 pairs and 26 gauge conductors for cables 400 pairs and larger (HM 5.0a IP, 2.3.2). Since distribution cable loops more than 9,000 feet from a DLC RT of no greater than 1,800 line capacity will invariably be less than 400 pairs, HM 5.0a does satisfy the CSA Concept constraint on 26 gauge cable distance.

Furthermore, HM 5.0a does this in a "least-cost" manner that is consistent with real world OSP Engineering practice.

Q. WHAT CSA DESIGN STANDARD DOES HM 5.0a EMPLOY?

A. The more cost-efficient design employed by HM 5.0a conforms to OSP transmission requirements for acceptable loop loss of 8.5 dB from the DLC RT based on currently available technology. OSP Engineering guidelines are always subject to "engineering judgment", and currently available technology continually drives the evolution of such guidelines. For example, when the CSA design concept was originally formulated around 1980, ISDN was then limited to less than 12,000 feet on copper. Such service is now routinely guaranteed to any subscriber served on copper cable within 18,000 feet of their serving wire center.

The realistic and cost-effective gauging of the copper distribution cables by HM 5.0a has been described above. For its Integrated DLC systems, HM 5.0a uses two types:

- Low density DLC system applications are based on the Advanced Fiber Communications UMC 1000A.
- High density DLC system applications are based on the DSC Communications Litespan-2000.

The line cards costed for each of these DLC systems allows for the utilization of extended range line cards as required to support distribution cable lengths out to 18,000 feet from the DLC RT. The low density DLC system, which is more likely to be deployed in rural areas, actually uses the cost for UMC Remote

Terminal Extended Range RST POTS Channel Units (R-EPOTS) for all channel units. The high density DLC system uses its "regular" R-POTS channel unit to meet transmission requirements for loops up to 17,600 feet from the DLC RT (Exhibit ___ (JWW-5)). Should there be any instances of customers between 17,600 to 18,000 feet from a high density DLC system, the Litespan-2000 RUVG2 card is utilized.

In the USF Hearings in Louisiana (Docket U-20883), the Staff's Final Recommendation dated April 3, 1998, reported on page 15 (with italics added for emphasis) that, "Dr. Bowman did concede that Hatfield's [i.e., *HAI 5.0a's] use of 18,000 feet for copper cable beyond the DLC remote terminal would provide quality telecommunications services, as long as the proper electronics were installed in those instances.*" HM 5.0a does indeed use the proper electronics, which are the range extension line cards described above.

Moreover, the Louisiana Staff also found (pages 17 – 18) that "the BCPM overstates cost because the input for extended line range cards are for the more expensive REUVG card." For comparison, the RUVG2 card, used by HM 5.0a for any customers located between 17,600 and 18,000 feet from a high density DLC RT, is approximately 25% more than the standard RPOTS card. However, <u>the REUVG card used by BCPM 3.1 for customers between 13,600 and 18,000 feet is twice as expensive as the standard RPOTS card.</u>

Q. WHAT IS THE COST COMPARISON BETWEEN MODEL RUNS BASED ON 12,000-FOOT GRIDS VERSUS 18,000-FOOT GRIDS?

A. The ILEC proponents claim that "the 12,000-foot grids result in lower per-line loop cost than the 18,000-foot grids." (Bowman Direct, Pg. 5) This claim is not surprising, nor particularly persuasive, given that:

- BCPM 3.1 defaults to <u>all 24 gauge</u> cable when any customer in a DA is beyond 11,100 feet from the DLC RT.
- BCPM 3.1 greatly exaggerates the cost of range extension line cards by utilizing the very expensive REUVG card beyond 13,600 feet when the RPOTS card, at half the cost, is good out to 17,600 feet. At the very least, BCPM 3.1 should be costing the RUVG2 card, which is only 25% more expensive than the standard RPOTS card.

Sensitivity runs of HM 5.0a with the maximum distribution cable length constrained to 12,000 feet have actually produced higher loop costs. This is because the expected reductions in distribution cable investment are more than offset by increased investments in feeder cable and structure and additional DLC RT sites.

Q. DO YOU HAVE OTHER TRANSMISSION CONCERNS REGARDING THE BCPM 3.1?

A. Yes. There is no explicit test in BCPM 3.1 to ensure that customers do not exceed 18,000 feet in loop length from the DLC RT. The BCPM 3.1 Model Methodology states that "ultimate grids are designed such that loop lengths from the DLC to the customer are *unlikely* to exceed 18,000 feet" (BCPM 3.1 Description, Pg. 125, with italics added for emphasis). However, BCPM 3.1 does indeed model customers more than 18,000 feet from the DLC RT, and Mr.

Pitkin has determined that BellSouth, GTE and Sprint have all modeled loops exceeding 18,000 feet from the DLC RT in this proceeding. By comparison, the HM 5.0a explicitly tests to ensure that no copper loops exceed the 18,000 feet limit from the DLC RT.

The reason that this is important is that copper loops in excess of 18,000 feet require load coils to meet transmission requirements for quality voice grade service. However, load coils are unacceptable in these models because they would inhibit the provisioning of advanced services per FCC Criterion No. 1. On the other hand, non-loaded copper loops longer than 18,000 feet from the DLC RT would violate network design standards and result in poor quality service to those customers.

Q. DO YOU HAVE A CONCERN WITH THE BCPM 3.1 MODELING METHODOLOGY THAT PLACES FIBER FEEDER CABLE TO LARGE CAPACITY GRIDS BY DEFAULT?

A. Yes. The BCPM 3.1 deploys DLC systems for voice grade services rather than analog copper facilities when demand within a particular grid "exceeds the user designated capacity of the largest copper distribution cable" (BCPM 3.1 Methodology, Pg. 19). I have serious engineering and economic concerns regarding this modeling assumption because no consideration is given to the distance of the particular grid from the wire center. Consequently, BCPM 3.1 will uneconomically deploy fiber and DLC to a large apartment/office building directly across the street from the wire center.

This is not an acceptable assumption for a "least-cost" local loop network. The reason is that there are insufficient savings realized in the substitution of fiber feeder cable for copper feeder cable to offset the additional cost of the DLC electronics for loops generally less than 12,000 feet in total length from the wire center, which is the BCPM 3.1 copper to fiber breakpoint. So, this particular BCPM 3.1 modeling assumption is an unreasonable cost adder to the network and thus unreasonably increases the cost of an average loop.

The justification offered by the BCPM proponents is that this modeling assumption "avoids the typical duct congestion in urban rights of way where utilities and urban services vie for below ground space" (BCPM 3.1 Methodology, Pg. 19). That is a backward-looking justification based on the ILEC's embedded network and is inconsistent with the "long-run, forward-looking cost" economic assumptions applicable to these models per FCC Criterion 3. In other words, in accordance with the "scorched node" assumption, a conduit system would need to be installed anyway with sufficient 4-inch ducts to handle whatever copper and fiber feeder cables might be required. So, BCPM3.1's uneconomic substitution of one fiber cable with substantial DLC system costs instead of placing two, more economical copper cables, saves only the minimal cost of one duct and certainly avoids no congestion.

HM 5.0a, on the other hand, performs a life cycle cost analysis of fiber versus copper feeder on the route to determine if fiber with DLC is the more economical alternative (HM 5.0a Description, Sec. 6.3.5). Thus, the HM 5.0a model methodology again more realistically represents the decision process of an OSP Engineer in designing a feeder route.

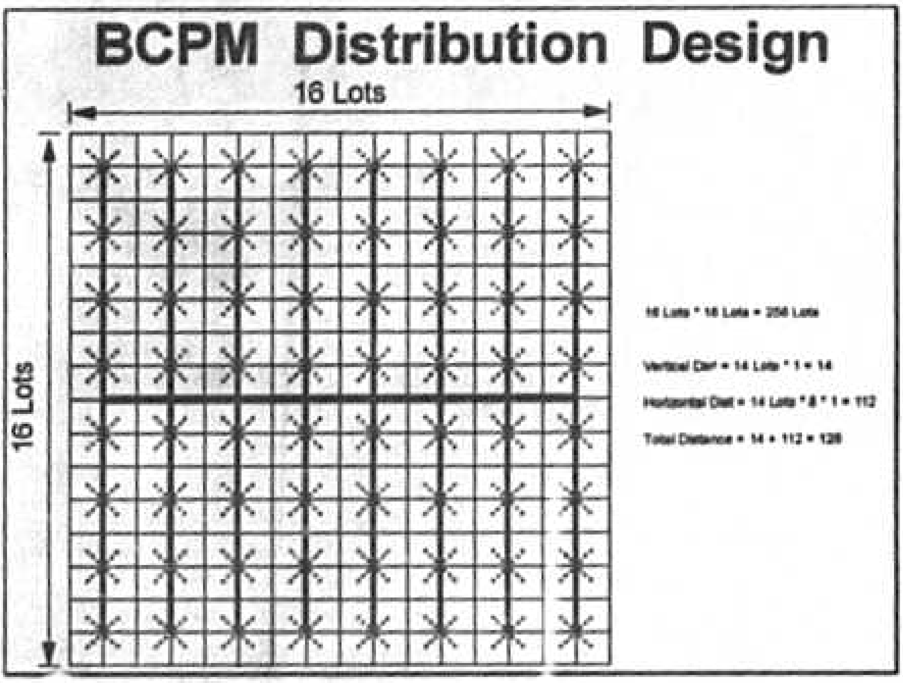
Q. DOES BCPM 3.1 SYSTEMATICALLY OVERSTATE THE AMOUNT OF DISTRIBUTION CABLE REQUIRED BECAUSE IT MODELS SQUARE LOTS?

A. Yes. The BCPM 3.1 developers continue to assert the assumption that customer locations should be modeled as square lots. This is not only unrealistic; it results in the modeling of excessive distribution cable and associated structure investment. HM 5.0a makes a much more realistic assumption that lots are rectangular based on observations of a number of zoning maps and field experience.

Furthermore, as will be detailed below, city and subdivision planners know that any given geographical area can be served with fewer streets, sidewalks, sewers, streetlights, etc. if the lots are rectangular rather than square. Since utilities typically follow the streets or rear lot lines, it follows that rectangular lot layouts are also more efficient and less costly for the power, water, cable and telecommunications utilities to serve their customers as illustrated by the diagrams in Exhibit ___ (JWW-6).

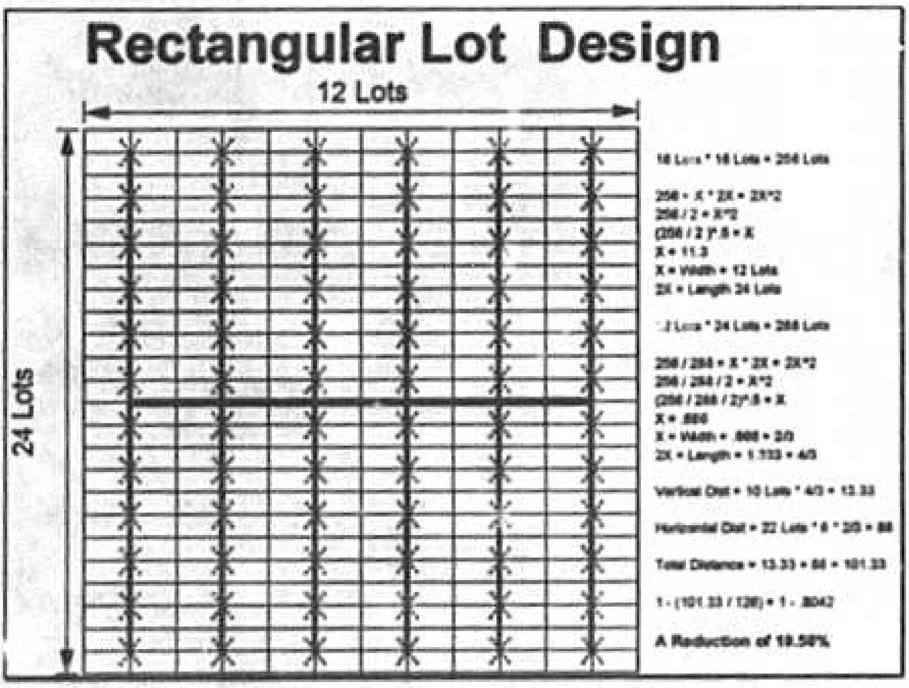
The square lot assumption that has been perpetuated in BCPM 3.1 results in more distribution cable than would be necessary with rectangular lots. Let's consider two generic examples. Assume there are 256 households within a DA.

The square DA in the BCPM 3.1 will have 256 square lots, or 16 by 16 as can be seen below.



Each square lot represents a customer location with a drop going to it (dotted line). The thicker lines represent the distribution cable needed to reach each customer location. For simplicity sake let's assume the area of each lot is one. This means each side of a lot has a length and a width of one. Thus, from the diagram one can see that the amount of distribution cable needed by the BCPM 3.1 in this example is enough to run past 126 lots.

Now consider the next diagram, which roughly represents the way rectangular customer locations could be distributed within the same DA. The total DA remains the same; however, in order to fit this into a square serving area that is somewhat similar, I have taken the liberty of using 288 lots to avoid rounding problems. Again, to be conservative, we will assume that the HAI Model will design the distribution cable to reach all 288 lots in this DA, and that none are empty. Refer to the following figure to see how the HAI Model designs the distribution plant.



Recall the BCPM 3.1 DA was 256 lots. The area of each lot in BCPM 3.1 was 1. The area of each lot in the HAI Model is the distribution area divided by the number of lots, 256/288 = 8/9. Since the length of a lot is twice its width in HM 5.0a, the width must be 2/3. You can see that this is correct by multiplying the width times twice the width, 2/3*(2*2/3) = 8/9 Now all we need to do is to add up the cable used by the HAI Model, which equals 101.33 to serve 288 rectangular lots. Now, compare this number to the BCPM 3.1 design, which needed cable for a distance of 126 to serve only 256 square lots.

The amount of distribution cable needed for the same distribution area as modeled by the HM 5.0a is 19.58% less than that modeled by the BCPM 3.1 — a significant difference that also reflects the reality of city and subdivision planning. BCPM 3.1 consistently models excessive distribution cable length to serve a modeled area of customers occupying lots of identical area.

Q. DOES BCPM 3.1 HAVE TO LIMIT THE AMOUNT OF CABLE THAT CAN BE MODELED WITHIN A DISTRIBUTION QUADRANT?

A. Yes. As an indication of just how seriously BCPM 3.1 overstates total distribution cable length, there is a check that had to be built into the BCPM 3.1 that "constrains the total length of cables (including the backbone, branch, vertical and horizontal connecting cables) within a distribution quadrant to not exceed the length of the road network in that distribution quadrant (BCPM 3.1 Methodology, Pg. 54). According to Mr. Pitkin, over half of the distribution quadrants have to invoke this constraint in order to limit the amount of excessive distribution cable otherwise modeled by BCPM 3.1 based on the square lot assumption.

This difference in modeling assumptions between the HAI Model and the BCPM is further accentuated when the distance from the center of the street to the front of the lot is taken into consideration. The 1 x 2 rectangular lots of the HAI Model and the 1 x 1 square lots of the BCPM include the entire area being modeled and thus go to the center of the street or road. When the distance from the center of the road to the actual front of the lot, which is typically 25 - 30 feet, is subtracted, the HAI Model still has a rectangular lot where the depth is greater than its width. However, the BCPM is now left with a rectangular lot where the width is greater than the depth with the distribution cables having to traverse the longer width. This further elucidates just how unrealistic it is for BCPM 3.1 to model square lots.

Q. DOES BCPM 3.1 OVERSIZE DISTRIBUTION CABLES?

A. Yes. In regards to distribution cable sizing, the BCPM 3.1 Model Methodology states the following:

- "Branch cables are sized to the number of pairs for housing units and business locations. This calculation takes the number of housing units times pairs per housing unit and the greater of actual business pairs per location or business locations times pairs per location." (BCPM 3.1 Methodology, Pg. 55)
- "The Model default inputs assume two pairs for a resident unit and six pairs for a business unit." (BCPM 3.1 Methodology, Pg. 56)

These "default minimums" in BCPM 3.1 are based on a guideline from the outdated practice on Detailed Distribution Area Planning (DDAP) for a minimum of two pairs per ultimate living unit and five pairs per small business, which may be modified based on the judgment of the engineer (BSP 901-350-250, Pg. 20-21). However, technological advances have superseded these "minimum" values. For example, two-channel DSL Systems have become a viable means of rapidly providing additional lines for loops up to 18,000 feet. A primary advantage of incorporating these systems into local loop distribution planning for additional lines is that the investment in two-channel DSL Systems is only needed if, when, and for as long as the additional customer demand is there.

There is excessive cost in oversizing copper distribution cables based on historically low utilization rates that can no longer be justified. The ILECs like to raise a big scare over the time, expense and disruption of digging up streets and yards to place a second distribution cable or drop to serve additional customer demand. With the widespread use of two-channel DSL Systems, the addition of a second cable is no longer the primary alternative. Thus, the ILECs can no longer justify exorbitant levels of spare cable pairs by using their historically low average distribution cables utilization, typically in the 40% range (Dickerson Direct, Pg. 11). Indeed, GTE's deployment practice prescribes distribution cable fills in excess of xxxx% based on the planned selective utilization of two-channel DSL Systems. ILEC cable utilization rates should be rising from their historical levels.

In regards to these historically embedded distribution cable fills, BellSouth testifies that, "These *[distribution cable sizing] factors* are designed to produce a *fill representative of* BellSouth's projection of *actual fill, based on experience over time, for Florida*" (Caldwell Direct, Pg. 12 with italics added for emphasis). However, in response to AT&T's First Set of Interrogatories, Item No. 26, which tried to ascertain the historical utilization of distribution cables, BellSouth responded that, "No record is kept of distribution cable status on statewide basis." Thus, BellSouth could not produce any distribution cable "actual fill, based on experience over time, for Florida", and BellSouth's interrogatory response appears to contradict Ms. Caldwell's testimony.

Similarly, Sprint testifies it "calculated *actual feeder fill* based on working pairs (cable pairs in service) divided by total pairs available *as tracked in the Customer Loop Assignment System, Sprint's internal system for maintaining cable pair inventory*" (Dickerson Direct, Pg. 10 with italics added for emphasis). However, in response to AT&T's First Set of Interrogatories, Item No. 26, which tried to ascertain the historical utilization of feeder cables, Sprint responded that, "Without waiving its objection, Sprint states that the information requested does not exist." Thus, Sprint's interrogatory response appears to contradict Mr. Dickerson's testimony.

From other proceedings that I have participated in, I know that BellSouth has reduced its distribution cable sizing guidelines for pairs per house, or living unit. BellSouth, GTE and Sprint have filed 2.0 pairs per housing unit in this proceeding. However, I recommend that the BCPM 3.1 input value for distribution pairs per residential housing unit for the ILECs should be reduced to 1.5.

BCPM 3.1 takes the greater of actual business pairs per location or business locations times the input value for business pairs per location. Based on data from several other dockets, I know that the number of business lines per small business location is definitely less than 3.0. However, BellSouth, GTE and Sprint all have filed input values of 6.0 pairs per business location. This is much too high given that the actual number of lines are modeled for large businesses. Therefore, I recommend that the input value for the minimum number of pairs per business location should be reduced from 6 to 3.

BCPM 3.1 utilizes distribution cable sizing factors to increase the demand numbers that are already based on the ultimate pair requirements. In addition, there is one more step of rounding up to the next discrete cable size, which is necessary, but in the case of the BCPM 3.1 is based on already overinflated pair requirements as detailed above. Interestingly, the ILECs have begun to realize the excess that has been built into the BCPM 3.1 distribution cable sizing methodology and have more appropriately filed distribution cable sizing factors ranging from 98.0% to 100.0% in this proceeding. Nevertheless, the resulting distribution cable fills are still aimed at maintaining historical embedded utilization levels rather than "least-cost, most-efficient, forward-looking" cable fills based on "currently available technology."

Q. IS THERE ANY EMPIRICAL EVIDENCE THAT ILEC COPPER CABLE UTILIZATION RATES BEING MODELED ARE TOO LOW?

A. Yes. I believe that ILEC historical copper utilization rates, the basis upon which ILEC copper cable fills for BCPM 3.1 have been developed, can be shown to be low based on empirical evidence. This is because an excessive defective pair rate can be attributed in large part to excessive spare capacity, which reduces the incentive to clear defective copper cable pairs.

The cost of a loop is being estimated by the ILECs in this proceeding to be approximately $1,300 per loop. The ILEC cost to clear a defective pair is $xxxx-$xxxx per pair (ILEC Responses to AT&T's First Set of Interrogatories, Item No. 33). Thus, there should be ample economic incentive to clear defective cable pairs and keep the cable pair inventory in high working order, unless there was an excessive surplus of spare cable pairs.

An acceptable defective copper pair rate in the industry is 2% - 3%. AT&T's First Set of Interrogatories, Item No. 25 requested data on defective pair rates. GTE's defective pair rate was reported to be within industry standards. Furthermore, there were practices and data produced that indicate that GTE makes clearing defective pairs and effectively managing the defective pair rate a priority.

However, BellSouth's defective pair rate is more than xxxx times the industry standard, and growing. Furthermore, in response to AT&T's First Set of Interrogatories, Item No. 33, BellSouth responded that, "No data is kept on the quar. y and percentage of copper pairs and fiber stands cleared."

Also interesting is Sprint's response that, "Without waiving its objection, Sprint states that the information does not exist." However, in response to AT&T's First Request for Production of Document, Item No. 12, Sprint furnished an extensive practice on its "Defective Cable Identification and Prioritization Process" that appeared to include a statistical reporting system.

It is difficult for me to believe that an ILEC would not keep track of and try to effectively manage its defective pair rate. Unless, however, that ILEC had such a large surplus of spare cable pairs that it was actually uneconomical to expend resources to reclaim even excessive numbers of defective pairs.

Q. DOES THE EMPLOYMENT OF THE TIGER ROAD NETWORK BY THE BCPM 3.1 MAKE THE MODEL MORE REALISTIC?

A. Not really. This is another modeling idea that sounds good at first, but when its implementation in BCPM 3.1 is investigated reveals a number of concerns and uncovers just how shallow the perceived benefits really are.

BCPM 3.1 relies on a straightforward premise that households and business typically reside near roads (Duffy-Deno Direct, Pg. 16). However, it is the converse of this premise upon which the BCPM 3.1 really operates. The actual modeling premise being that the presence of a road ensures the uniform distribution of households and businesses along that road. As stated in the BCPM Model Methodology, "[c]ustomers, assigned to microgrids within distribution quadrants, are subsequently placed *uniformly* in Road Reduced Areas (BCPM 3.1 Methodology, Pg. 122 with italics added for emphasis). This is simply not the best premise for modeling customer locations.

Indeed, there are many roads that have no households or businesses, and many roads along which customers are not uniformly distributed. In rural areas, customers tend to be more concentrated at the end of their road, which may traverse several grids without any customer locations, before it gets to them. These models are supposed to design a network to serve all of the customer locations, not all of the roads.

However, if a model accurately locates the customers, then it can be reasonably assumed that roads exist to reach those customers without having to identify particular roads from a separate database. This is the modeling premise of HM 5.0a.

The BCPM 3.1 Model Methodology states another simple fact that "rights of way for provisioning telecom cables are most frequently found along roadways" (BCPM 3.1 Methodology, Pg. 6). Once again, if a model such as HM 5.0a locates customers, then it can be reasonably assumed that roads exist with rights of way for cables to reach those customer locations. BCPM 3.1 thus has no claim to any superiority in the matter of rights of way. Furthermore, BCPM 3.1 makes absolutely no use of the road network information to determine pathways that engineers would use to place facilities.

On t' contrary, the need for road right of way actually indicts another assumption in the BCPM 3.1 in that it is necessary to model sufficient route distance to allow for the meandering of the road network. Typically, this is done in HM 5.0a and the BCPM 3.1 via right angle, or rectilinear, routing of the cables. However, in BCPM 3.1 the split, or angled, feeder route appears to take a direct route towards "the population centroid of the entire feeder quadrant" (BCPM Methodology, Pg. 43). If no allowance is made for conversion of "airline" route to "road" route distances, as is done in HM 5.0a, then the BCPM 3.1 will not model sufficient investment for the split feeder route to reach its destination.

Any perceived added value of applying the road network to locate customers below the CB level is suspect. As an example of how the road network is used to allocate customers from CBs to microgrids, the BCPM 3.1 Model Methodology (Pg. 30) uses an illustration of 20 miles of roads traversing a microgrid. However, a microgrid is only 1,500 feet by 1,700 feet and could not realistically contain a even minuscule fraction of 20 miles of roads.

Q. DO YOU HAVE CONCERNS WITH THE OSP SENSITIVITY ANALYSIS CAPABILITY OF THE BCPM 3.1?

A. Yes. The BCPM 3.1 has two major, rather arbitrary, OSP network design assumptions which cannot be readily subjected to sensitivity analysis because they are only user adjustable via the cumbersome and time consuming one day preprocessing application. These two assumptions are:

1. The preprocessor has a maximum threshold of 999 lines (or households plus business lines) for determining if microgrids are re-aggregating to form CSAs. As detailed earlier in my testimony, I believe that the BCPM 3.1 models far too many DLC RT sites because the number of lines modeled in its CSAs and DAs is well below capacity. It is very difficult to run a sensitivity analysis in the BCPM 3.1 to verify this and develop a more cost-efficient alternative threshold because it is only changeable in the one day preprocessing cycle.
2. The preprocessing routine has a fixed distance of 10,000 feet from every wire center as the appropriate distance where it is economical and feasible to split a feeder route. This is also the fixed distance where the spacing of lateral subfeeder routes suddenly goes from roughly every 1,600 feet to roughly

every 13,000 feet (BCPM 3.1 Methodology, Pg. 46). The BCPM Model Methodology rationale is "that within 10,000 feet [of the wire center], customers are generally located within the perimeter of a town and that the town has some sort of gridded street complex" (BCPM 3.1 Methodology, Pg. 43).

BCPM 3.1 then applies this questionable fixed assumption to every feeder route in every wire center in every geographical area in Florida. Furthermore, there is no economic justification offered by the BCPM modelers that 10,000 feet is the realistic or least-cost, most-efficient distance for any feeder route, much less for every feeder route in every wire center. This number needs to be more easily adjustable for sensitivity testing. Furthermore, this assumption should be variable (perhaps in a look-up table) that is based on the size of the wire center and/or the density of customers along the feeder route.

VI. OTHER CRITICISMS REGARDING THE HAI MODEL

Q. WOULD YOU PLEASE RESPOND TO ANY OTHER BCPM 3.1 CLAIMS OR HM 5.0a CRITICISMS REGARDING OSP?

A. Yes. There are six.

1. The BCPM 3.1 alleges superiority in sizing distribution cables based on ultimate pairs per house instead of current households. There is no shortcoming of HM 5.0A in this regard. The distribution cable fill factors in HM 5.0a are more than adequate to serve the number of empty houses that may exceed the number of households in an area, even though this is not a

requirement of the model. Furthermore, the BCPM 3.1's modeling of distribution cables sized specifically to serve empty houses has been rejected (Staff's Final Recommendation, LA Docket U-20833, 3/27/98, Pg. 16).

2. The BCPM 3.1 Model Methodology still continues show the Hatfield Model Release 4.0 ("HM 4.0") methodology for distribution road cables in rural areas. This methodology has been totally superseded by the clustering algorithms of HM 5.0a. Furthermore, BCPM 3.1 continues to misrepresent the road cables of HM 4.0 as two cables running in a straight line from the center to opposite corners of the quadrant (BCPM 3.1 Methodology, App. A, Ex. 2). What HM 4.0 did with road cables was model road cable investment based on twice the rectilinear distance from the centroid to the corner of the occupied area of the quadrant. The relevant points being that there could be more than two cables within the modeled total length and the total distance modeled is significantly understated in the BCPM 3.1 illustration.

3. The BCPM proponents are also still making outdated and totally irrelevant assertions in regards to 85% of the rural customers modeled as being in towns and served via a distribution cable grid on maximum three acre lots in HM 4.0 (BCPM 3.1 Methodology, Pg. 24). For many months, HM 5.0a has modeled main and outlier clusters in a way that is more precise and representative of the way that local loop networks are designed. (A description of the OSP enhancements of HM 5.0a is covered in the direct testimony that I filed in this proceeding.)

4. The BCPM proponents cite a study of five states performed for the FCC that concludes that 12,000-foot grids result in lower per-line loop costs than 18,000-foot grids (Bowman Direct, Pg. 5). I have little doubt regarding the reported results given the longer loop cost inefficiencies inherent in the BCPM 3.1. Specifically, the previously documented excessive costs of the REUVG range extension card for all loops in excess of 13,600 feet in length and the use of 24 gauge cable only for the entire CSA when the copper loop to any customer in the CSA exceeds 11,100 feet. If this study had been conducted using the HM 5.0a assumptions of less costly RUVG2 range extension card and 24 gauge for cables less than 400 pairs, the results would no doubt have been markedly different.

5. In regards to the sharing of buried cable trenching , it has been written that, "such proposals [for sharing buried cable trenches in the future] conveniently overlook the fact that GTE's network is in place today....With respect to buried cable, these parties [i.e., AT&T and MCI] apparently believe that GTE will dig up its existing cable in order to immediately rebury in a shared trench" (Tucek Direct, Pg. 8). These statements reflect a serious lack of understanding of the "scorched node" assumption that is to be applied to these models. As stated very clearly by another ILEC witness, "the BCPM 3.1 model assumes that the entire network is built at a single point in time" (Staihr Direct, Pg. 7).

6. The BCPM sponsors have unilaterally declared that "data transmission over a 28.8 Kbps modem" constitutes "access to advanced services" for the purpose

of implementing FCC Criterion 1 (Bowman Direct, Exhibit RMB 3, Pg. 2). The FCC Criterion actually states that, "[t]he loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services. For example, loading coils should not be used because they impede the provision of advanced services." (FCC Report and Order, May 8, 1997, Paragraph 250, Criterion 1). While the FCC does not specifically define "advanced services," its use of the words "not impede" and the example of "load coils," which would actually preclude the transmission of digital signals, does provide ample guidance in this matter.

My understanding of "impeding advanced services" in regards to the issue raised in Exhibit RMB 3 would be to deny modem access to rural customers, which the existing ILEC networks certainly do today. The attempt by the ..CPM sponsors to declare 28.8 Kbps modem access as the standard for advanced services (as opposed to say 14.4 Kbps or 56 Kbps) is blatantly self-serving and misleading.

Proponents of BCPM have noted a Bellcore Technical Memorandum TM-25704 as support for why the Hatfield Model will not support modem speeds of 28.8 Kbps (Bowman Direct, Exhibit RMB 3, Pg. 10). This TM is not a transmission standard and was specifically developed as a worst-case scenario. Mr. John Donovan, the leader of the HAI OSP Engineering Team has reviewed this TM, talked with its author and makes the following observations, which I support:

A close reading of the TM indicates exactly what I have been saying regarding the inexactness of analog modem performance. Worthy of note is page 12 of that TM, which tabulates the actual experiments performed. The purpose of the tests was not to validate the transmission characteristics of either the BCPM or Hatfield Models, but to examine worst-case scenarios. In fact the worst case is so bad, that none of the loops used in experiment meet tariff requirements, since all loops exceed the 8.5 dB maximum for POTS loops. Since other empirical data is not readily available on short notice, however, we can make certain observations about the data. First of all, I personally spoke with Rick Perez, the Bellcore author. He told me that the worst-case test loops had many gauge changes and many splices. This would cause high reflection losses in each splice, and is the most likely cause of the abnormal dB losses at the standard test frequency of 1004 Hz.

Test loop number 1 was 18,000 feet with no bridge tap. It supported 24.0 kbps on a 28.8 modem, but had a horrendous loss of 14.3 dB, 5.8 dB above the maximum allowed by tariff. Since each 3dB attenuation halves the signal strength, this means that the signal on this loop was at about ¼ or 25% of the strength it should be at 8.5 dB. The next longest loop was test loop number 6 which was 17,500 feet with 1,000 feet of bridge tap. Yet this loop still had 12.8 dB of loss, or about 3/8ths of the signal strength the Hatfield Model would provide at 8.5 dB. Still, this loop readily supported 26.4 kbps with a 28.8 kbps modem.

As one would surmise from the Bellcore Technical Memorandum, determining predicted modem speeds is not an exact science. The HAI OSP Engineering Team has estimated that the HM 5.0a will support minimum modem speeds of 21 - 24 Kbps for any loop, and 28.8 Kbps, or better, for most loops. I believe that this level of performance more than complies with a reasonable interpretation of the FCC requirement to provide access to "advanced telecommunications and information services that are reasonably comparable to those services provided in urban areas."

The conclusion of this exhibit stated that, "[b]y utilizing the DSC architecture and the *maximum 12 Kft copper loop*, BCPM3 *assures that the requirements for advanced telecommunications service access* for remote rural customers is reasonably comparable to that enjoyed by urban customers, as mandated by the 1996 Act" (Bowman Direct, Exhibit RMB 3, Pg. 9, with italics added for emphasis). In this testimony it has been shown that the BCPM 3.1 clearly designs copper loops out to 18 Kft and even beyond. Not only is the conclusion statement above rather questionable, but any undue concern raised by Exhibit RMB 3 regarding modem speed is applicable to BCPM 3.1.

VII. SUMMARY

Q. WOULD YOU PLEASE SUMMARIZE YOUR TESTIMONY?

A. I recommend that the Commission adopt the HM 5.0a as the most appropriate model for determining the local loop cost of basic local exchange service in Florida. In Release 3.1, the BCPM modelers have taken steps to evolve their model by incorporating several of the concepts of the Hatfield Model plus some additional ideas to improve the accuracy and cost efficiency of the local loop model. Most of the evolutionary changes in this particular release of the BCPM have the initial conceptual appearance of being cost improvements. However, upon investigation, I have found that in the implementation of these ideas the BCPM 3.1 still falls well short of being the least-cost, most-efficient, forward-looking and reasonable local loop cost model based on currently available technology, particularly in comparison to the HAI Model Release 5.0a.

Second, I recommend that many of the OSP input values proposed by BellSouth, GTE and Sprint be rejected, since these inputs contain numerous fallacies and are not the least-cost, most-efficient and forward-looking set of input values that are required in this proceeding. The HAI Model 5.0a and the input values proposed by AT&T and MCI for OSP are more appropriate to use in this proceeding for determining the cost of the local loop network in Florida in order to size the Universal Service Fund.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.