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EX PARTE

January 29, 1997

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W. Room 222
Washington, DC 20554

RE: Ex Parte Notice - CC Docket No. 96-45

EX PARTE OR LATE FILED

Dear Mr. Caton:

Enclosed for inclusion in the record of the above captioned docket is a transcript of the Federal-State Joint Board staff's workshops on Proxy Cost Models of January 14 and 15, 1997.

An original and one copy are being filed in the secretary's office today. Please include this filing in the public record.

Respectfully submitted,

Porter E. Childers

Porter E. Childers
Executive Director
Legal and Regulatory Affairs

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**Staff Workshop on Proxy Models**

**Federal Communications Commission**
**Washington, D.C.**

**January 14 and 15, 1997**

**Tuesday, January 14**

**Introductory Remarks**

David Krech, FCC

Excuse me. If we could all have our seats please, we would like to begin. Good morning. My name is David Krech. I am on the Federal Staff of the Joint Board Staff on Universal Service and Docket 9645. And we are here today to discuss proxy cost models. We have workshops scheduled for today and tomorrow. The first thing on the agenda is opening remarks, and I would like to start off by introducing Gina Keeney, the Bureau Chief of the Common Carrier Bureau at the Federal Communications Commission.

Regina Keeney, FCC

Welcome to all of you. Some of you may have just wandered in to get in from the cold, and you're welcome to stay too. Actually, I'm glad to see what we have such a good turnout. This is a real opportunity for us to hear from you and for you to hear what's on our minds too. The proxy cost models will be important to the Commission in a number of proceedings, universal service and access charges. And it's very important for us to have a

dialogue here, and I know that none of you here will be reluctant to share your views. I just want to tell you that they're welcome and we truly intend this to be a workshop that's "interactive," if I can use that buzzword, because we want to know what we're doing. So, we're counting on you to help us out.

I think we'll have a very productive couple of days and I want to thank all of you for coming. I especially want to thank the state participants. It's very important for us to work closely with the states on this particular project as well as others and I thank you very much for coming. I know it's hard to travel from different parts of the country in the cold weather and I really appreciate your efforts. So with that, I'll turn it back over to David Krech who can set forth the procedures. Thank's a lot.

David Krech, FCC

Thank you, Gina. As I'm sure you're aware if you have seen our public notices, we have a very tight agenda. We're trying to cover a lot of ground in two short days. I want to just quickly go over some of the ground rules that we'll be using at the workshop. We will be first having presentations by the three models that were submitted to us last week. First, Ben Johnson will be discussing the Telecom Economic Cost Model. Second, Bob Mercer will be discussing the Hatfield Model. And third, Glen Brown from U S West will be discussing the BCPM — which I keep tripping over, they should have used different acronyms than just

snatching those two together. After that we will have a break and then we'll move on to the first panel, which is on Modeling Network Investment.

The way that the panels will work is that the moderator will first ask all the panelists to introduce themselves. The moderator will then briefly repeat everything that I'm about to say so that nobody can forget. We will then ask the panelists to discuss the first question before them. We will go to the three proponents of the models first, give them an opportunity to respond to the question. They will be allowed two minutes to respond. We will then open it up for other panelists to respond to the question or to respond to the comments from the modelists and they will also be given two minutes. At that point we will turn to rebuttals after everyone on the panel has had an opportunity to respond to the question. Rebuttals will be limited to one minute. It will be at the discretion of the moderator when we move to the next question.

All the panels are scheduled for two and a half hours, though they're kind of broken up in different time zones so that — like the first panel this morning, I believe, has an hour and a half and then an hour after lunch, and other panels are broken up a little differently. After the panel presentation is over there will be time for audience questions. This is a Federal-State Staff Workshop. Part of our purpose here is to allow the states to gain information for a report that they're supposed to submit to the Commission before we take action, so we will be

giving deference and allowing the state regulators to have an opportunity to ask the first couple of questions when we get to the public audience question time. Then we'll open it up to the rest of the audience. The questions should be questions. We are not looking for people to make comments or to give speeches; we would like you to ask questions. If they are directed to a particular individual, please let us know that, otherwise we'll open it up to the panel and let anybody on the panel who cares to respond to the question have an opportunity. Responses to the questions will be limited to two minutes, and if there are rebuttals to those responses they'll be also limited to one minute. And then at the end of the day on Wednesday after we've gone through all four panels, we will have closing remarks and hopefully wrap this up by 5:00 so people can meet their flights and get onto other business.

Without any further ado because I have nothing further to say, let's move to the presentations of the models. First up will be Ben Johnson from Ben Johnson Associates discussing the Telecom Economic Cost Model which was submitted to us by the New Jersey Division of the Ratepayer Advocate. Mr. Johnson. Oh, excuse me, one last thing: Public audience, when you ask questions, please use the microphone. This is being videotaped, and in order to make sure that we get everything on tape for future reference, it is important that you ask questions from the microphone. There is a microphone set up in the middle aisle there.

**Overview of Models**

**Telecom Economic Cost Model**

Ben Johnson, Ben Johnson Associates

I misjudged the size of the room and the size of the screen, so I'm not sure any of you can see my overheads, which is fine. They're not critical. The Telecom Economic Cost Model may not be familiar to you. We've used it in about a half dozen different States. It's a general purpose cost model which I think is the first difference between it and the other two models you'll be looking at.

What I'm going to do today, since in 15 or 20 minutes it's just impossible to completely familiarize you with the details of the model, I'm going to assume you're somewhat familiar with the other two models and that if you're interested, you'll take the time to study our user documentation after this meeting or get a copy of the model and look at it yourself. What I'm going to do with my time is try to focus you on some differences and some unique features of our model and perhaps get you focused on what I think are some of the things that we do particularly well.

First, is that it's a general purpose model. In contrast, the Benchmark Cost Proxy Model, BCM Model, is said by its sponsors very specifically to be a single purpose model designed for the purpose that we're here for today, estimating high-cost and identifying high-cost areas. The Hatfield folks have two

purposes in mind: One is to estimate the costs of unbundled network elements and the other is to, for this purpose here of getting the total or average costs for high-cost areas. In contrast, our model is a general purpose model that from the very beginning has been designed to serve many different purposes. It answers more questions than you've probably thought of, but as I've encountered different questions over the years, working for regulators and working for public agencies involved in regulation, there's a lot of questions that people have, regulators have, or questions that arise in the course of pricing various telephone services. And when we built this model we decided to go towards a general purpose model that could be used for many different questions.

One of the reasons that we're able to accomplish that is fundamental to its architecture, which is a little different than the other models in that it is built and looks at — it builds a network one wire center at a time. It allows you, if you pull it up on screen, to study that wire center in complete detail and you can jump around and pick randomly any of hundreds of different wire centers. And as you select that different wire center it will build a network to serve that wire center and you can study that wire center in complete detail. Just from a pure use of today's computer technology, that's an advantage because you can get nearly instantaneous answers to your questions for one wire center. If you're curious what happens when you change market share and go to, say, this same wire center served by a small carrier with a small market share, in a matter of seconds

you can find out how the network looks different, you can find out specifically how it differs and you can see how the costs differ. If you're curious what the effect of changing the mix of buried and aerial cable or underground cable is, you can find out very, very quickly. All the other models you can do that, but you have to run the entire database, is the tendency, and so it takes 20 or 30 minutes. That would be true for our model as well. If you actually wanted to run all the wire centers, you're back to a half (inaudible), maybe an hour, but you can get answers fairly quickly, both because you can get feedback as a user and see the effective changing assumptions on the wire center you're looking at, and because you can study that wire center in detail. And we've organized the inputs, we're organized the algorithms to encourage you to look deeper below the surface. I think it encourages a deeper understanding of the costs that are being estimated. And that's one of the advantages of a modeling approach, as opposed to just gathering data from the embedded costs of the universe that's out there, that you can see details. And we take advantage of that by structuring the model in a way that encourages you to go deeper in.

The other advantage of it is one that I think longer term is very relevant to the task at hand for the Joint Board, which is that because it's structured around wire centers, it doesn't inherently limit you in your ability to fine tune and made more precise your input assumptions. To date, all we've ever done is run it with a standard set of inputs for an entire state, much like the BCM and Hatfield folks run their models. But, as you

get out into these high-cost areas, if you start wondering now maybe their costs of labor are a little higher, or maybe the hourly rates are lower but the time is higher, or certain specific time is higher, the time to set up the job, for example, if it's many miles from where you would dispatch the workforce. That's something that readily can be fine-tuned within the model.

So, again, the architecture, I think, is inherently more flexible, more open. We've chosen a path that we think will ultimately be very useful. Recognize that when you're attempting on a short time frame to develop costs for the entire nation, the ability to adjust or fine-tune inputs for individual wire centers may seem irrelevant to you. But certainly if you take this model and put it in the states, and if the states start having high-cost funds that are overlaid on the Federal funds where they're attempting to target more precisely and make sure there's enough funds available to pay their unique circumstances for their particular wire centers, within the States that expertise exists and they know these wire centers and they can potentially take the time — and it wouldn't necessarily take more than an hour or two — to specifically set inputs for that wire center. You can adjust the mix of type of structures, you can adjust the labor times, you can potentially adjust the hourly rates. There's a variety of things that you could adjust.

Okay, the second major point is that we're providing some additional useful inputs. Each of the models has a different set of inputs. In some areas, some are more detailed than others. I

want to call attention to some things we're doing that we think are particularly useful. And even if you pick one of the other models, something I would encourage you to have the other models modified to allow. First, very up front, one of the first inputs you see as a user is you have to decide what market share this carrier is serving. It's fundamental to the design of the network and it's very important in the future. In the past it didn't matter. You could assume it was a 100% incumbent, that's the only folks that ever studied. But we're going to very soon, within the next few years, be in a world in which there are other carriers. And so if you want to understand what their cost structure looks like, you can do that by selecting a different market share. What is the target market share for the carrier being studied?

The second example is something I think is particularly useful for some, but not all, I think all of the important ones. We have gone to the effort of breaking out hourly labor costs and distinguishing that from the time requirements. Primarily where we've done this is in the installation of cable which is where I felt the issue was most important because we've seen over the years, in reviewing studies, a wide variety of different numbers for what it costs for an installed length of cable and yet the materials costs are relatively similar nationwide. So it's obvious the labor costs were varying. What we've done is break that labor down into a series of piece parts, such as placing and splicing, and then we've assigned amounts of time that we estimate for each of those activities as default input values.

But again, those inputs can be refined. The key factor that I'm trying to focus you on is that by distinguishing an hourly rate and the number of minutes, that's a fundamental improvement that I think is needed if you're ever going to start reconciling this wide array of opinion as to what it costs to do certain things. Because one company may have relatively high labor rates because they're, say, in the Northeast where it costs more, or Alaska where cost of living is extremely high. Other companies may have relatively low labor rates because they're a low cost of living area. The time requirements, on the other hand, should be relatively similar for all carriers, but widely varying depending on conditions. The splicing time may be relatively constant, but certainly the time to place cable can vary depending on how congested it is, depending on the terrain and the like. And most dramatically, the time it takes to put in a pole or the time it takes to dig a trench, and certainly the time it takes to install conduit can vary widely. So by breaking those out in greater detail, we think we're on the path towards getting much more accurate understanding of the true differences in cost.

Another distinction that we have that I think I'd like to emphasize is that in dealing with the question of fiber and copper, that's one of the fundamental differences between these models and in any kind of imbedded cost data you look at because the imbedded world is predominately copper, it's copper in which there's overlays. You build cable and then you overbuild with more cable, and then you overbuild with more cable, and you accumulate a lot of dollars in those accounts. And you're also

depreciating away so on a net investment basis, the numbers may not be that dramatically high. But certainly if you look at the gross investment, it greatly exceeds what it would cost today to install cable.

All the models are pointing towards more of a fiber in the plant, certainly at least in the feeder. One of the things we're doing that I think is useful, again, you get instant feedback, you can optimize, and if you want to you can determine how much extra does it cost to extend more fiber out looking towards the future and other services, or you can go towards a cost minimization approach and fairly quickly you can minimize cost. We give you two criteria to do that with. One is a breakpoint, the number of feet of fiber, the minimum number of feet of fiber that you would install. And secondly, a minimum number of loops to be served by that remote electronics. And we think those two criteria capture the economics of the tradeoff that you have to make in choosing between fiber and copper.

Another difference, returning to my theme that we're a general purpose model, is that the model is fundamentally designed to do a variety of different types of economic costs. Now for purposes of this Joint Board, there's probably only one type of cost that you're particularly interested in, which is the total cost or the average cost of serving these customers. But we think it's a true advantage to have a model that is set up and ready to give you answers to other types of questions that are often of interest in pricing in regulatory proceedings, and for

that matter questions that would be of interest to companies that were planning their expansion, trying to decide whether to expand into new markets and the like. The model can give you a variety of long-run average cost studies. The type that we did for the illustrative study we submitted last week is comparable to what the other models do, which is it's a combined residence and business network. There's both residence loops and business loops being served on the same network, you size the network to optimally fit the mix of customers. It can also give you the stand-alone cost of only serving residence locations. It can also give you the stand-alone cost of only serving business locations. And those are interesting questions and they will answer some questions like: Well, will the new carriers entering the market want to only serve business? And I think you'll find not necessarily; even though the revenues are obviously higher in the business market, the extra cost of also serving residence locations is not as high as the initial cost of serving your core group of customers, and so the incentives are there and the model tends to give you a good feel for that. But the incentives are not great enough necessarily to expand out into well beyond the central business core into areas that are purely residential. And again, the model can give you answers to that.

Specifically, one of the things it can do is something called TSLRIC, or Total Service Long Run Incremental Cost, and that's a broad concept that can apply to a variety of types of studies. We've developed a model in a way that it can answer, I think, many of the interesting types of TSLRIC studies that you

might be curious about. And, again, this is something if you take the model home and just turn it on, you look at wire center, you can for yourself start experimenting and seeing what's happening. But, for example, you can add residential as incremental to a business network and find out what's the incremental cost per loop or per unit, per line, of adding those resident customers to a business only network. You can do the reverse, because there's nothing necessarily that says that residential is the incremental volume. You can go in the other direction and say, well, if we assume that we had a residence network and we're going to incrementally add business to that network, what is that cost.

Similarly, you can fine-tune a group and say, for example, low-income residential customers being added to a network that already serves everybody else is one of the types of studies we've specifically designed the model to handle.

Finally, it also generates long run marginal cost estimates which I think as an economist is very interesting and something that many Commissions would be very interested in understanding about. It will be very useful in better understanding dynamics as the market becomes more competitive. And it estimates that by iteratively — you use the model iteratively, over and over and over — to compute a variety of networks sized for different sizes. You get a series of total cost points and then you get a statistical fit of the slope of that line of the total cost curve and that slope is our estimate of the marginal cost. It is still

somewhat unstable. That's one of the things that economists have long known about telecommunications costs, that marginal cost estimates are unstable because of the lumpiness of the facilities. But we think you can understand and study that lumpiness and can understand and study the marginal cost estimates fairly well. Again, I'm not sure anyone can read these, but I'll move on.

In terms of advantages of the model, to summarize why I think our model has some strong advantages that are relevant to this Joint Board, I believe it facilitates more precise cost estimates. And I recognize that some of this precision goes beyond what the Joint Board can deal with in the next few months. But as you roll out in the next few years and start talking about applying this to real companies for which the monies that they are going to receive make a very significant difference in their bottom line, that precision is going to be demanded and going to be expected because companies that have been depending on high-cost funds have a right, I think, and they should be given that opportunity to come in and show you if their labor times are higher because they're so far from where people are located, where the technicians are located, or because their labor rates are higher. For example, Alaska, and I should disclose that we've done a lot of work for the Alaska Public Utilities Commission over the years, so I'm very familiar with their problems. This architecture fundamentally allows for that growth in that direction towards greater precision because it allows the individual states or their companies to come in and develop a

database and proof to show why their costs are different than the average. And, obviously, the incentive will be to try to show all the instances where there are higher costs and I recognize that, but I think that ability to handle greater precision is an advantage.

Secondly, I think it facilitates a deeper understanding of the factors that are driving these costs. And, again, it's partly because of the fact that you can study one wire center at a time. And as you do that, you come to understand that wire center and you start understanding why do the costs change in the way they do, why are they higher or lower. If I change my assumption as to a certain variable, why is it that the costs either did or did not dramatically change, you can sort of slow down and study that. We've structured the model to encourage you to look at the algorithms and encourage you to understand the piece parts of the costs, and it's much easier to do that if you have something that's meaningful to the user like a wire center rather than a CBG which is just a purely artificial abstraction that really has relatively little to do with the traditional deployment of telephone plant.

Thirdly, I think it facilitates better decision-making. In particular, I think it does because it's a general purpose model and as we refine the inputs and have better knowledge of the accurate inputs — what does it really cost to buy certain pieces of equipment, how many minutes does it really take to do a certain activity under normal conditions — as we refine those

inputs and as the state regulators and the industry becomes familiar with the model, we start being able to use that model to answer a lot of questions, not only the pricing of unbundled loops, but also pricing of specific services. We're going to see requests to cut prices on particular markets or niches where they feel like they are under competitive pressure. For that question, you don't want to know what the average cost is, you want to know what the marginal cost is or at least the incremental cost in some sense because that's where your true floor is of whether they are overshooting the mark and being anti-competitive in their response to competitive pressures. A model like this, I think, will be a sound platform that allows you to make better decisions, not only involving the Joint Board issues, but other issues.

Finally, I wanted to make some closing thoughts and that's concerning how to go about evaluating the models as well as their inputs. First, I would suggest — point out — that none of these models are perfect. The state of the art is evolving rapidly. Each of these models has strengths and weaknesses, and each of the models has room for further improvement. And certainly each of the models continues to evolve and improve. We hear about a new version of Hatfield that's due at the end of the month that is attempting to make some improvements, some of which are headed in paths that I agree with and which we think we've already gotten there. Others are pursuing issues that we haven't had the time to pursue, such as interoffice trunking issues and trying to refine that, which will become very important if you

try to spread out and do say an intra-latta(?) access case in which you're trying to get transport costs. The correct distances and the correct way of estimating those costs is something that our model doesn't do particularly well, or at all at this point. We just have a very simplified approach to that, which we think it adequate for most intra-exchange issues, but certainly is not adequate for pricing of longer distance intra-latta access transport.

Also, don't confuse either your own opinions or a speaker's opinions concerning outputs with their opinions concerning models and their opinions concerning inputs. These are three very distinct things. Ultimately the Joint Board, and initially the Joint Board staff, needs to reach some decisions and at least narrow the range of debate on each of these three aspects of what we're hearing about today. The outputs are the first and the easiest thing to grab onto. And if you look at comments coming from other parties that haven't been deeply involved, they tend to focus on outputs, and they're either saying the cost numbers are too low or maybe too high. Bear in mind that outputs are a function of the inputs and the model structure or algorithms, the way the inputs are utilized. Interestingly, I think you'll find that if you take these three models and you match their inputs as closely as you can, the resulting outputs will be relatively similar. And that's one exercise that I think it's a matter of how much you want to do it, what set of inputs you pick. But you pick a common set of inputs and run them through three models, the chances are the outputs are going to be much closer together

than you would initially expect if you only looked at the typical runs coming from the different parties.

Next point is I think the Joint Board needs to improve the accuracy of the inputs. This is one of the most important things to concentrate on before you roll out and start spending real money and requiring competitors to pay into a fund and paying out of it to incumbents. We need better information about the inputs. Some should be straightforward questions: What does it cost to buy a certain item? The problem is that a lot of these items are clouded in secrecy. The manufacturers are attempting to keep the market from being more competitive by limiting the availability of information as to what discounts they offer or what prices they're charging. Regulators clearly have a different interest, which is both to find out what the truth is and also perhaps an interest in trying to improve the accuracy of that market by having better information available. It's a basic concept of economics, better information tends to give you more efficient results.

In general, you need to be gathering more data, more facts, for any of these models because if you'd run them with the existing default sets of inputs, you aren't necessarily going to get as accurate results as you could with some more effort in that regard. Also, I would suggest that at this point when you're seeing differences in output, they are generally a function of differences in input choices. That maybe seems redundant to the point I was making before, but I want to

reiterate it. Our model falls somewhere between Hatfield and the BCPM folks. I tend to think our inputs are closer to the truth than either of the other two, and I don't think it's coincidental that we fall somewhere in the range between those two parties, but I do not claim that every one of our inputs is perfect knowledge. We've had to estimate and use judgment on a lot of our inputs because we do not have enough data to get exact answers. And it's very possible that with further perfection, our outputs would tend to move down towards Hatfield or perhaps up towards the incumbent carriers model, the BCM model.

Finally, I would suggest on a positive note, I think that all three of these models are already good enough and accurate enough that with the right inputs they'll do the job for you. For the basic thing of what you need right now, I think they're adequate. Thank you, and I hope I haven't run too long.

**Hatfield Model**

David Krech, FCC

Okay, thank you very much. Next we'll hear from Bob Mercer from Hatfield Associates. He will be discussing the Hatfield Model which has been submitted to us by AT&T and MCI. Bob.

Robert Mercer, Hatfield Associates

In talking about the Hatfield Model, people sometimes ask where it got its name. There's two possibilities: One is that

the Dale Hatfield was the founder of the firm, and the other is that this is the real McCoy. I'll leave it to you to figure out. So this is a discussion of a model that's now been on the scene for some number of years, and at least in its basic form is presumably familiar to most of you. It's been used in early universal service proceedings at the state level, it's been submitted to the FCC, it's been used extensively over the past six months or so during arbitration proceedings, and it's been used in one rate case proceeding. So, it's not new. What it is is it's a model that estimates the TSLRIC, Total Service Long Run Incremental Cost, or TELRIC, Total Element Long Run Incremental Cost, of both universal service and unbundled network elements. We think those two words together are very important because it's our position, and in fact I know this is a question of some interest in these proceedings as to whether one model can and should do both. And our answer to that question is basically, yes, we believe that is a very important attribute of these models.

I will not in these few minutes attempt to speak at length about the basis of the Hatfield Model. What I'd really like to focus on primarily, after a brief introduction about what the model is doing, is the changes that we are implementing. As Ben has already noted, we've committed to the Joint Board that the updated of the model will be available by the end of the this month and are, obviously, at this point, very far along in that process and expect to have the results — or not the results but

the characteristics that I'll be talking about implemented at that time.

What does the Hatfield Model do exactly? It calculates a reconstructed local exchange network, "reconstructed" in the following senses. It uses forward-looking technology. It uses that technology in efficient network configurations that have been sized and engineered and deployed in order to meet the demand for the services that are being studied. And it assumes the efficient operation of that network using the best available techniques from the technology and just based on generally the efficiency of operation that should be available to a carrier providing local exchange service.

It does have one departure from what you might consider sort of an economic optimization and that is in line with decisions that have been struck at the Federal and state level in a number of proceedings like this, it does assume the presence and use of existing wire centers as sort of a common basis to start from, so all population, all demographics, all configurations are built around the idea that wire centers are located where they're located in the LEC exchange networks today. It is a model that is designed at this point to estimate the demand for the narrow band services that are at issue in universal service and that have heretofore been at issue in considering the cost of unbundled network elements. It certainly can evolve in a straightforward fashion to consider other services as well. But first and foremost, the focus is to make sure that the cost of

voice and narrow band data services, the network is efficiently deployed for that purpose, and it constructs a network that does that. That is certainly not to say, by any means, that there is not potential value in some kind of integrated, high-speed broad band network that can support other services as well. But even in such a milieu, if such a network turns out to be possible, if all the economics of scope that all of us imagine or hope might be present, even if those turn out to be present and there is some future broad band integrated network, very important benchmark is still, what is the cost of providing the services at issue. For instance, in universal service, what is the cost of providing those services in a network optimized for that purpose with the expectation that if there are economies of scope there, in any future broad band network you would expect to see costs that are at or below that level of cost.

So, the model calculates forward looking — "forward looking" means it uses digital switching, fiber optics where appropriate, modern digital loop carrier systems — forward-looking technology, models economic cost because you deploy that technology efficiently to meet the demand that's there. And it deals with universal service, it deals with unbundled network elements as have been defined during the arbitration proceedings, and it also allows you to calculate the cost of access and the cost of interconnection between two local exchange networks since both of those are obviously either at issue or will be at issue as we proceed forward into the new realm that is envisioned by the legislation. And it does all that with a set of consistent

logic, a set of consistent inputs and a set of consistent outputs that properly combine elements in the right fashion to produce those costs that it's trying to estimate.

This is Local Network Engineering 101. I don't want to dwell very much on this picture except to say that if you're going to model universal service properly, universal service really includes the local loop, it includes local switching, it includes local usage. If you're modeling unbundled elements, unbundled elements also deal with those same elements of local loop switching and interoffice facilities. And we've designed the Hatfield Model from its earliest days to be able to look at all of those elements, because you think in looking at all of the elements are key. So, in this picture, we start out here at the customer premises represented by a telephone and the model captures both the cost of the distribution network that connects the premises back to some intermediate point. The cost of what we refer to as the loop concentrator or digital loop carrier systems that efficiently combine multiplex individual circuits for more efficient transport back to the local office. The feeder part of the network that connects typically high capability, high cross section circuits the central office, the central office itself and the wire center that surrounds it.

And then going further as Ben pointed out, there is a rather important thing since any unbundled element or universal service has to consider the interoffice traffic to correctly capture usage, it also captures the interoffice part of the network, both

the transport elements of that network, the tandem switching that's involved, the signaling system, and we've assumed signaling system 7 as the forward-looking technology with its associated transmission links, signal transfer points and data bases or SCPs. So all of these elements have been included in the model and all of them, as I say, use the right technology and are a deployed efficiently for the services that they support.

Those of you that were at yesterday's workshop saw the picture of the model flow and it was the picture that went along with the former Release 2.2. Overnight we created a similar picture that shows the simplified, scaled-down version. I mentioned yesterday that we've, among many other changes, have organized the model to be much more efficient in operation. And basically what happens is about two or three modules disappear. Without dwelling very long in this flow I would like to emphasize that the model is organized so that it's run on Excel spreadsheets, it can be obviously looked at in great detail, every cell is available for examination, and at every stage of output of the model, there is an exhaustive set of outputs that you can look at. You can examine the investment in all the categories of plant, you can examine the corresponding expenses of the model. And you can generally look in about — answer as many questions as you might want to ask about what the model is producing as it moves towards what's rather boiled down and concise set of sort of standard outputs which are really only two or three Excel spreadsheets in length.