that kind of underlies all three of these concerns that are voiced in here. As far as the individual three concerns, I don't know which one is the most error-prone, but certainly I think all of them could be addressed by looking at CBGs or different areas, and making some reasonable comparisons to what might be produced from actual studies in terms of line counts, areas, whatever, to make a more reasonable test of what is actually there, what is being provided to compare these models to.

Robert Loube, FCC

Thank you. I guess we'll start with who we started with before. Jim?

Jim Dunbar, Sprint

Just very quickly, there's a couple of things that I would like to counter, particularly addressing the CBGs. The CBGs were accepted as a set of public data which we strived to look for, publicly available information. Not as an engineering criteria, as has been hinted at, but purely as a way of locating in fact where the customers are. It is an open public database that shows where customers generally are located. The model is not specific to having to require CBGs or anything else. The CBG selection, census block selection, grids, whatever, is a selection of how you want to aggregate or determine the input data that goes into the model. It's all aggregated, it's a function and decision related to the inputs that are applicable.

And it's merely a case of selecting the right level of input aggregation that's necessary. It's a way of locating where the customers are. Ideally, we'd like to see them geocoded, and see where every physical customer is, then you've got the absolute right design. Beyond that, you take the best available data you've got that you select.

Robert Loube, FCC

Ben?

Ben Johnson, Ben Johnson Associates

I would just follow up one point that was made. Our model can be run with data that's developed by the Bell Companies based on sampling and other techniques. And we've done that. It's very interesting. The results do differ. We've also done, between those, and if you run it with a CBG type approach in which we've taken output tables from the BCM2 and used their results to run the model. I think in general there are differences. It'll become very important if you get down to small companies, which if they're missed, you know, it could have a significant impact on them. And we talked about the examples on the mountain and the like. I think those are all very real problems. But on the other hand, I was surprised at how accurate or how similar the results were. We got a correlation between the BCM2 estimated geopositioning versus the data that was provided by Bell Atlantic on the order of a 90% correlation,

which was higher than I was expecting. And as I recall, I can't recall which one was higher, the loop lengths or the number of loops, but they were both — the data to the extent we could get it, seemed to indicate that, considering how soon this whole process has been happening, they've only been doing it for a couple of years now, we're already pretty accurate. A few more years of refinement, we're going to be very accurate. Certainly by the target dates the Joint Board set, I don't think this will be a big problem.

Robert Loube, FCC

Bob?

Robert Mercer, Hatfield Associates

Okay, I have four comments to make in a minute, which is tough. First is, I agree with Jim about the CBGs or alternative if you don't use CBGs right now, is assume uniformly distributed people around a wire center. That doesn't seem to make nearly as much sense as CBGs. You could go further, as he said; it's an issue of the time and energy going from, say, 250,000 CBGs to 140 million geocoded people, and you'll have to select how much differentiation that you want. Second of all, the model has about 400 inputs in it, including the percentage of the aerial underground and buried, so inasmuch as there's a problem in a state where you'd have much more underground or buried cable, you can certainly reflect that in the model. That's the purpose of

having all the inputs in the model. And the last part is, I'd like to counter something Lisa said, or correct an impression she may have left. The model works perfectly fine for rural companies. It's a database issue. We focused on getting Tier 1 companies in first. We're confident that the model works as well for rural companies, when the data is available, and it's a question of time and effort to get it there. And that also would obviously be shaped by the priorities of the Joint Board.

Robert Loube, FCC

Peter?

Peter Martin, BellSouth

Just one quick comment. I agree with everyone that it's very difficult to assess models you haven't seen. But we're basically having to rely on Hatfield Version 2.2.2, and again they have said that there is improvements and refinements coming out, and we'll have to see what are in those. But, for example, on the distribution cable, most of the changes they've talked about are related to bringing in multiple tenant buildings, and I think also taking out some of the rural area, and very rural or isolated CBGs. I haven't seen anything that will address the problem I talked about, which is the fact that they're not getting enough distribution cable in there to serve a whole CBG.

Tom Wilson, Washington Utilities and Transportation Commission

Well, I'd like to support what Mr. Dunbar said about the CBG data being public data. It is, in fact, very important that we continue to use as much public information as possible, so that the models can be verified. And also it is correct that we also found the models do not estimate line counts accurately in all situations, and that needs to be addressed also. I think that another thought is, if estimates are wrong, then there may be a fall-back position that can be structured in the way that universal service needs are met. Particularly I'm thinking about competition stepping in and correcting those errors. And I think that as the universal service programs are developed, if competition can be relied on to correct those errors, it would be real way of addressing that concern.

Robert Loube, FCC

Thank you. Lisa?

Lisa K. Hanselman, GVNW Inc./Management

Regarding — I guess just coming back to the CBG. I know that's where we've got to start. It just struck me that the variance for our data, for the small company data, was so far off. And it was really difficult to tell exactly where the variance is coming from. Was it strictly material? Was it design issues? Where actually, where was it? And so I did take a look at some of the material costs also to try and attribute

part of the variance to one or the other. And, yes, there is some variance there, but if you guys could help us out in breaking the model down more componently, so we could go back to something more realistic, maybe we could come to some conclusions. And I guess I look forward to working with the new Hatfield Model in the small company environment.

Robert Loube, FCC

David?

David Gabel, Queens College

All right. I have two comments. First, continuing on this theme of the CBGs. First, the CBGs are bad type of data to use, because it doesn't have anything to do with the way that you engineer telephone networks. What you're doing is you're putting digital electronics in every CBG, when you might want to have more customers sharing the CBG, or you might want to have fewer. But that's saying that you should decide where to deploy electronics based on where customers are located, and the model really isn't doing that. Instead, it's forcing the electronics to be shared by a CBG. Secondly, if CBGs or census blocks aren't good items to work with, what do you work with? I go back to what's already been said, and that is that there are regularly done loop samples by the local exchange companies that tell you where their subscribers are located relative to the wire center. And we already know how many customers should be located in each

of these wire centers. We can then use the sample data to distribute the customers around the wire center.

Robert Loube, FCC

Thank you. David?

David N. Porter, MFS

Just to take the opposite perspective, I like CBGs because it's not related to telcom. The whole idea was to find some kind of an independent way of creating an optimally efficient network. And if we start off — I've already expressed my problem with starting off with wire centers. I think that biases the result. The problem is, it's a model. And you have to start with something, and you have to have something to build around. And I think CBGs are a reasonable alternative. I think we can address at least a fair number of the problems by going back and asking the companies what CBGs do you serve? An example that I heard from a fellow who lives out in Kansas and works for Sprint, talks about the adjacent wire centers, one that's 10 miles in diameter, and one that's 30 miles in diameter. And if you're assigning to the nearest wire center, everybody that's in that 20 to 30 range in the big wire center gets assigned to the wrong wire center. Well, if you're a small wire center, or a small telephone company, the mechanics will work just the opposite — or excuse me a very large area but a small number of customers, your mechanics work just the opposite, and you're not getting anybody

assigned. So CBGs, I think, are at least a reasonable first approximation.

Robert Loube, FCC

John?

John Schrotenboer, Southwestern Bell Telephone Company

Well, I guess I would reiterate my concern over CBGs and for the exact reason that Mr. Porter mentioned in terms of CBGs being assigned in the wrong wire center. If you're assigning the whole CBG to the wrong wire center, that may create a significant error. If you even assign a portion of it, it may create some sore of error in the process. One way to mitigate that error is to look at what is the number of lines per wire center and do some sort of correction on that basis to take out some of that error in the process. And to provide that information, Southwestern Bell has made the information for Texas available for line counts on a wire center basis, as a way to look at making that sort of a correction. I think that that is a reasonable thing to do to mitigate some of this problem. I think it also may warrant some further investigation to looking at how the CBGs or how smaller areas might affect the overall areas that are associated with individual wire centers.

Robert Loube, FCC

Thank you. Again everybody answered on time. Oh, sure.

Robert Mercer, Hatfield Associates

One fact that hasn't come out, there was several people expressed concern about the fact that the Bis-Res lines, or the total of lines in a wire center is wrong, and there's a lot of focus on the CBGs and their assignment to wire centers. I guess I'd only add another factor that's very important is what way do you allocate the total company lines to a wire center. And in line with my earlier comment about how databases are getting better all the time, one of the things that's getting better is I think there is a much more precise location of Res-Bis customers coming. So I think in both areas, Release 3 and I assume the other models are addressing not only getting CBG assignments right, but finding the right number of Bis-Res lines within CBGs. And both of those are getting better as we go.

Robert Loube, FCC

Jim, do you want to say anything? I don't want to show any prejudice in favor of one side or the other here.

Jim Dunbar, Sprint

The only thing I would comment on is that with all the talk of the CBGs we do need to recognize that part of the assignment

problem has been corrected in the current model that we have put on the table. Because they do assign it to the proper office that owns that CBG or serves that CBG. And it's not purely related to distance, as the original BCM2 was.

Robert Loube, FCC

Ben, final word?

Ben Johnson, Ben Johnson Associates

No, I'd reiterate I think we're starting to solve these problems, and you shouldn't — hopeful the Joint Board is not going to lock down and say "well, this is the best of the batch as of February," even if, you know, if you could simply issue in an order, say we want improvements in these, and we'll have a cutoff date at some point. But I don't think you need to cut it off in the next month or two when everybody's scrambling to try to get it right.

Robert Loube, FCC

Okay. Thank you. Let's go to the third question then. The third question is: One of the purposes of setting the fill factor or utilization rate below 100% is to provide a cushion for growth and demand. How large should that cushion be? Is there an alternative way to model the impact of demand growth on the economic cost estimate? If so, please explain. I guess, Ben, you're the next one.

Ben Johnson, Ben Johnson Associates

I think the way we approach it is appropriate. We give the user a utilization factor, but our default factor of 85% I think is just about right, in the case of cable. What that does in the model, it then computes an effective utilization or effective fill factor, which is almost always lower based on the rounding to the next available, the next largest available discrete cable size. We've given the Joint Board in our submission of last week actual effective fill factors for every wire center, and they range from about 55% to about 75%, which we think is appropriate. They're probably just a bit higher than the embedded base, but we think that's appropriate as well because to some degree we need to remember this is supposed to be a long run model. And the long run in economics has certain tendencies, one of which is a tendency towards optimal efficiency that is achievable in the long run planning horizon where you can optimize the amount of capacity to fit the volume of output that you're actually producing. And you would expect to have a higher level of efficiency in a long run study than in the real world, because the real world is a series of short runs in which there are sunk costs and other things that we're not talking about today.

There is a debate about growth, I would point out very quickly because I'm not sure how much you'll hear this, but I've heard it in some other state proceedings, the incumbents are now claiming "well, we don't build enough spare in for growth in our version of the model," and they're saying "oh, we have to allow

for many years of growth." On the other hand, we're about to see market share shifts. And so it seems to me there's an inconsistency there in that view. In any event, that's an issue that certainly could merit further study. I don't think small changes in that factor will make a big impact on results, but if you start having wide discrepancies in perspective, if you have a study with a 30% utilization factor for cable, for example, and I've seen some studies doing that, then it does have a pretty serious impact. The question really is, given the economic depreciation rate, the number of years that you expect this plant to be in place, do you realistically — are you having enough spare to allow a little bit of growth within that time span? But bear in mind, if you try to allow enough to grow all the way to the end life, then there's a mismatch here, because you're computing the cost as of the beginning point. And the initial is the maximum amount of spare that would be installed.

Robert Loube, FCC

Thank you. Bob, do you want to go next?

Robert Mercer, Hatfield Associates

Yes, sure. The reason fill factors becomes an issue, it's impractical for a LEC to exactly meet current demand and then have to go out and deploy a few pairs every week, recognized and understood. On the other hand, I'd say to the extent that cable is deployed to meet future demands, it's the future base of

ratepayers that will be paying for that cable. And if you impose that all on the current ratepayers, then there's really what I — I'm not an economist — but I understand to be a generational transfer of cost to immediate ratepayers which doesn't seem right, either.

The Hatfield Model has attempted to find fill factors. First of all, let me emphasize something Ben said. It does it on a cable-by-cable basis, and then it takes cable modularity into account. So the effective fill again will be significantly lower than the target fills. But let me talk about target fills. The Hatfield Model has chosen target fills to allow a reasonable amount of spare facilities associated with a near term and unusual fluctuations that accompany today's demand, as well as administrative spares and cable breakage and the like. And particularly those kinds of things that are therefore associated with churn, which is sort of the inward-outward movement of cable. And we've tried to find the right values to do this. These fill factors that address another part of the question, we treat all demand by fill factors that are generous enough, if you will, in terms of excess capacity, to avoid the need to do an exact demand forecast. Because if you did an exact demand forecast in a model like this, you'd really have to be predicting on a wire center by wire center, or even an SAI by SAI level, what the demand's going to be. And even then those demand estimates are markedly off. They're not quite as bad as a weather person, but maybe not a whole lot better, either. And that's really beyond the scope of the models. So our short

answer says you use fills; through those fills you accommodate churn, near-term demand and all the other things like administrative fill for adding new customers and the like. And then you hope that those fill factors are appropriate, and we believe they are appropriate for the current situation.

Robert Loube, FCC

Thank you. Jim?

Jim Dunbar, Sprint

Okay. I think one of the things we have to recognize when we talk about fill factors is if we were sitting in a perfect world, and assuming for a moment as we run the model as if it's building the network instantaneously, and we know where all the customers are, I mean that's one nice way to build it and know where your target is. The problem that you get into with the network is, nobody knows where your customer demand is coming from. You can predict as you get closer by wire center, for example. You can do a reasonable job at the wire center. As you start working out on the feeders, the further out from the office you get, the more difficult it is to predict where that customer is going to be. The smaller the cable size, the more significant a single pair becomes. If you look, for example, and just go down to a 12 pair cable where many of your distribution legs are, one pair immediately takes you down to an 87% fill, if you leave one spare. And you can't leave one spare for a customer. You

have to recognize that the further out you go in the network, as you build out from the office, the more difficult it is to predict where those customers are going to be, the more difficult it is to recognize the demand, and then more demand has effect on the cables because the cable sizes are smaller. So you have that decreasing fill that has to be recognized as you move section-by-section out to the cable to look at what the fills are. You can be a reasonably good predictor at the wire center level or higher, but as you get out into the network, it becomes very much more difficult to do. We think in the way that we've laid out the fill factors we recognize those propensities for error in any forecast that are out there. You would certainly expect us on a universal service basis to have service universally available to the customer when they want it at the time they want it, whether they're out on the end of a 12 pair cable, or next to the office.

Robert Loube, FCC

Thank you. Let's start with David Porter.

David N. Porter, MFS

We heard two concepts here that I hadn't heard before, and I think are highly relevant to the modeling. The first is the question of what is your planning period, which is more or less a classic question in cost studies that we haven't discussed here. And obviously the planning period would have a direct impact on the amount of spare that you had to build into the network. I

think, Jim, you had specifically — some of the other reasons why there might be spare in a cable, the breakage, planning for your unknown demand. I don't think we discussed the question of how many pairs do you assume per household versus how many pairs per household are in use. So when you are at the very end at the distribution cable, and if you assume there are two pairs per household or three pairs per household, and the average in use is only 1.2, obviously you've got a very much lower fill factor at the very end of the distribution cable. But I think that's all required. I think it's also required, as you consider the other services that you'll be providing — and I've already mentioned it twice, I might as well be consistent and mention it thrice — the requirement to make available to all people advanced technology. I bring you back to the question of what do you have to do to engineer that capability into the network? And I think we're required to consider that. Thank you.

Robert Loube, FCC

Thank you. Let's go this way. David?

David Gabel, Queens College

Well, I agree with Ben Johnson's comment that for most places, the utilization rate doesn't have much of an impact on the cost result. But that being said, let's also pursue what David Porter said. How many loops do you need per household? For a number of years, the standard in the industry was to have

two distribution pairs per household. In the past few years, due to the explosion in demand for second lines, a lot of telephone companies have shifted to having three pairs per household. If the intent of the model is to reflect engineering practices of the industry, I would suggest that the models be designed to reflect that three pairs household are now a very common standard within the industry, two or three pairs per household in the distribution portion of the network. If you do that, though, you also have to include the revenues from these second lines. This spare capacity, at three pairs per household or the old standard of two pairs per household was done in part this way because of the anticipation that some households would have a second line. You want to have always your analysis to revenues to follow costs, and if the cost driver for extra pairs or second lines, you want to make sure you include the revenues. So I think one way in which the Joint Board should go is adopt the two or three pairs per household, but include the revenues from the second lines.

The other alternative is to do something like Ben has chosen and go wit the 85% fill and say well, we're going to ignore it. What's the standard construction practices in the industry? Instead, we're just going to think of what's the minimum amount needed in order to get one line into the household, and therefore will not consider also the revenue from the second line. Eighty-five percent, that's enough for one line and we won't consider the revenue from the second line.

Robert Loube, FCC

Lisa?

Lisa K. Hanselman, GVNW Inc./Management

Okay. Fill factors, so critical. I guess when I think about applying fill factors and somehow some way we could have some kind of just-in-time telecommunications principles. Kind of interesting. But the thing is that I guess I want to approach it from a different perspective. I'm wondering — what I noticed about the fill factors was that they were uniformly applied across the study areas. And in the planning process what we find is really that's not the case. Marketing provides the engineers and planners with certain data and you'll find certain hot growth areas with hot growth rates and some that are slow. We just don't see a uniform growth rate. And I think as was alluded to, there's a real planning cycle that has to be taken into consideration. A few things: I wondered if we could take a growth rate and we could not only look at it from a single point in time, but over a period of time, could we take that and utilize and apply it to the model in a similar way as we modify for terrain different characteristics? And secondly, is there a market share kind of a factor that could be applied, because certainly we don't take a look at the impact that competition is going to have coming in. No matter how well we engineer for efficiency, we're going to lose market share as competitors come in. And that's not reflected in the models today as I've known them.

Robert Loube, FCC

Tom?

Tom Wilson, Washington Utilities and Transportation Commission

I think that the cushion for growth and demand provided by saying the fill factor or utilization rate below 100% should not be very large. I also think that it should be something that's a user changeable input in running the models, and there needs to be a sufficiently fine level of detail for different elements of costs, so that accurate estimates are received. I think that rather than setting the fill factor at the actual level, it's important to set the fill factor at the objective fill level in running the models. That way, as Dr. Mercer points out, it will be those who use the investment who pay for it, rather than current ratepayers. Or worse yet, their competitors, competitive entrants who are challenging the incumbent monopolists. Fill factors have been a major sticking point for the staff in Washington State. We did a study in 1989 of U S West's excess capacity, and hired an expensive consultant, and we did never get an answer. We gave up. (Laughter) It's a very difficult problem. We have challenged the incumbent to provide us with the back-up material that they use in running their forecasts for demand. And frankly we've been very unsatisfied in the responses to that. So I think that setting fill factors is apparently more of an art than a science. And I guess that's it.

Robert Loube, FCC

Thank you. Peter?

Peter Martin, BellSouth

I guess I would add to what a few earlier panelists said, and that is that there are other factors that impact utilization besides just having a cushion for growth. I think maintenance is a very key factor. And basically as you have a higher utilization level, you're going to have higher maintenance costs. And the reasons for this are fairly obvious. If the cable is nearly full, and a customer has a service problem, the options for putting that customer back into service are limited. And the repair options are considerably less, and overall it's going to result in an increase in maintenance cost. And bottom line is you have a lower quality of service if you had too high a level of utilization. So I think you absolutely have to consider maintenance when you're looking at utilization. The Hatfield and BCPM Models are relatively close on utilization levels. They're higher than actual fills, and we think you need to consider actual fills. The levels advocated by ETI in one of their ex partes are unrealistically high. They're up in the 85%-90% range. And I think that's also the level that Dr. Johnson is espousing. And again, I think those are totally unrealistic and have nothing to do with making sure the customers can get service when they want it, and ensuring the quality of service remains where it's at today.

Another thing I'd like to point out is the optimal cable problem. And this is an issue with both the Hatfield and BCPM Models. They both assume that an optimally sized cable is placed to handle all the demand. For example, 1,200 pair of cable would be placed to handle 1,000 pairs of demand. Well, that's not the way that we place cables, because demand doesn't materialize all at once. We place cables over a period of time to meet demand as it materializes. And somehow that factor needs to be worked into the models. We might place 300-400 pair of cables, five years apart, as demand materializes, rather than one 1,200 pair of cable. And bottom line is utilization is very important, it does have a big impact on cost, and you need to be very careful in making sure that you have proper utilization levels built into your model. Thank you.

Robert Loube, FCC

Thank you. John?

John Schrotenboer, Southwestern Bell Telephone Company

I'd like to reiterate the things that I've heard here. I think that in the models they take a theoretical approach of using a fill factor on an optimal design basis. There are some other factors that could be taken into account in the process in some way, in terms of what are the growth patterns for the particular area, what is the planning period over which you're looking at, the maintenance aspect that Peter talked about, and

the overall provision of the quality of service. One way to test that is to look at actual fill factors or actual utilization factors. They may provide some basis for determining what's reasonable or not on the high end. I wouldn't say that they should be used for the purposes of developing the forward-looking costs that are being anticipated for a proxy model, but certainly they can be used as a test point for determining what's reasonable and what's not reasonable. If a utilization factor, actual factor, in comparison to a proxy model yields a too low a cost, an unreasonably low cost, then I think that there should be some changes or consideration for changes of those fill factors. Certainly the other things in terms of number of lines per household, number of lines per business, all of these things will impact the overall utilization factor. And maybe the idea should be to go or look at the specification of those particular aspects rather than just looking at just one fill factor, in terms of how you would size a particular cable.

Robert Loube, FCC

Thank you. I guess for rebuttal we'll start with Ben.

Ben Johnson, Ben Johnson Associates

Okay. First I want to be sure it's clear that although the default value we run the model with is an 85% target factor, you can change that to a lower number very easily. It's one of the first variables that you're confronted with in making the

decision how to run the model. Secondly, at that value, which I believe is about the right number, we get an effective fill factor of about 55% to 75% on copper, and the illustrative study averages about 65%. We think that's just a bit higher than the industry norm, and we think it should be a bit higher because we think one of things in a forward-looking long-run type scenario, we should be getting a little closer to optimum or maximum efficiency than is actually happening in the real world. That's one of the natures of the long run. It's that envelope of all those short-run curves and it's sort of the lowest possible set of average costs that you compute. And you just need to keep that in mind when you're using long run. You've decided to use the long run, there's many characteristics of it that are good. You don't need to abandon that. You just need to understand the nature of the long run, and when you're interpreting the results. And I'm out of time, I had some other points, but that's okay.

Robert Loube, FCC

Bob?

Robert Mercer, Hatfield Associates

Okay, I want to pick up on a comment that was suggested by what David Gabel said, which is there's a difference between the engineering practice and the economic model. Just like I said before, there's no issue with a telephone company deploying a broad band network, it's a question how much their universal

service subs, you know, should pay for. By the same token, I can say it may be sound engineering practice to deploy larger cables for future use. But that doesn't mean that today's ratepayers should pay for them. And I guess I'm a little concerned, and have been from time to time, the Hatfield Model and BCPM are fairly close in this, may be stuck uncomfortably in the middle. On the one hand we're paying the price for having a fill factor significantly less than one. On the other hand, we're not taking into account any future demand that would spread the cost of those cables among more parties. And I think there is an argument that can be made, and I'd recommend that the Joint Board is going to have to consider carefully this argument that says maybe the right fill is not 100% because there is breakage in the cable, there is administrative, there is a media churn for the next few days. But that perhaps a higher fill factor really is appropriate and that we're in the wrong place right now on fill factor.

Robert Loube, FCC

David? Or Jim?

Jim Dunbar, Sprint

I'd only comment in terms of the fill factors and in this one point I agree to a certain extent with what Dr. Mercer said, that the fill factors are important when you look at both the economics and the engineering. But we need to recognize that the

facilities we're putting out there right now and the modeling are instantaneous. And you've got to recognize that you don't know where the growth is coming, you don't know where it's all at, and a single economic assumption at the front end of the cable is not realistic with how the cable's deployed and where the growth and expectation needs to be. There are also inputs. All of the models, I believe, have the inputs necessary to be able to reflect the changes should any changes be desired in making fill factor changes.

Robert Loube, FCC

Thank you. Now, David.

David Porter, MFS

Thank you. I think we're all unanimous we need fill factors. Beyond that, I think somewhere between Tier 1.1. I would appreciate a comment on planning periods, which we're obviously not going to get today. The other comment that I didn't hear but I think I recall, that at least the two models do not use the same fill factor for every element of the plant. So that there's a much lower fill factor at the very end of the distribution and a relatively higher fill factor as you accumulate demand and move back toward the wire center, which I think is appropriate. I think it's also interesting the impact that might have on loop electronics would suggest that loop electronics are more attractive because you don't have to put in