were conveniently lined up along one or two roads, and could be served by only two main distribution routes. This arrangement ignored the actual distribution of customers, which requires a much larger number of smaller cables to serve. In effect, the earlier BCM algorithm assumed away the problem of indivisibility in distribution cable. As a result, the Hatfield 2.2.2 yields an estimate of loop length that is too small, and an estimate of utilization that is also unrealistic.[95] The Hatfield 3 addresses the flaw to a large degree and places cable sufficient to serve 75% of the streets in the California area examined, but manages to serve 17 times the street length without a corresponding increase in investment.[96]

The latest BCPM model has a much more detailed distribution algorithm. While the model still has no specific information on where customers are located within the CBG, it uses information on lot sizes to make inferences about how customers are distributed, and hence about how distribution cable must be placed. The result is a more realistic algorithm that recognizes to a greater extent the need to place small, indivisible units of distribution cable if customers are actually to be reached by the network.[97]

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[95] Further, as will be explained *infra*, the Hatfield structure simply does not provide enough cable to complete a circuit between the customer and the central office.

[96] Attachment B, at 7-9.

[97] The BCPM also calculates structure cost on a per-foot basis instead of using a factor applied to cable investment, as the BCM1 did. *Staff Analysis* at¶ 36. When this is combined with a more realistic model of distribution lengths and sizes, it should yield a better estimate of distribution costs. Unfortunately, however, in the time available, GTE has not yet been able to perform sufficient analysis of the BCPM to validate the reasonableness of the distribution cable length it predicts.

However, while the BCPM algorithm may tend to produce more reasonable results than does the Hatfield model, the simple fact is that the results are still determined by the details of the algorithm, which in turn reflects no data about the actual underlying facts, or even any reliable basis on which such data could be simulated. All of this simply reinforces the conclusion that great care must be taken to ensure that the output of the models can be verified. In the case of the amount of loop plant, the amount of feeder and distribution cable estimated by the model should be compared with evidence of actual sheath-miles, as was done in the NERA analysis described *supra*. In the case of fill factors, it means that the fill assumptions should be set to ensure that the "static fill" inherent in the model's output is consistent with the actual fill observed in real networks.

f. GTE proposes a conservative 55% utilization factor be used.

Based upon individual studies and common industry averages, fills of approximately 65% for feeder and 30%-40% for distribution are normal. Using state-specific data derived from wire centers, GTE has calculated utilization factors for 26 of the 28 states it serves. In these 26 states the average combined feeder and distribution utilization factors range from 40%-55%. The fact that GTE's average results fall within this range serves to validate the study.

GTE has selected 55%, the upper boundary of those cross state average utilization factors for both feeder and distribution, for use in its cost studies, and recommends the Commission adopt this figure as the maximum value for the "static fill" exhibited by the output of any model (for feeder and distribution combined). Over the long run, GTE's actual average fill factors can be expected to decline. Accordingly,

GTE's forward-looking factors are very conservative, and yield a conservative lower estimate of GTE's costs.

g. Both the Hatfield 2.2.2 and Hatfield 3 model's default fill factors are too high.

The *Staff Analysis* at ¶ 41 recognizes that Hatfield Associates have not provided a detailed justification for the default fill factors used in version 2.2.2. Both the Hatfield 2.2.2 and Hatfield 3 default fill factors are inappropriate for several reasons.[98]

The Hatfield 2.2.2 model's hypothetical world assumes that end users served by the network live an average of no more than 50 feet from the distribution cable.[99] Given the assumption that customers are evenly distributed throughout the CBG, and the very limited amount of distribution cable provided for in the model, it is physically impossible for the network built by Hatfield 2.2.2 to connect all of the customers in a CBG. Thus while Hatfield 2.2.2 purports to address all of the types of equipment needed to provide basic local service, it simply does not provide sufficient quantity of facilities to actually

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[98] *See* Attachment A, at Table 5 for a comparison of the fill factors used in Hatfield 2.2.2 and Hatfield 3.

[99] This assumption is revealed by calculating the Hatfield 2.2.2 model's total cost of a service drop by the typical cost per foot for the wire.

provide local service, or to make loops available to reach all customers in a CBG.[100] Hatfield 3 suffers from the same deficiency.[101]

Moreover, Hatfield offers no support for its default fill factors for distribution cable. Hatfield 2.2.2 modelers state that the Model's default distribution fills "were reviewed and modified by Telecom Visions, Inc. based on knowledge of generally accepted Distribution fill standards."[102] Hatfield further asserts that it is "unreasonable to design distribution cable for less than 50% fill."[103] However, as GTE explained above, due to a variety of factors, neighborhoods are often served with a distribution cable that has less than a 50% fill. Consequently, there is a substantial disconnect between Hatfield's world and the one that GTE actually serves.

Finally, both the Hatfield 2.2.2 and Hatfield 3 default fill factors are so out of proportion with GTE's actual operating experience that their model seriously understates GTE's true cost of providing service.[104] In particular, the fill factors utilized in the Hatfield model are too high and do not adequately reflect the need to

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[100] Alternatively, if one were to relax the 50 feet assumption for drop length, and extend the drops in the Hatfield model far enough to actually reach the customers from the limited distribution cable provided, the result would be that the average drop would have to be extremely long; this would produce a very expensive and inefficient network design.

[101] Attachment B, at 7, reveals that Hatfield 3 includes various gyrations aimed at minimizing distribution cable length, and fails to reach many homes by at least 30 feet.

[102] *See*, Hatfield 2.2.2 model - Input Summary, Attachment RAM-3, at 6.

[103] *Id.*

[104] For example, Hatfield 3 assumes a 100% fill for fiber optic feeder cables. *See* Attachment A, at Table 5.

accommodate growth in GTE's service areas. Hatfield modelers ignore the cost of building and maintaining spare capacity for future expansion. The hypothetical, no-growth world of the Hatfield model conflicts with the one GTE must service. Indeed, as the carrier of last resort, GTE is obligated to consider the future needs of all consumers and, thus, it must install the capacity in its distribution and feeder systems, required to meet these needs, at least for the foreseeable future.[105]

h. The Commission should choose input fill factors that result in output utilization levels within the range normally found in the industry.

For reasons explained *supra*, the proxy cost models themselves do not provide any objective information which could be used to select a fill assumption which would approximate a solution to the "cost minimization problem" faced by an efficient carrier. Further, the form of the input to the models is such that it cannot be compared directly to the results of the actual cost minimization observed for a real firm. The only reliable information the Commission has concerning the cost-minimizing level of fill is from data on the fills actually achieved by ILECs today. GTE suggests that the Commission should respect the validity of these data, and choose the input fill factors in such a way as to ensure that the "static fill" in the output of the model is within the range of actual fills normally found in the industry.

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[105] GTE has consistently advocated that all local service providers that obtain universal service support should have the same set of obligations to provide the defined service at the affordable price throughout the area designated for support. *See Staff Analysis* at ¶ 43. *See also*, GTE's *D.96-45* Comments, at 47-50 (December 19, 1996).

This can be accomplished by iterations of model runs. That is, choose a fill factor, run the model, and examine the output report to determine the utilization level that results. This process should be followed until an output utilization level is equal to approximately the mid-point of the normal 30%-40% range for distribution cable utilization factor range found in the industry, and approximately 65% for feeder.

3. Loop plant structure sharing factors must reflect the limited amount of structure sharing likely to occur in the future. (¶¶ 44-47)

The *Staff Analysis* (at ¶ 44) states the belief that a model "should be supported by independent evidence that the default prices chosen for cable, fiber, and other loop-related facilities, such as drops, pedestals, and network interface devices, are equal to the actual market prices of these inputs," including any volume discounts that may be available. GTE agrees.

The forward-looking cost model must also include an reasonable estimate for what is known as "structure costs" for the "cable plant" -- that is, costs involved in building or obtaining access to those physical structures holding or containing the loops running from the Central Office to the end user.[106] These structures are generally of three types: aerial (*i.e.*, poles), buried, and underground (*i.e.*, cable in conduit).

Because the electric utility and cable TV provider might also use these physical structures, an accurate economic model must estimate what percentage of the time use

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[106] GTE agrees with the *Staff Analysis* at ¶ 45 that any model should accurately reflect the actual conditions that new support structure construction will encounter. There must be a means to account for the variation in construction costs that will be found in congested urban areas where hand digging will be required versus new developments where trenching machines may be used.

of these facilities is shared, and by how many different utilities. As the *Staff Analysis* (at ¶ 45) recognizes, Hatfield 2.2.2 and BCM2 models make vastly different assumptions concerning the sharing of these structure costs: BCM2 assumes no sharing of costs; Hatfield 2.2.2, on the other hand, includes only a fraction of structure costs, with the default value being one-third[107] (presumably because there are three different utilities with the potential to share use of the structures). In other words, Hatfield 2.2.2 by default assumes that only one-third the cost of aerial, buried, and underground facilities is paid by the telephone company; the remaining two-thirds is paid equally by the electric utility and cable TV. It makes this assumption -- that three utilities share equally in all three types of physical structures -- without any empirical basis. Hatfield 3 makes an even worse assumption; that as many as four utilities will share aerial structures.

The Staff (at ¶ 46) correctly recognizes that the support structure sharing assumptions used by the Hatfield 2.2.2 model is "simplistic" and that "further investigation is needed." The structure-sharing factors used in any model must be based on current practices and reasonable, supportable predictions of future practices. Even more fundamentally, if structures are going to be shared, there has to be enough structure built to accommodate the other utilities. It makes no sense to build just barely enough structure to meet the needs of the ILEC network and then blindly assume that

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[107] *Id.* ¶ 46.

the carrier will be able to share two-thirds of it with cable TV and electric power companies, as the Hatfield 2.2.2 model does.[108]

The Hatfield 3 is even worse in that it -- without any supporting rationale -- assumes that other utilities will bear as much as 75% of the costs of aerial support structures, and 66% of underground conduit.[109] In spite of this extensive sharing assumption, Hatfield 3 allows only sufficient investment dollars for a manhole that would accommodate only four ducts.[110] Setting aside one duct for an emergency spare, leaves three ducts to be shared three ways, according to the Hatfield 3 algorithm. Thus, the ILEC is allowed to use only a single conduit in each feeder route it constructs before it must build another.[111] But, because Hatfield 3 has adjusted the percentage of feeder cable in urban areas so that 85% of all such cables are now assumed to be aerial, perhaps this accounts for the reduced conduit allowance.[112]

The *Staff Analysis* (at ¶ 46) properly characterizes both sets of assumptions as "simplistic" and asks for further investigation of the most appropriate fraction to be used in determining what portion of total structure costs are paid by the telephone company.

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[108] The recent claim by Robert Mercer of Hatfield Associates that the sharing of conduit costs in their model was a "bug" in the program is hardly credible given this latest "fix" incorporated into Hatfield 3. Remarks of Robert Mercer at Proxy Cost Model Presentations, Washington, D.C., January 13, 1997.

[109] *See* Hatfield Model Release 3.0, Appendix B, at 8 (February 7, 1997).

[110] Attachment B at 6-7.

[111] Note that in the static world of the Hatfield model, such a real-world "stair step" addition of the next conduit system is not included in the cost estimate.

[112] Attachment B at 5-6, citing Hatfield 3, at 30 (February 7, 1997).

In response to the Staff's request, GTE examined its actual costs for buried, underground, and aerial facilities; GTE also examined the degree to which these costs are shared by other utilities.

The results of this analysis -- while varying by state and region -- demonstrate unequivocally that GTE pays far more than one-third of the costs of each type of facility. Moreover, the actual percentage of costs GTE pays for its buried and underground facilities closely approaches the zero-sharing estimate contained in BCM2.

Specifically, GTE pays the following percentages of cost with respect to each physical structure that constitutes its cable plant:

Buried:	97.5%
Underground:	95-99%
Aerial:	57-61%

In the following section, GTE explains how its percentages of sharing were derived, and why they are appropriate to use on a forward-looking basis.

Costs of Buried Cable

GTE currently bears at least 95% or more of its buried cable facilities costs because over 95% of its trenches are not shared. The remaining portion might be shared with a cable TV provider. GTE's overall share of buried cable costs is therefore reasonably estimated to be 97.5%, at a minimum.[113] This figure probably understates

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[113] This number was calculated by taking the percentage of buried cable facilities not shared with another provider (95%), and adding to it the percentage of shared facilities (5%) multiplied by the inverse of the number of companies sharing the facility (2 or 50%): 0.95 + (0.05 x 0.50) = 0.975, or 97.5%.

GTE's share. In the Midwest, for example, fewer than 1% of GTE's trenches are shared.

As additional households become equipped with cable TV, this percentage may decline slightly, but not notably or significantly. This is because GTE's buried cable facilities are seldom shared by other companies because of safety, technical, and administrative concerns. These reasons will not change in the future.

Safety concerns, to begin, virtually prohibit sharing of buried cable facilities with an electric utility. Electric power lines generally are buried about one foot deeper than telephone lines. This is done to safeguard against the serious injury that would result from accidental contact with an exposed "live" electric cable, and to minimize the chance the power line is accidentally cut or disturbed in digging and trenching.

The requirement that power lines be buried deeper and separate from telephone lines prevents any sharing of costs with power companies.[114] A prevalent practice today -- and one that likely would form the basis for a forward-looking estimate -- is to bury cable by "plowing" it into the ground. That is, the machine that cuts the trench in the ground also drops the cable into the trench and covers the cable with earth in essentially one operation. Plowing three cables with a single machine at the same time and locating those cables at three different depths is not feasible. And the coordination

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[114] Neither the Hatfield 2.2.2 nor the Hatfield 3 indicate a depth of trench or include a user table for input of trench depth. Therefore it is impossible to determine if Hatfield constructs a trench that is deep enough for sharing to occur. See Attachment B at 6.

of joint efforts creates transactional costs far outweighing any theoretical "cost savings" that might result.

Technical concerns also minimize the likelihood that sharing will proliferate in the future. Sharing of trenches is not practical where the existing facilities of a phone company, power company, and cable TV provider are physically located in different areas. For example, for providing service to a single subdivision, differing "feeder" locations of the various firms may require delivery of telephone cable from the north, electric power cable from the south, and cable TV cable from the west. And, for the portions of distribution routes that theoretically may be feasible to share, extensive coordination is required to ensure that one company's failure to be on time with all needed materials does not delay the other companies.

Finally, administrative concerns make it unlikely the utilities will share buried cable in the future. Power companies, phone companies, and cable TV providers have generally experienced different timing in installing their cables. It has been GTE's experience that developers zealously pursue the installation of electric power lines, contacting the power company as soon as possible after a plat is finalized. However, telephone service and cable TV providers are rarely contacted directly by the developer, but often learn of new developments by accident. As a result, telephone and cable TV cables are typically laid after the electric power lines were installed. There is no reason this is likely to change on a going-forward basis; certainly, there is no evidence to suggest it will.

Costs of Underground Conduit

GTE's estimate that it does not share the costs of underground conduit 95-99% of the time is based upon the realities of current practice. These realities are not likely to change on a going-forward basis, for they are based on safety and economic considerations. If anything, various provisions of the 1996 Act make is less likely that sharing of these facilities will occur in the future.

To guard against accidental injury, underground conduit containing electric power cable generally is separated from conduit containing telephone cable by a one-foot layer of soil, four inches of masonry, or three inches of concrete.[115] The risk of injury is substantial: If electric power lines were placed in the same conduit as phone lines, GTE's employees could not service the phone lines without risking contact with live power lines. The presence of standing water in the manholes from which the conduits are often serviced substantially magnifies this danger. Moreover, because telecommunications and cable TV workers do not receive extensive training in handling high-voltage power lines, increased sharing of conduit facilities would either exacerbate the safety dangers or cause a marked increase training costs for those workers servicing and installing the television and cable lines.

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[115] These guidelines appear in section 320(B)(2) of National Electric Safety Code ("NESC"). State specific codes may also prohibit sharing of conduit between electric power lines and other utilities. For example, General Order 128 of the Public Utility Commission of the State of California among other things prohibits telecommunications and electric-conduction lines from sharing the same duct or conduit; moreover, where both lines enter a vault from separate conduits or ducts, they must be partitioned within the vault.

Cable TV providers have not shared conduit costs with GTE in the past; in the future, they are likely to do so only on a limited basis. Under 47 U.S.C. § 224, cable TV providers have been allowed to use phone company conduits and ducts at an extremely low rate, a rate amounting to only a fraction of the annual maintenance cost. There is no true sharing of costs; rather, cable TV's contribution is limited to paying an associated minimal rental rate. Cable television companies therefore have had no incentive to share in the enormous capital costs associated with deploying new conduit. In the future, cable TV companies can be expected simply to rent capacity from GTE at the section 224-prescribed rates. Accordingly, for the purposes of this analysis, GTE estimates that its historical sharing rate of 95-99% for underground conduit will continue in the future.

Costs of Aerial Facilities

GTE currently pays between 57% and 61% of the total costs associated with poles carrying its loops. Because GTE has a shared ownership interest in many of the poles on which it attaches its cables, and because of contractual relationships with power companies that allocate costs for jointly used poles, calculation of the sharing percentage for poles is more complicated than that for either underground cable or underground conduit.

First, GTE determined the percentage of poles it owns and uses entirely by itself. On a nationwide basis, the breakdown between the percentage of poles used solely by GTE and those jointly used -- the remaining percentage -- was calculated as follows:[116]

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[116] The percentage of jointly used poles equals 100% - Column 7.

	(1) TOTAL POLES OWNED BY GTE	(2) POLES OWNED BY GTE AND JOINTLY USED	(3) POLES PARTIALLY OWNED BY GTE	(4) POLES OWNED BY POWER COMPANY AND JOINTLY USED	(5) TOTAL POLES USED BY GTE (1+3+4)	(6) POLES USED SOLELY BY GTE (1 - 2)	(7) % USED SOLELY BY GTE (6) 5)
ALL GTE REGIONS	2,284,116	467,188	578,376	3,032,640	5,895,132	1,816,928	30.8208%

Next, GTE determined the percentage of costs it bears for poles in each of these categories. For those poles used solely by GTE, no calculation is needed: GTE bears 100% of the costs associated with that 30.8208% of the total poles.

Determining the percentage of GTE's costs for the remaining 69.1792% of the poles is more complicated because of variable arrangements GTE has with power companies for sharing costs of jointly used poles. These arrangements typically call for GTE to bear 40-45% of the annual cost, with the power company bearing the remaining 55-60%. The calculation is made slightly more complicated because 47 U.S.C. § 224 mandates, at present, a pole rental charge for cable TV of 7.4% of the annual carrying cost of the pole (including depreciation). Both currently and on a forward-looking basis, the attaching cable TV provider pays the rental charge directly to the owner of the pole. The owner of the pole does not share that revenue.

With this information, GTE calculated its percentage of pole costs as follows for the 69.1792% of total poles in which it is a joint user, assuming that the contractual

arrangement with the electric utility calls for GTE to pay 40% of the annual pole costs, with the electric utility paying the remaining 60%.[117]

Cable TV Co.'s share:	7.4%
Power Co.'s share:[118]	Power company's contractual share of pole costs - (cable TV's share x % of jointly used poles solely owned by Power) -- expressed as a percentage
GTE's share:	GTE's contractual share of pole costs - (cable TV's share x % of jointly used poles solely or partially owned by GTE) -- expressed as a percentage

Inputting figures for GTE nationally, the following is the percentage for the 69.1792% of poles jointly used by GTE:

Cable TV	0.074		=	7.4%
Power Co.	0.60 -	(0.074 x 0.743621)	=	54.4972%
GTE	0.40 -	(0.074 x 0.256379)	=	38.1028%

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[117] Because this calculations assume that both an electric utility and a cable TV provider are attached to each pole that GTE jointly uses with some other company, the result is extremely conservative. In many instances, GTE shares the pole with only one company -- usually the electric utility. And in any instance where GTE shares solely with a cable TV provider, GTE's actual percentage of the pole costs would be 92.6% (100% less the 7.4% it receives from the cable TV provider) -- much higher than the figure that results from the calculation assuming that all three utilities share each jointly used pole.

In addition, GTE has assumed that it is the complete owner of every partially owned pole and therefore receives the total contribution from the attaching cable TV provider on each pole. In reality, GTE would have to share this percentage with its co-owner, but GTE's assumption adds to the conservative nature of its calculation. And as demonstrated *supra*, the number of poles GTE partially owns -- and therefore for which it would have to share cable TV revenue with another owner -- actually exceeds those poles GTE fully owns but jointly uses with another utility.

[118] *See* Attachment C for calculation of percentage of jointly used poles owned by Power companies and by GTE.

100% of jointly used poles

To arrive at GTE's total costs for both poles it uses solely by itself and poles it uses with another utility, the percentage of poles it uses by itself (30.8208%) is added to 69.1792% of the percentage just derived for GTE for jointly used poles (38.1028%):

Percentage of poles solely used by GTE	=	30.8208%
69.1792% x GTE's share of poles used with other utilities (38.1028%)	=	26.3592%
Total	=	57.1800%

The same calculation can be performed assuming the contractual arrangement with the power company calls for GTE to bear 45% of the costs, with the power company paying the remaining 55%. The results of the calculation using the 60/40 split and using the 55/45 split are as follows:

FRACTION OF TOTAL AERIAL COSTS BORNE BY GTE ASSUMING 60-40 SPLIT ON COSTS OF JOINT POLES	FRACTION OF TOTAL AERIAL COSTS BORNE BY GTE ASSUMING 55-45 SPLIT ON COSTS OF JOINT POLES
0.5718145408 or 57.18%	0.606390 or 60.64%

Thus, GTE's average share of the cost for poles range from 57% to 61% of pole costs – far more than the 33% assumed by the Hatfield 2.2.2 model. In any event, 60% is an extremely conservative estimate of GTE's current share of pole costs in a typical region.

Nor is there reason to believe significant additional sharing will occur on a forward-looking basis. First, all incentives for sharing of aerial facilities already exist. The electric utility and cable TV industries have been in existence for years (and in the case of the electric utility industry, even longer than the telephone industry). Sharing has occurred to a limited extent during that time, but there is no reason to suggest that GTE will share more than 69% of its poles, or that its arrangement with the power companies will alter markedly from the 40-45% of total costs GTE currently pays.

As for cable TV providers, their contribution is tightly controlled by 47 U.S.C. § 224 and/or similar state laws. Under the federal statute, the current rate of contribution is 7.4% of the pole's annual cost. Thus, the amount to be recovered will be nowhere near the two-thirds the Hatfield 2.2.2 model assumes will be paid by other carriers from day one.

The Hatfield 2.2.2 model's default assumption that three utilities will share equally the costs for buried, underground, and aerial facilities is clearly erroneous. Hatfield 3 incorporates an even more unrealistic assumption -- that four firms will share some structure costs.[119] These assumptions are not supported by any empirical data. Further, they are counter-intuitive, particularly in that they assume that all sharing occurs immediately. Based upon the forces that can be anticipated to guide sharing

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[119] Apparently recognizing that there is no case to be made for any sharing of underground or buried cable, Hatfield 3 has resorted to dramatic increases in the proportion of cable assumed to be carried on aerial structures. Hatfield 3's input table assigns 85% of the plant in "downtown urban areas" to aerial structures. This is just silly, and it is contradicted by Hatfield's own recognition that the vast preponderance of cable in urban areas must be underground or buried. See Attachment B, at 5.

arrangements in the future -- those involving safety issues, technological concerns, administrative burdens, and economic incentives -- it is unlikely that forward-looking sharing percentages will differ markedly than those currently in existence.

4. Switching investment should be estimated based upon actual average switch costs. (¶¶ 48-50)

The estimates produced by the switching cost modules of the Hatfield 2.2.2 model are significantly lower on a per-line basis, and in the aggregate, than those in BCM2, and much lower than those in the BCPM. The switching cost equation in the BCPM is at least based on a large sample of actual data, whereas, the *GTE Model Response* (at 1-7) demonstrated that the Hatfield 2.2.2 model's "equation" is based on a rumor of data, and does not deserve to be taken seriously. GTE also explained (*id.*) the erroneous results that flow from ignoring growth and from relying on factors to estimate the cost caused by traffic volumes.

Hatfield 3, like Hatfield 2.2.2, uses three switch line investment data points that result in a large underestimation of the investment needed in switching.[120] No documentation is available to determine the origin of the new "data." And, the cost per line for the small switches that comprise the vast majority of GTE's network has been reduced by over 40%, again with no rational explanation.[121]

To validate switch costs, the Commission should consider use of the Bellcore Switching Cost Information System (SCIS) models. The recent change in ownership of

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[120] *See* Attachment B, at 13-14.

[121] *Id.* at 18. *See also*, Attachment A, at 45, describing how Hatfield 3 has reduced the switching trunk port costs per line by between 27% to 49% in three states studied.

Bellcore should eliminate any objections to use of these models. These models are clearly far superior in specification, and hence in information content, to what is contained in any of the models proposed in this proceeding.

To use the SCIS models, data would be necessary that is no doubt required by switch vendors to be held highly confidential. Any data gathered would have to be submitted under protective order. In this connection, it should be noted that there is no good reason why any such data request from regulators should be confined to ILECs. To the extent that competitive LECs ("CLECs") are genuinely interested in getting accurate data included in the models, they should be willing to voluntarily supply the same kind of data as the ILECs. If they are not willing to provide such information voluntarily, they should be under the same legal burden to furnish data as the ILECs.

E. Cost Models Must Rely On Market-Determined Cost For Debt And Equity, And Use Depreciation Schedules Based Upon Economic Lives. (¶¶ 52-72)

1. The cost of capital and depreciation schedules used in cost models must reflect the increased level of risk brought about by competition and technological change.

The cost of capital is the average of the forward-looking cost of debt and equity weighted by a firm's forward-looking debt/equity ratio. Depreciation is certainly dependent upon the proper estimation of an asset's economic life.

The cost of capital and depreciation schedules used in cost models must reflect the increased level of risk ILECs will face because of competition and technological change. ILECs' forward-looking cost of capital will undoubtedly rise due to this increased risk. Economic lives of ILEC assets will clearly shorten as a result of competition. The failure to account for increased competition and the subsequent

increased risk when determining cost of capital and depreciation inputs for use in cost proxy models will result in inaccurate and unreliable ILEC cost estimates.

In the context of the Commission's universal service plan, the *Recommended Decision* calls for both the cost of capital and depreciation estimates to be forward-looking. GTE submits that, on a forward-looking basis, it should experience a cost of capital, and a depreciation expense, that are comparable to those of other large firms against which GTE will be competing in local markets and elsewhere. There is no reason to expect that ILECs as a group will have radically different costs for these items than their competitors.

However, even if, contrary to logic, it were assumed that ILECs would have lower costs over the long run, simply because of who they are, it would still be imperative to estimate the universal service price using cost of capital and depreciation assumptions that would be correct for an efficient entrant. The universal service support provided under the Federal plan is not exclusive to the ILECs, but will be portable to other carriers who serve as universal service providers. If the plan is not to hinder the development of competition, then support must be sufficient to reasonably compensate an efficient entrant for serving providing universal service. If the support were set based on lower estimates presumed to be valid only for ILECs, then even an efficient entrant would be deterred from entering, because the return it would realize from undertaking that project would not meet the firm's expectation, given the costs and risk

involved.[122] Thus, for the plan to be competitively neutral, the cost estimate must use estimates of the cost of capital and of depreciation that are representative of the costs that likely entrants would experience for those items.

2. A forward-looking cost model should use a forward-looking, market-determined cost of capital. (¶¶ 53-59)

GTE agrees with the *Staff Analysis* (at ¶ 57) that a forward-looking cost model should use a forward-looking, market-determined cost of capital. Further, the debt/equity ratio should be the one the firm is targeting as more suitable to the new environment.

Any amount of increased risk will necessarily result in a cost of capital that is higher than the cost of capital in a regulated environment. Despite this fact, some models discussed in the *Staff Analysis* fail to consider the greater risk that ILECs will face. Indeed, the Hatfield 2.2.2 model's cost of capital is lower even than what an ILEC would have incurred in a regulated industry.

GTE currently calculates the forward-looking cost of equity capital for various GTE operating companies as the mid-point of the range of the costs of equity capital estimated using three different models: the Discounted Cash Flow ("DCF") Model; the Capital Asset Pricing Model ("CAPM"), and the Risk Premium Model. To perform the calculations involved in the DCF and CAPM models, GTE conducts a statistical analysis

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[122] Dixit and Pindyck emphasize (at 106) that "new economic conditions that may affect the perceived riskiness of future cash flows can have a large impact on investment spending -- much larger than, say, a change in interest rates." *See also* Attachment A, at 50-53, on the large effect of an increase in risk on the return the market would demand.

to select the 20 most comparable firms in a Compustat database, according to six risk criteria. Then, GTE obtains forecasts of the 20 firms' financial statistics for use in the DCF approach, and forward-looking betas (risk measurements) to use in the CAPM approach. For the Risk Premium Model, a "risk premium," derived by subtracting the historical yields of "Aa" rated public utility bonds from the historical yields of the Standard & Poor's 500, is added to the cost of an "Aa" rated bond. This method produces a cost of capital range that is higher than the cost of capital used in the CPM, which is, in turn higher than those used in the Hatfield 3 model, and is superior to either model because it considers the risk that ILECs will face in a competitive environment.[123]

Another dimension of the cost of capital is the debt/equity ratio. The Hatfield 3 model uses a debt/equity ratio of 45%/55%, while the CPM uses a ratio of approximately 33%/67%. The debt/equity ratio must receive the same forward-looking treatment by the modeler as the "other important model inputs" recognized by the Staff. *See Staff Analysis* at ¶ 16.

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[123] The BCPM has an improved cost of capital methodology which reveals both its cost of capital and depreciation rates. Like the Hatfield model, however, the BCPM does not provide for the replacement of capital whose depreciation lives, however established, are shorter than the depreciation lives of the longest-lived plant. That is because neither model employs a planning horizon, as panelist David Porter pointed out in the Proxy Cost Model Workshops, nor any coherent concept of the firm as an economic agent.

The Hatfield 2.2.2 model calculates the cost of capital for each category of plant. *Staff Analysis* at ¶ 53-54. However, Hatfield assumes that general support facilities last seven years, end-office switching 14.3 years, loop plant 20 years, and buildings 37 years. The result of this approach, of course, is an underestimate of the level of investment required to keep the company in business.

The Staff's decision to evaluate the applicability of formerly submitted USTA cost of capital proposals is misplaced. *Staff Analysis* ¶ 58. The USTA's recommended use of the cost of capital implicit in the U.S. National Income and Product Accounts was made in the context of a proceeding examining the *historical* total factor productivity ("TFP") record and was not a *forward-looking* exercise.

3. A forward-looking cost model must use depreciation schedules based upon economic lives rather than physical lives. (¶¶ 59-63)

GTE shares the Staff's belief that, in a competitive and technologically changing environment, forward-looking depreciation rates used in cost models should be based upon economic lives of investments, rather than physical plant lives.[124] *Id.* at ¶ 61. This is an important distinction because an asset's economic life is shorter than its physical life. GTE has been stressing this point before the FCC for more than twenty years.

The economic life of an asset is the period of time over which that asset is used to provide economic value. Both increased competition and technological change shorten the period over which an asset will provide economic value. In a world where GTE was a regulated monopoly, it was able to keep old assets on the books, even after

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[124] The BCPM sponsors endorse this principle and use what they regard as reasonable estimates of economic lives, but Hatfield Associates continues to endorse the use of lives prescribed by regulators. The obvious reasons for using prescribed lives is that the models are very sensitive to depreciation lives, as well as capital costs. While the Staff and SPR are correct in asserting that shorter depreciation lives produce lower net investment, and the two effects should be offsetting, the fact is that in the models they are not. In fact, the longer lives used by Hatfield results in smaller costs.

their economic life had expired, because regulators preferred that depreciation rates be based upon long asset lives. By basing depreciation rates on long asset lives, the depreciation rates were lower and the period of time over which the asset was depreciated was longer. This meant that some companies would not fully recover their asset "costs" until after the economic life of the asset had expired. Today's current market environment -- which will reduce the length of time an asset will be usable -- renders such an approach unsustainable.[125] As the Staff notes, a critical element in determining forward-looking depreciation rates that allow for full recovery of investment is establishing a proper economic life for each plant account. *Id.*

a. Plant assets must have accurately estimated economic lives.

GTE has identified those assets for which the estimation of correct economic lives is critical for a proxy model to generate accurate costs. Those assets include:

Digital Switching
Circuit Equipment
Pole Lines
Aerial Cable Metallic
Aerial Cable Non-Metallic
Underground Cable Metallic
Underground Cable Non-Metallic
Buried Cable Metallic
Buried Cable Non-Metallic
Conduit Systems

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[125] The Hatfield modelers ignore this fact. Attachment B, at 16, provides a comparison of depreciation lives proposed by AT&T in 1994 for its own use with those in Hatfield 2.2.2 and Hatfield 3. AT&T's proposed lives are far shorter; one-fourth for one type of asset. Hatfield 3 increased the lives used in Hatfield 2.2.2.

This list does not contain all of any particular ILEC's plant assets. It does, however, reflect those assets that are most subject to change in a competitive and technologically evolving industry.

The Staff identified conduit systems and pole lines as components of loop-plant investment for which the Staff believed the establishment of accurate economic lives was particularly important.[126] While conduit systems and pole lines are important components of loop-plant investment, the eight additional accounts identified above by GTE play a far larger role in loop-plant investment relative to the accounts identified by the Staff. Accordingly, emphasis should be placed on establishing accurate economic lives for *all* of the accounts GTE has listed above.

b. Traditional methods of establishing plant lives are not adequate to predict economic lives.

The methods employed to establish asset lives for depreciation purposes in a monopoly environment are not appropriate in today's competitive industry. Moreover, those models utilizing plant lives that were established using these traditional models generate inaccurate and unreliable cost estimates.

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[126] *Staff Analysis* ¶ 61. The Staff specifically identified conduit, manholes, and poles. *Id.* The list that GTE has presented incorporates all three of the Staff's loop-plant components ("conduit" and "manholes" are included in GTE's listing of "Conduit Systems," and "poles" are included in GTE's "Pole Lines") as well as eight additional components.