D.P.U. 96-73/74, 96-75, 96-80/81, 96-83, 96-94 -- Phase 4

Consolidated Petitions of New England Telephone and Telegraph Company d/b/a NYNEX, Teleport Communications Group, Inc., Brooks Fiber Communications, AT&T Communications of New England, Inc., MCI Communications Company, and Sprint Communications Company, L.P., pursuant to Section 252(b) of the Telecommunications Act of 1996, for arbitration of interconnection agreements between NYNEX and the aforementioned companies.

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PHASE 4 ORDER

I. INTRODUCTION

This is a proceeding being held pursuant to the federal Telecommunications Act of 1996 ("the Act") and regulations issued thereunder by the Federal Communications Commission ("FCC") in its First Report and Order dated August 8, 1996.[1] The Act and the FCC regulations are designed to facilitate the introduction of competition in the provision of telecommunications services throughout the United States. The Act recognized that many of the physical facilities and operating systems needed to provide local exchange service in a given geographic area are owned and controlled by the incumbent local exchange carrier ("ILEC") and that it would be difficult and inefficient for potential competitors to duplicate these facilities and systems. Accordingly, under procedures set forth in the Act, each ILEC is required to engage in good faith negotiations with each telecommunications carrier who wishes to compete against it. The purpose of the negotiations is to establish the terms and conditions of service for the resale of ILEC services, the provisioning of certain telecommunications services, and other matters necessary (together, an "interconnection agreement") that would enable the potential competitor to enter the marketplace under conditions which would promote robust competition.

The Act and the regulations further provide for binding arbitration in the event that negotiations cannot be concluded within a specified time, upon petition to the state public utility

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1 First Report and Order, Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98, FCC 96-325, adopted August 1, 1996 (released August 8, 1996) (hereinafter "Local Competition Order").

commission by either party to the negotiation. 47 U.S.C. § 252. This proceeding is the result of such petitions.

II. PROCEDURAL ISSUES

On July 16, 1996, Teleport Communications Group ("TCG") and New England Telephone and Telegraph Company, d/b/a NYNEX ("NYNEX"), respectively, filed petitions requesting arbitration pursuant to the regulations. They were docketed as D.P.U. 96-73/74. On July 18, 1996, Brooks Fiber Communications of Massachusetts, Inc. ("Brooks") filed a petition requesting arbitration pursuant to the regulations, which was docketed as D.P.U. 96-75. On August 9, 1996, AT&T Communications of New England, Inc. ("AT&T") and NYNEX, respectively, filed petitions requesting arbitration pursuant to the regulations. They were docketed as D.P.U. 96-80/81. On August 29, 1996, MCI Telecommunications Corporation ("MCI") also filed a petition requesting arbitration pursuant to the regulations, which was docketed as D.P.U. 96-83. On September 19, 1996, Sprint Communications Company L.P. ("Sprint") filed a petition requesting arbitration pursuant to the regulations, which was docketed as D.P.U. 96-94.

Upon agreement by the parties, Paul F. Levy was designated by the Department of Public Utilities ("Department") as the arbitrator for each of these proceedings. At a procedural conference held on September 18, 1996, it was determined that there was sufficient overlap in the issues presented in the various petitions and they were consolidated for hearing. The Attorney General of the Commonwealth ("Attorney General") intervened.

The proceeding has been divided into four phases: Phase 1 covered issues which were

determined by the parties to be ripe for an abbreviated hearing format. In that phase, parties submitted statements of positions and reply statements, no discovery took place, and a short hearing was held without witnesses to permit the arbitrator to ask follow-up questions of the parties' attorneys. The Department issued an Order addressing the issues in Phase 1 on November 8, 1996.

Phase 2 covered the issue of the appropriate amount by which NYNEX retail services will be discounted for resale. As envisioned by the Act, such prices are to be based on the retail rates charged for such services, excluding the portion attributable to costs that would be avoided by the ILEC in the wholesale provisioning of such services. 47 U.S.C. § 252(d)(3). It is the review of avoided cost studies and other associated matters that was the subject of Phase 2 prefiled testimony, discovery, and evidentiary hearings. The Department issued an Order addressing the issues in Phase 2 on December 3, 1996.

Phase 3 covered other non-cost study issues that were too complex to be handled in the abbreviated format of Phase 1, and it consisted of prefiled testimony, discovery, and evidentiary hearings. The Department issued an Order addressing the issues in Phase 3 on December 4, 1996.

Phase 4 covered the issue of the appropriate pricing for unbundled network services and combinations of unbundled network services, and these matters also were the subject of prefiled testimony, discovery, and evidentiary hearings. Prefiled testimony and exhibits were filed by all parties, except Brooks. Those documents, plus all information responses, were introduced into evidence. This evidence was supplemented by oral testimony and record requests from a

number of witnesses at hearings on November 4-8 and 11, 1996. At these hearings, NYNEX presented Dr. William E. Taylor, senior vice-president of National Economic Research Associates, Inc.; Dr. Timothy J. Tardiff, vice-president at National Economic Research Associates, Inc.; Michael J. Anglin, director of service cost studies at NYNEX; Dr. Lawrence K. Vanston, President of Technology Futures, Inc.; James H. Vander Weide, research professor of finance and economics at the Fuqua School of Business at Duke University; and Joseph Gansert, managing director, network and operations support systems, architecture planning at NYNEX. AT&T presented Robert Glenn Hubbard, professor of economics and finance at Columbia University; Lee Globerson, district manager, local infrastructure and access management at AT&T; and Dr. Brenda Kahn, district manager at AT&T. MCI presented August H. Ankum, an independent telecommunications consultant; and Dr. Robert A. Mercer, of Hatfield Associates, Inc. TCG presented William Page Montgomery, an independent telecommunications consultant. Briefs were submitted on November 18, 1996 and reply briefs on November 24, 1996.

In this phase of the proceeding, the parties were asked to address a number of issues with regard to the determination of the incremental costs of unbundled network elements:

1) Which costing model, the NYNEX model or the Hatfield model, more accurately represents the network conditions, accounting decisions, and numerical calculations appropriate for the total element long-run incremental cost ("TELRIC") study deemed appropriate by the FCC for the pricing of these elements?

2) Regardless of the model or models chosen by the Department, which inputs to the

model(s) should be used? The following areas are in dispute:

a) Sizing of the network, which includes the overall level of demand that should be assumed in the cost model, the fill factors that are assumed for the various network elements, and the level of investment costs;

b) The cost of capital (i.e., cost of debt, cost of equity, and debt:equity ratio);

c) The depreciation rates;

d) The calculation of forward-looking joint and common costs; and

f) The choice of geographic zones for deaveraging of costs.

There are also a number of issues from earlier phases of this proceeding that were carried over into this phase, some of which are dependent on our rulings with regard to the TELRIC studies and some of which are not. These issues include: a) service order pricing; b) the prices for collocation, including prices for space, power and lighting in collocated space; c) the appropriate mutual compensation rate; and d) E911 port charges.

As we have discussed in our Phase 2 Order in these proceedings, the pricing of unbundled network services is affected by the actions of the Federal Court of Appeals for the Eighth Circuit, which, on October 15, 1996, issued a stay of certain portions of the FCC regulations, including those portions setting forth the required methodology to be used by the states in determining the rates for resale of services and unbundled network elements. Iowa Utilities Board v. FCC, No. 96-332, Order Granting Stay Pending Judicial Review filed October 15, 1996, left stand by the United States Supreme Court on November 12, 1996. As the pricing testimony filed in this proceeding by all parties was predicated on the FCC

requirements, it was necessary to reach an agreement among the parties as to the appropriate manner of proceeding in this case in light of the Court's order. At the hearing on October 21, 1996, all parties agreed that Phase 2 and Phase 4 of this proceeding would go forth as though the FCC regulations had not been stayed, in order to ensure a timely completion of this arbitration (Tr. 1, at 4-10). However, recognizing that the Court's ruling might affect the ultimate rules under which pricing of services and unbundled network elements would be determined, the arbitrator asked the parties to submit briefs in Phase 2 on the question of the appropriate status of the rates determined in this arbitration. In our Phase 2 Order, upon review of the arguments raised by the parties, we concluded that the revenues collected pursuant to the rates established in this arbitration should not be subject to reconciliation when the Department decides on its own costing and pricing methodologies. Consolidated Arbitrations, D.P.U. 96-73/74, 96-75, 96-80/81, 96-83, 96-94 (Phase 2), at 6-8 (1996). Recognizing the importance of this issue, however, the Department expressed a commitment to investigate and give expedited consideration to these matters. Id. at 8.

III. STANDARD OF REVIEW

Before turning to the detailed issues in the proceeding, we set forth the context of the case and the standard of review we will apply. In the Local Competition Order, the FCC devoted a substantial amount of discussion to the importance of pricing unbundled network elements and to the description of the appropriate pricing methodology. Local Competition Order at ¶¶ 618 et seq. The standard for pricing individual network elements and interconnection is different from the standard we employed in Phase 2 to calculate the

wholesale price of resold services (e.g., residential local exchange service). There, we determined the appropriate discount from retail prices that should be used to calculate the wholesale price for resold services by evaluating which of the ILEC's expenses would be avoided in a wholesale environment. Thus, the retail price was the starting point of the analysis. Here, the retail price is not relevant. Instead, we are constructing a "bottoms-up" analysis of costs. The FCC presents the rationale for this choice of methodologies, the TELRIC model, stating:

> Adopting a pricing methodology based on forward-looking, economic costs best replicates, to the extent possible, the conditions of a competitive market. In addition, a forward-looking cost methodology reduces the ability of an incumbent LEC to engage in anti-competitive behavior. Congress recognized in the 1996 Act that access to the incumbent LECs' bottleneck facilities is critical to making meaningful competition possible. As a result of the availability to competitors of the incumbent LEC's unbundled elements at their economic cost, consumers will be able to reap the benefits of the incumbent LECs' economies of scale and scope, as well as the benefits of competition. Because a pricing methodology based on forward-looking costs stimulates the conditions in a competitive marketplace, it allows the requesting carrier to produce efficiently and to compete effectively, which should drive retail prices to their competitive levels. We believe that our adoption of a forward-looking cost-based pricing methodology should facilitate competition on a reasonable and efficient basis by all firms in the industry in establishing prices for interconnection and unbundled network elements based on costs similar to those incurred by the incumbents, which may be expected to reduce the regulatory burdens and economic impact of our decisions for many parties, including both small entities seeking to enter the local exchange market and small incumbent LECs.

Local Competition Order at ¶ 679.

This theme is repeated in a number of places by the FCC. For example: "We are establishing pricing rules that should produce rates for monopoly elements and services that approximate what the incumbent LECs would be able to charge if there were a competitive

market for such offerings." Id. at ¶ 738. The agency expanded on this to indicate that, "under a TELRIC methodology, incumbent LECs' prices for interconnection and unbundled network elements shall recover the forward-looking costs directly attributable to the specified element, as well as a reasonable allocation of forward-looking common costs." Id. at ¶ 682. To provide guidance as to the configuration of the telecommunications network that should be assumed by each state commission, the FCC stated that the pricing methodology "should be based on costs that assume that wire centers will be placed at the incumbent LEC's current wire center locations, but that the reconstructed local network will employ the most efficient technology for reasonably foreseeable capacity requirements." Id. at ¶ 685.

The FCC clearly stated that the ILEC -- in this case NYNEX -- has the burden of proof with regard to calculation of incremental costs of unbundled network elements, noting that the ILECs have greater access to the cost information needed for such a study. Id. at ¶ 680.

To determine whether NYNEX's proposed TELRIC study meets the standards set forth by the FCC, we must examine both the structure of the model and the inputs used in the model. With regard to the structure of the model, we must determine whether it is reviewable, i.e., whether it is possible to find and understand the financial and numerical relationships inherent in the model. We must also determine whether the structure itself provides a good representation of a reconstructed local network that will employ the most efficient technology for reasonably foreseeable capacity requirements. If the model is reviewable and accurately portrays the network we desire, we must determine whether the various financial inputs to the

model are appropriate. These include the variety of items listed above, such as cost of capital and fill factors.

In conducting this analysis, we are assisted by the presentation of an alternative TELRIC study, the Hatfield model, presented by AT&T and MCI. If we determine that NYNEX has not met its burden of proof with regard to the efficacy of its TELRIC model, we could employ the Hatfield model as a replacement, if we determine that it meets the FCC's requirements.

As mentioned by the arbitrator at the start of the Phase 4 hearings, it is also conceivable that we will find both the NYNEX and the Hatfield models to present acceptable formulations of forward-looking incremental costs (Tr. 6, at 5-6). In so doing, we might determine that both models have strengths and flaws, but that together they provide the Department with useful information in designing rates for unbundled network elements. Accordingly, in the following sections, we will review the structure of both the NYNEX and the Hatfield models. We will then, separately, determine which inputs should be used in whichever model(s) we deem acceptable for pricing purposes. Following issuance of this order, the parties will "run" the appropriate model(s) using the inputs that we have determined are correct, and we will conduct compliance hearings to ensure that the results are in conformance with this order (Tr. 10, at 150-155).

IV. THE MODELS

A. The Suitability of the NYNEX Model

1. Positions of the Parties

The NYNEX model was presented by Mr. Anglin (Exh. NYNEX-11). It was used to produce costs for links, local switching, tandem switching, dedicated transport, common transport, signaling network, and call-related databases - switch query. Mr. Anglin relied upon Mr. Gansert for the specifications of network elements (Exhs. NYNEX-17, 18), Dr. Vander Weide for cost of capital (Exhs. NYNEX-15, 16), and Dr. Vanston for depreciation rates (Exhs. NYNEX-13, 14).

The NYNEX study uses currently available switching, transmission, and distribution technologies. It assumes that wire centers are located where they are today. It establishes geographically-deaveraged rates for three cost-related rate zones: a rural zone, a suburban zone, and an urban zone. It uses the company's current anticipated demand as the estimated increment of demand on which the network design is based. It calculates a required level of investment to meet that demand, and then "loads" that investment to reflect a utilization factor and costs of installation and power. It further assigns to each amount of investment and the buildings that would house those investments carrying charge factors that reflect depreciation, cost of capital, and forward-looking joint and common costs. Depending on the element in question, costs are presented either on a flat rate monthly basis or on a usage-sensitive basis.

AT&T and MCI offer a series of objections to the use of the NYNEX model. AT&T

argues that the model does not satisfy the FCC's TELRIC criteria, is methodologically unsound and is impenetrable. It asserts that the FCC stated a preference for generic forward-looking costing models, like the Hatfield model, because such models would allow state commissions to examine the assumptions and parameters that go into the cost estimates. It states that the NYNEX model is not generic, not forward-looking, and not a model. It states that NYNEX offers no evidentiary support for its engineering inputs, that it is not possible to conduct sensitivity analyses on those engineering assumptions, and that the NYNEX model has significant and unexplained differences from the model presented by NYNEX in New York. AT&T further argues that the NYNEX study does not reflect the lowest cost, most efficient forward-looking network design.

MCI states that NYNEX's model is not open, public or verifiable. It asserts that it is nothing more than an uncritical picture of NYNEX's existing network and practices and does not assume a forward-looking network with forward-looking fill factors and other crucial characteristics. Both AT&T and MCI argue that the NYNEX model is so flawed that it cannot be the vehicle by which NYNEX sustains its burden of proof. (They also offer extensive criticism of the model's inputs, to which we shall return below.)

NYNEX responds that the NYNEX model meets the FCC standards for TELRIC studies. It agrees with AT&T that it did not provide "every voucher for materials and labor, every engineering manual, every cost and facilities database, every engineering costing tool, or every engineer" that supports inputs to its study, but it asserts that to require such a level of data would be to impose on the company a burden that would be both unprecedented and

unreasonable. NYNEX states that it offered the other parties access to all of these inputs, but none of them took the opportunity to examine these data. The company states that the Hatfield model is replete with engineering judgments of its own, and that the NYNEX model provides more support for these than does the Hatfield model.

NYNEX states that the fact that there are differences between the Massachusetts and New York TELRIC studies is proof of the degree of care used in Massachusetts. It asserts that the Massachusetts model can and should be judged on its merits, and then NYNEX defends the inputs it has used.

2. Analysis and Findings

As noted above, we distinguish here between the characteristics of the NYNEX model and the inputs used therein, and we turn now to those characteristics. We first address whether the NYNEX model is reviewable, i.e., whether it is possible to find and understand the financial and numerical relationships inherent in the model. We find that the NYNEX model is reviewable.

The NYNEX model is not complicated. It consists of a series of interlocking spreadsheets, in which the outputs of one section are the inputs to the next. The workpapers provided by Mr. Anglin make these relationships clear, and he was also able to elaborate on them clearly and concisely when questioned (see, e.g., Tr. 11, at 16-255). The model's lack of sophistication is certainly not grounds for finding it lacking; indeed, its transparency is, in many ways, refreshing. The ability of NYNEX to rather quickly re-run the model with a different set of density zones is a good indication of its ability to be used for sensitivity analyses (RR-23).

Having now learned the model's structure, we conclude that it would likewise be possible to vary other inputs for similar purposes. It is not necessary -- notwithstanding society's leap into the age of CD-ROMs and powerful microcomputers -- to present a model in an interactive format to have it meet the test of reviewability. The NYNEX model is reviewable.

We now turn to the question of whether the structure of the model provides a good representation of a reconstructed local network that will employ the most efficient technology for reasonably foreseeable capacity requirements. We find that it does.

To model loop plant, NYNEX constructed three density zones. To determine the loop profile characteristics and utilization levels for all wire centers in Massachusetts, it took a random sample of the wire centers based upon their density characterization, sampling ten percent of the wire centers for each density zone (RRs-22, 38). We recognize that this approach is different from that used in the Hatfield model advocated by AT&T and MCI, but we find that it is reasonable. It determining the average loop length and the loop characteristics that are the keys to estimating loop costs, a surrogate must be found to model the dozens of wire centers across the state. Using a random sample is an appropriate way to construct this surrogate. There is no indication that NYNEX attempted, in any way, to create a biased sample, and we find that its approach is an effective way of modeling this aspect of the network.

AT&T has complained that NYNEX's network design does not meet the FCC standards because it incorporates the existing lay-out and topology of the current network facilities in Massachusetts. MCI joins this issue in a similar manner. We do not read the FCC standards in

the same way as AT&T. The FCC states that we should use "a reconstructed local network [that] will employ the most efficient technology for reasonable foreseeable capacity requirements." Local Competition Order at ¶ 685. We interpret that sentence to refer to the technology, not to the geographic distribution of that technology. We believe that the FCC, in requiring that existing wire centers remain unchanged, was trying to rationalize a forward-looking technology approach to costing with the reality of the physical distribution of existing customers and central offices. We agree with AT&T that such an approach does not address the question of whether any efficiency gains could be achieved by a physical reconfiguration of NYNEX's forward-looking technologies, but we cannot find a section of the Local Competition Order that would lead us to believe that the FCC expected such an analysis. We also believe that to do so is simply not practical without a circuit by circuit topographical study. To require such a study within the strict timeframes imposed by the Act is not feasible, even if it were desirable.[2]

We turn now to the question of whether the technology choices used in the NYNEX model are appropriately forward-looking. For switching equipment, NYNEX used its existing configuration of digital switches where such switches exist, and, where analog switches currently exist, NYNEX "replaced" these in the model with digital switches. No party has

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[2] Of course, the Hatfield approach, to which we will return below, offers a methodological way of incorporating gross numbers of customers and general topographical features into a model, but it, too, cannot be considered a model that would actually be used by system planners in designing a system. Its purpose, too, is to present a surrogate for costing purposes (Tr. 10, at 97).

suggested that there is a more advanced form of switching in common use today or that NYNEX's choice of switch technology was inappropriate, and we, therefore, find that NYNEX has made the appropriate judgment with regard to switching technology. For its transport system, NYNEX has assumed the upgrading of certain transport electronics to an all-SONET configuration. No party has suggested that this is not an appropriate technology choice with regard to transport investment, and we, therefore, find that NYNEX has made the appropriate judgment with regard to transport technology.

The parties have disputed NYNEX's choice of technology in the feeder portion of the loop. MCI and the Attorney General argue that NYNEX's use of optical fiber in the feeder system is not an efficient use of this technology, when considering the general needs of telecommunications subscribers. They argue that inclusion of fiber feeder in lengths of less than 9,000 feet is, in essence, a subsidy between narrow-band users and broad-band services that NYNEX will be offering in the future. They reach this conclusion by attempting to demonstrate that for the vast majority of customers who are served by copper distribution circuit, a 100% fiber feeder is not the least expensive way of providing service, for the present or for the next few years. In particular, MCI cites the testimony of Dr. Mercer to the effect that studies that he has seen by other telephone companies support a 9,000 foot cutoff point for fiber in the feeder, and it further cites testimony by Mr. Gansert along the same lines.

NYNEX first notes that there is no basis on the record for assuming that the TELRIC cost that would result from an all-fiber feeder system would be greater than one which incorporates copper. It further states that the industry practice today is to install feeder and

cites testimony by Dr. Mercer to the effect that new entrants to the telecommunication business would use fiber. Finally, the company cites an earlier study that it undertook to demonstrate the efficiency of fiber in the loop.

We find the arguments of MCI and the Attorney General unpersuasive, for a number of reasons. First, NYNEX has testified that, for five years, the company's application guideline has been to install fiber in the feeder component of the loop (Tr. 8, at 307). Thus, it has actually been installing fiber in the feeder, and so its model is not attempting to create a fictitious forward-looking view of the network. Second, during that period, the Department has never, in its review of NYNEX's retail rates, made a determination that such an investment policy was imprudent or represented an unwarranted subsidy of broadband services by narrow-band telecommunications users. Third, use of fiber in the feeder system is an established industry practice (Tr. 10, at 63-64). AT&T's witness in another phase of this proceeding stated that AT&T, in fact, would like access to NYNEX's "outreach" (as opposed to interoffice) dark fiber to support AT&T's SONET access rings, "to get into that building or that office building, or even out into residential communities, so that we could start getting closer and closer to the resident" (Tr. 5, at 30-31; see also, Tr. 5, at 46-48). As we have stated in our Phase 3 order, SONET rings are an integral part of the current local exchange telecommunications infrastructure. This architecture and its inherent use of fiber is the forward-looking network architecture (Tr. 6, at 27-29).

Accordingly, we find that the structure of the NYNEX model provides a good representation of a reconstructed local network that will employ the most efficient technology

for reasonably foreseeable capacity requirements. We now turn to a similar analysis of the Hatfield model.

B. The Suitability of the Hatfield Model

1. Positions of the Parties

The Hatfield model recommended by AT&T, MCI, Sprint and the Attorney General consists of a number of sequential modules, where like the NYNEX spreadsheet, outputs from one module serve as inputs to the next. The Hatfield model starts by using the number of household and business employees in each census block group ("CBG") in the state to determine the number of residence and business lines that would exist in that CBG, subject to the constraint that the overall state total has to equal the actual NYNEX total number of lines. The output from this Line Converter Module is fed into a Data Module, which calculates feeder, sub-feeder and distribution cable lengths required to satisfy the total number of access lines in each CBG, taking into account the CBG's physical size, the line density, and its location relative to the wire center serving that CBG. The Loop Module takes the distribution lengths per CBG and the feeder lengths per wire center developed by the DATA Module to calculate the initial loop investment needed to serve that CBG. The Wire Center Module calculates the investments in the non-loop elements, such as switching, interoffice transport, and signaling. A Convergence Module combines the loop and wire center investments and adds in other required investments. Finally, the Expense Module calculates the four segments of each unbundled network element's cost. It converts the total investment outputs of the Convergence Module to a per-month carrying cost. It calculates direct plant-specific operating expenses

based on the expense-to-investment ratio of certain ARMIS accounts. It assigns non-plant-specific and other supporting network expenses. It uses a 10 percent variable overhead factor to calculate variable support expenses associated with network and customer operations (Exh. AT&T-21).

AT&T and MCI assert that the Hatfield model is reviewable, in that the inputs, structure, and operation of the model are all open for verification by any party. It also states that the model offers a good representation of a reconstructed local network that will employ the most efficient technology for reasonably foreseeable capacity requirements.

NYNEX asserts that the Hatfield model uses erroneous assumptions and flawed methodologies. It further asserts that, even if the stated methodologies had merit, the actual calculations performed do not always follow the methodology described. It describes the model as "riddled with error and unreliable and unsubstantiated assumptions" and unsuitable for the purposes envisioned by the FCC (NYNEX Initial Brief at 17).

NYNEX claims, for example, that the Data Module is unrealistic in that it estimates the amount of distribution cable required in a CBG based upon the average distance from the serving area interface ("SAI") to a customer, which is calculated to be 0.625 times the square root of the serving area, assuming an even distribution of customers across the CBG. The model then assumes a certain number of "legs" of distribution cable, each of the same length, depending on the density zone involved. NYNEX offers a hypothetical example from a low density zone to show that the simplifying assumptions used in the model failed to provide sufficient cable length and to size the cable correctly. NYNEX argues that neither AT&T nor

MCI provide any basis to prove that their model, even on average, is actually estimating the amount of distribution cable required, the sizes of cable required, or the extent of structure necessary for outside plant.

NYNEX also claims that the model does not adequately anticipate physical obstructions, such as rivers and mountain ranges; that it arbitrarily assumes that 9,000 feet is the appropriate cut-off point in selecting whether to install copper or fiber feeder; and that it improperly assumes different characteristics from CBG to CBG as feeder cable moves out from a wire center. NYNEX also asserts that the methodology used to estimate common costs is flawed.

NYNEX states that, counter to the claims of AT&T and MCI, the FCC has not adopted the Hatfield model and also states that the model has not been subjected to rigorous reviews around the country. It also asserts that the model is difficult to use and confusing to interpret, noting that it is not possible to audit the model on a spreadsheet to trace the source of an input for a given cell and also the destination of that data after further manipulation. NYNEX states that before using the Hatfield model, it should be validated by comparing its outputs to reliable external sources and comparing its estimate of physical structure to what exists in the real world (NYNEX Initial Brief at 23-24).

NYNEX states that the Hatfield model behaves in a bizarre fashion, such as calculating negative structure investment in certain regions and responding in counterintuitive ways when inputs are changed. It says that the model is demonstrably unreliable, failing even to perform as described. NYNEX further asserts that it has structural flaws that tend to underestimate the facilities required to serve the state, and it lists a number of errors that cause this to occur

(NYNEX Initial Brief at 24-28).

MCI states that NYNEX's attacks on the Hatfield model are a study in nitpicking and cherry-picking that have an insignificant impact on the end results from the model. It agrees that the model makes assumptions concerning average loop lengths but claims that this modeling technique is similar to the modeling techniques used by NYNEX in its own model. It also argues that NYNEX has selectively chosen flaws in the model that tend to underestimate costs, while ignoring similar flaws that would overestimate costs. Finally, it states that the Hatfield model has been adopted for use in other jurisdictions.

2. Analysis and Findings

We apply the same standard here as we did to the NYNEX TELRIC model. With regard to the structure of the Hatfield model, we must determine whether it is reviewable, i.e., whether it is possible to find and understand the financial and numerical relationships inherent in the model. We must also determine whether the structure itself provides a good representation of a reconstructed local network that will employ the most efficient technology for reasonably foreseeable capacity requirements.

While it is difficult to follow through the Hatfield model on a cell-by-cell basis in its underlying spreadsheet (Tr. 10, at 75), the basic structure and assumptions of the model are clearly presented. Also, because it can be made available to any interested user with the proper computer, that user can change inputs and conduct sensitivity analyses to get a "feel" for the behavior of the model under changing assumptions. In these respects, the Hatfield model is clearly reviewable.

With regard to the representation of the local network, it is clear that the network created by the Hatfield model is a hypothetical one. That is not problematic in and of itself, but the form of the hypothetical is. The creation of the outside plant based on CBG data and broad state averages is unrealistic because, in essence, the model is placing houses and businesses where they do not currently exist, and it is designing outside plant based on a trigonometric view of the world. As NYNEX correctly notes, there are at least some circumstances in which this formulation will be far afield of the actual manner in which a local distribution system will be built (Tr. 10, at 165-168). While the NYNEX model, too, relies on averages, it is at least based on a random sample of actual distribution plant served by actual wire centers, and it therefore presents a stronger resemblance to a real portrayal of the actual layout of wires and customers in the state. The Hatfield model has the clear potential, given the configuration it adopts, to present skewed results with regard to local loop plant investment. AT&T has not presented data or results that demonstrate that the Hatfield formulation accurately portrays the configuration of outside plant in Massachusetts. Indeed, such an analysis has not been undertaken (Tr. 10, at 99-100). This leaves the model unverified and without support, and, given its abstract reconstruction of the network, we are therefore unable to find that it is an acceptable representation of the network for use in the TELRIC studies.

We are concerned, too, about the examples raised by NYNEX with regard to the inner workings of the Hatfield model. For example, when the model was run reducing the cut-off point from copper to fiber feeder from 9,000 to 100 feet, it produced a counterintuitive result. In this case, the model should have calculated that many more lines would be served by fiber

feeder and thus would need to be equipped with digital loop carrier equipment (Tr. 10, at 77). In fact, the reverse occurred (NYNEX Initial Brief at 24). MCI does not dispute this result, and its argument that such mistakes are offset by mistakes in the opposite direction does not inspire confidence in the underlying assumptions and structure of the model (MCI Reply Brief at 1-2). The fact that the model is reviewable, i.e., one can test its assumptions, does not mean those assumptions are correct.

We are also concerned that the Hatfield model relocates tandem switches in new locations in the state (Tr. 10, at 253). It is unclear from the record what the effect of this change is on the costs generated by the model, but it certainly has not been demonstrated that such a relocation is, in fact, a more efficient forward-looking view of the network, especially when the placement seems to be derived from the hypothetical configuration of customers generated by another module of the model.

We find, too, that the design of feeder plant produced by the model is unrealistic. In essence, each CBG is treated as an independent part of the feeder system, and so continuous cables in the model will experience different fill factors and structures as they pass through adjacent CBGs' (Tr. 10, at 132-135). This is not an accurate representation of the network. We cannot tell from this record whether this assumption has the effect of increasing or decreasing costs in the various density zones.

In making these criticisms, we are in no way seeking to impugn the developers of the Hatfield model. The model is a thoughtful and clearly presented view of the world. It suffers, however, from design flaws. Some are immediately evident. Some are difficult to track and

produce counterintuitive results. Ironically, the model's sophistication may make it vulnerable to unexplainable results, in that the various modules have such a variety of formulas and interactions that one cannot trace why such counterintuitive results occur. Whatever the reason, in light of our unresolved concerns about the Hatfield model, we find that its sponsors have not met their burden of proving that it is an appropriate model to develop TELRIC costs. In light of that finding, we will not use the Hatfield model in this proceeding.

Before turning from this issue, we raise a final point. While we ordinarily place little weight on the decisions reached in other states, since we rely for our decisions on the record presented here, we feel compelled to address the argument made by AT&T that at least two state commissions, those in Iowa and Washington, have endorsed the Hatfield model. Dr. Kahn's testimony that other states have adopted numbers "that were either the Hatfield numbers themselves or Hatfield-like numbers" does not appear to be supported in fact, if she meant to imply that these states actually have used the Hatfield methodology (Tr. 10, at 287-289). We have reviewed the decisions submitted by AT&T in support of this statement and can find only two instances in which the Hatfield model was adopted (RR-35). In one state, Iowa, the model was adopted, but no reason was given for the decision other than the fact the model is publicly available and can be verified. State of Iowa, Department of Commerce, Utilities Board, Docket Nos. ARB-96-1, ARB-96-2, at 3 (October 18, 1996). Thus, we cannot determine whether the structural issues we have raised here with regard to the model were considered in that state.

In another state, Minnesota, the arbitrator concluded: "The Hatfield Model submitted

by AT&T is the best evidence in the record of GTE's costs." His elaboration explained why: "GTE and AT&T presented cost studies using very different methodologies. Their results for TELRIC costs, however, are fairly close; it is GTE's addition of what it calls "forward looking common costs" that generate substantial differences in the proposed prices." Arbitration Decision, Minnesota Public Utilities Commission, Dockets OAH 78-2500-10733-2 and MPUC P-442, 407/M-95-939, at 17-18 (November 12, 1996).

The other examples offered by Dr. Kahn are not at all supportive of her conclusion. In the California GTE arbitration, the arbitrator used the cost studies submitted by GTE, but applied to them the Hatfield 16 percent shared and common cost factor. Arbitrator's Report, California Public Utilities Commission, Application 96-08-041, at 13 (October 31, 1996). In the California Pacific Bell arbitration, the arbitrator concluded, "Neither model could be presented in adequate depth in the time available. . . . Neither party has satisfied me that its model accurately captures the relevant costs or that the opposing model necessarily does not." The arbitrator decided, in the interim, to use the incumbent's previously approved total service long-run incremental cost model. Arbitrator's Report, California Public Utilities Commission, Application 96-08-040, at 18-19 (October 31, 1996).

In Texas, the arbitrators determined that, "[while] the merits of the SWBT methodology outweigh the "openness" advantage of the [Hatfield model], they also find that the SWBT methodology must be made much more open. . . . The Arbitrators find that, on the whole, the advantages of the SWBT methodology outweigh its disadvantages, if the changes recommended by this Award are made. . . . The Arbitrators are also concerned that, after spending

significantly more time reviewing the [Hatfield model] than has been done in this proceeding, the FCC has as yet been unable to fully endorse [it] as an appropriate TELRIC model." Public Utilities Commission of Texas, Arbitration Award, Consolidated Docket Nos. 16189, 16196, 16226, 16285, and 16290, at 26, 27, 29 (November 7, 1996).

In the Illinois decision, there is no mention of the Hatfield model at all. Hearing Examiners' Proposed Arbitration Decision, Illinois Commerce Commission, Docket 96-AB-005, at 9-12 (November 8, 1996). In Michigan, the arbitration panel adopted the AT&T costing proposal because the incumbent's study was not based on long-run incremental costs. Notice of Decision of Arbitration Panel, Michigan Public Service Commission, Case. No. U-11165, at 15 (November 12, 1996). In Pennsylvania, two decisions included determinations to rely on the FCC default rates, pending Commission review of the TELRIC analysis. Agreement for Withdrawal and Modification of Arbitration Issues, Pennsylvania Public Utility Commission, Docket No. A-310125F0002, at 4 (undated); Recommended Decision before the Administrative Law Judge, at 33 (September 30, 1996). Another Pennsylvania decision submitted by AT&T was not relevant to the unbundled element cost issue at all. Recommended Decision before the Administrative Law Judge, Docket No. R-00963556 and others (October 8, 1996). Finally, in the Ohio case submitted by AT&T, there was no mention of the Hatfield model. Arbitration Panel Report, Public Utilities Commission of Ohio, Case No. 96-752-TP-ARB, 17-29 (November 5, 1996).

Likewise, Dr. Kahn's suggestion that the FCC has endorsed the Hatfield model (Tr. 10, at 288) is not supported. The FCC clearly stated that the model was admitted too late in its

proceeding for it to be evaluated fully. Local Competition Order at ¶ 835. In fact, it is unclear that the version of the Hatfield model that is discussed from time to time by the FCC is the version 2.2.2 presented in this proceeding. Local Competition Order at ¶ 794, footnote.

To summarize, we find that it has not been demonstrated that the Hatfield model presents a good representation of a reconstructed local network, and we therefore conclude that it should not be used in this proceeding. We will therefore use the NYNEX TELRIC model for determining the costs of unbundled network elements. We now turn to the inputs that should be used in that model to produce accurate costing results.

V. THE INPUTS

A. Sizing of the Network

The parties agree that the FCC has required that the current level of demand on the NYNEX network should be the basis for establishing the investment requirements of the TELRIC model. The Local Competition Order provides the economic basis for this standard, stating that the relevant increment in a long-run incremental cost study is the entire quantity of the service that a firm produces, rather than just a marginal increment over and above a given level of production. Local Competition Order at ¶ 677.

The FCC went beyond this premise to relate this level of demand to the physical facilities that would be required to meet that demand. The agency recognized that it is not feasible to build a telecommunications network to meet exactly the level of demand upon it, but that there is a certain amount of spare capacity designed into the network. It stated, "Per unit costs shall be derived from total cost using reasonably accurate "fill factors" (estimates of the

proportion of a facility that will be "filled" with network usage); that is, the per unit cost associated with a particular element must be derived by dividing the total cost associated with the element by a reasonable projection of the actual total usage of the element." Local Competition Order at ¶ 682. Thus, as noted by AT&T, under the FCC standard, the cost calculation for any given element must start with a determination of current demand for that element, which is then increased by reasonably anticipated growth in demand for the element (AT&T Initial Brief at 14). An important related step, of course, is to estimate the actual cost of the equipment that satisfies this technical criterion. Thus, these three items -- demand, fill factors, and equipment costs -- are intimately related. They create the starting point for the TELRIC studies, for they produce an investment amount to which is applied a variety of factors, including installation factors and carrying cost factors. As such their calculation is key to an accurate forward-looking cost study for unbundled network elements.

1. Positions of the Parties

a. AT&T & MCI

The parties disagree as to whether NYNEX properly carried out the calculation of sizing the network. AT&T asserts that the NYNEX methodology does not conform to the FCC criteria. It states that the NYNEX methodology starts with engineering estimates which incorporate assumptions about future growth and spare capacity. Then, according to AT&T, it "applies to those engineering estimates fill factors, which are themselves both unsubstantiated and overstated, that have the effect of adding excess capacity on top of excess capacity" (AT&T Initial Brief at 14).

MCI offers a somewhat different view of how NYNEX is overstating network costs. It asserts that NYNEX assumes a given material quantity or size to meet the network demand, and then it grosses up its price via a fill factor. MCI states that, particularly with regard to facilities such as cable, where the price increase for greater capacity is non-linear, this has the effect of increasing the alleged cost of the facility in question (MCI Initial Brief at 10).

MCI also argues that NYNEX has not used an appropriate discount off the manufacturer's listed prices for switches and other electronic equipment that is assumed. It asserts that, if the network were being purchased in whole today, NYNEX would obtain a relatively large discount from the equipment suppliers (MCI Initial Brief at 20-21).

We will review these contentions after we summarize the methodology employed by NYNEX in its TELRIC study.

b. NYNEX

NYNEX says that, to size its TELRIC network, the company used the current demand on each of the network components and estimated the amount of material investment needed to serve that demand. In so doing, the company employed utilization factors. These factors vary by type of plant and, according to NYNEX, reflect the unique characteristic and uses of the plant as actually employed in a network (NYNEX Initial Brief at 34).

Mr. Gansert explained the "drivers" behind the utilization factors for the various kinds of plant investment. For those components of the network that grow incrementally in capacity in response to changes in demand, the utilization factors are a function of (1) the fill-at-relief point, an engineering parameter used in administering the network to ensure that plant additions

are made appropriately in advance of using up the capacity in an element; (2) the breakage points, which reflect the modularity in the supply of capacity of elements; and (3) the unit of capacity addition, the expected growth in demand over the planning horizon for that element. The components of the network that are designed in this fashion are local switching, tandem switching, interoffice elements, channel units, channel bank commons, copper feeder, and all signaling elements (Tr. 9, at 46-48).

Mr. Gansert further explained that the utilization of distribution cable was affected by the serving area concept of designing that part of the network. Under this concept, which has been in use by NYNEX and most of the industry for over 25 years, the copper distribution size is defined by the physical extent of the area and the number of households and businesses in the area. It is sized to provide enough distribution to cover current demand, the percent of customers who are likely to purchase additional lines, and the maximum number of housing units on the streets served by the distribution cable. The purpose of this approach is to avoid having to re-enter a local distribution area to augment service when growth or changes occur. This is viewed as more economical because the carrying cost of installing surplus distribution capacity when the system is first laid out is less than the cost of repeatedly augmenting a distribution route from year to year (Tr. 8, at 218-220; Tr. 9 at 49).

The utilization of fiber feeder and conduit are driven by other factors. Both are affected by the need to have surplus capacity for an administrative and maintenance margin, and both are also affected by the breakage, or modularity, of the supply of the commodity. In the case of fiber, NYNEX installs cable sizes well beyond those needed for anticipated future growth

because the various sizes of cables have a minimal impact on cost as compared with the costs of installing additional fiber at a later time (Tr. 9, at 49-50).

NYNEX has argued that, although AT&T and MCI have complained about its utilization factors, neither party has shown that the company has employed any unreasonable assumptions or departed from accepted engineering practices in estimating those factors (NYNEX Initial Brief at 36).

Mr. Anglin explained that the investments associated with local loops were based on the company's Outside Plant Planner's Costing Tool and its Engineering and Construction Records Information System ("ECRIS") and used the vendor costs and other cost factors from the company's recent outside plant jobs (Exh. NYNEX-11, at 10). Switching investments for every switch in Massachusetts were developed using the Switching Cost Information System ("SCIS"), an engineering costing model (id. at 15-16). Other elements were also costed using recent discounted vendor prices.

2. Analysis and Findings

As noted above, AT&T argues that the cost methodology employed by NYNEX results in an overstatement of investments. In arguing that NYNEX's fill factors are too low, AT&T asserts that the company has ignored the TELRIC requirement to design a least cost, most efficient network based on fill factors that reflect a reasonably anticipated growth level. AT&T asserts that this must mean that one of the characteristics of the TELRIC network is that it is "assumed to be dropped in place, i.e., created from scratch, at the moment in time when the TELRIC costs of the network are being determined." AT&T argues that Mr. Gansert's use of

fill factors has ignored this characteristic of the TELRIC network in that it has applied "business as usual" engineering assumptions as if he were designing a slowly evolving network with incremental additions over extended periods of time. Instead, says AT&T, in the TELRIC network, there is no reason at all to have any facility that has an "initial" utilization of as low as those presented by NYNEX for many of its elements (AT&T Initial Brief at 16-21).

As noted by NYNEX, AT&T is not disputing the engineering assumptions used by NYNEX with regard to its fill factors. Rather, AT&T is claiming that the use of those fill factors is incorrect in the TELRIC model because the TELRIC model should be designed to a higher level of network efficiency when it is "dropped in place." It is clear that these two parties have a fundamentally different view of the FCC requirements, and so we must address that issue directly.

As we have noted above, the FCC requires that "per-unit costs shall be derived from total costs using reasonably accurate 'fill factors' (estimates of the proportion of a facility that will be 'filled' with network usage." Local Competition Order at ¶ 682. We are attempting to design "the reconstructed local network [that] will employ the most efficient technology for reasonably foreseeable capacity requirements." Local Competition Order at ¶ 685. We do not draw from these descriptions the same conclusions as AT&T. NYNEX has explained that there are a number of drivers that determine the fill factors for various portions of the network. It has explained those drivers in a manner that, on its face, is clear and sensible, and there has been no engineering evidence presented that they are not. We do not agree with AT&T's argument that those drivers would not also apply to the TELRIC network. Although that

network may be viewed as "dropped in place", it will presumably exist beyond the moment it is dropped in place, and there is no reason to believe that the same set of drivers that exist today when NYNEX plans its own network would not exist in a situation where it is the "firm" building unbundled network elements under the TELRIC framework.

On another matter, AT&T asserts that it is "very likely" that NYNEX, in performing the first step in its TELRIC cost calculation, i.e., the determination of investment dollars for each component of each network element, has already included a greater capacity than is required to serve existing demand. AT&T provides an extensive example of this issue with regard to Mr. Gansert's description of the process of estimating the quantities of loop facilities needed in each operating area (AT&T Initial Brief at 22-23).

We believe that AT&T has misconstrued the nature of the analysis described by Mr. Gansert (Exh. NYNEX-17, at 13-14). AT&T views the steps listed by Mr. Gansert as steps taken seriatim, one process building on the other, and therefore double-counting the need for surplus capacity. We do not read the testimony in that way; and it is perhaps more clear from Mr. Gansert's oral testimony that the steps he has outlined in his prefiled testimony are, taken together, components that lead to the loop investment amounts. We have summarized, above, that testimony, which gives a clear and reasonable statement of the drivers of the utilization factors on which NYNEX relies in costing loop investment amounts. We do not agree with AT&T that the double-counting it has termed "highly likely" does, in fact, occur.

AT&T goes on to say that it was difficult to understand what NYNEX actually did because the workpapers containing its underlying calculations were difficult to retrieve from the

computer disk (AT&T Initial Brief at 24). As we have mentioned earlier, we have found NYNEX's calculations to be transparent and clear, and we are not willing to use AT&T's early difficulties as evidence of some ulterior motive of NYNEX to hide alleged double-counting.

AT&T further states that NYNEX's workpapers contained a "paucity of actual inputs." It draws a comparison with equivalent workpaper pages from the New York arbitration proceeding in support of its contention that the cost inputs to the element investment amounts were insufficient (AT&T Initial Brief at 24-25). It views NYNEX's response to this issue -- that NYNEX used average/typical configurations of, for example, cable sizes -- as evidence of insufficient engineering support for the ultimate investment amounts derived.

As above, this complaint does not, in any event, go to the heart of AT&T's double-counting argument. It is, in fact, a different argument, that the choice of technology used in the model (average-sized cables versus a variety of smaller and larger copper cables) is inappropriate. Putting aside the question of whether the New York model, which was not the subject of examination in this proceeding, is a proper guide, we nonetheless conclude that this is not a severe problem, if it is indeed a problem at all. We find nothing untoward in NYNEX's Record Response No. 25, in which it states that "the costing methodology allows an average to be determined in advance of input or allows the model to calculate the average."

It appears that, if NYNEX did indeed make an incorrect averaging assumption, it would have worked to its disadvantage, at least in the instances cited by AT&T (AT&T Initial Brief at 25). Use of a single cable size as a costing input in the model actually has the effect of producing a lower cost per loop, as can be demonstrated by comparing the New York and

NYNEX inputs. The range of costs assumed in the New York major cities and urban zones for aerial fiber cable range from $6.85 per foot installed for the smallest cable size (12 fibers) to $44.87 for the largest (216 fibers); while in the Massachusetts workpaper, an average 144-fiber cable is assumed for the urban zone, at a cost of $8.50 per foot installed. While two of the cable sizes in the New York example (the 12 and 24 fiber size) have installed costs below that of the average used for NYNEX, the resulting weighted average cost in the New York major cities zone is $11.55, and in the urban zone it is $14.73. The weighted average cost in the Massachusetts urban zone is $8.50. The same phenomenon occurs with respect to underground fiber feeder, where the weighted average costs in the New York zones are $18.80 and $16.72, while the Massachusetts figure for its urban zone is $12.70 (Exh. AT&T-13, page 105 of 135 (New York inputs); Exh. AT&T-18, page 13; and Exh. NYNEX-40, page 12 (NYNEX inputs)).

This evidence rebuts MCI's complaint, as well. As noted, MCI argues that, if the utilization factor were applied to the facility, and not the cost of the facility, a larger facility would be purchased, thus lowering the unit price (MCI Initial Brief at 10). NYNEX correctly notes that MCI's logic is based on a faulty premise, since the investment cost used in the NYNEX TELRIC study already accounts for the optimum sizing of the facilities and is a weighted average cost reflecting the most efficiently engineered plant. Thus, the investment cost to which the utilization factor is applied already reflects the economies associated with installing the properly sized units of capacity (NYNEX Reply Brief at 13-14).

AT&T goes on to raise similar objections concerning the assumptions of switching costs

in the NYNEX model, once again comparing the results with that of New York. It derides Mr. Anglin as being unable to provide an explanation for this difference (AT&T Initial Brief at 28). It is not Mr. Anglin's responsibility to explain the difference between a Massachusetts study that he supervised and a New York study in which he was not involved. Nonetheless, he offered coherent and thoughtful and -- in the words of the AT&T attorney -- plausible explanations based on his personal knowledge of the New York and Massachusetts networks (Tr. 9, at 129-132; Tr. 11, at 72-73, 87-88, 99-100).

AT&T raises additional objections concerning the use of the SCIS model and states that NYNEX asks these outputs to be taken on faith (AT&T Initial Brief at 29). NYNEX states in reply that the SCIS model has been audited on behalf of the FCC and found reasonable (NYNEX Initial Brief at 37). We have no reason to believe that the model does not produce reasonable outputs.

AT&T states that switch costs are overstated because NYNEX ran the SCIS model using lines both active in service and those currently inactive, or spare. Thus, says AT&T, the total calling seconds employed as an input to the SCIS model is based on NYNEX's current total switch capacity rather than its current total switch utilization (AT&T Initial Brief at 30). We believe, based on the evidence presented, that AT&T is correct in this assertion, although there is probably a reason to include a number of spare lines to reflect maintenance and growth and other administrative requirements. Accordingly, when NYNEX prepares its compliance filing in this proceeding, it shall correct the inputs to the SCIS model to reflect the lines currently active in service, plus others it demonstrates to be appropriate, unless it is able to

present an explanation for why the numbers it has used are properly reflective of TELRIC assumptions.

Finally, we turn to MCI's argument that NYNEX has not used an appropriate discount off the manufacturer's listed prices for switches and other electronic equipment that is assumed. It asserts that, if the network were being purchased in whole today, NYNEX would obtain a relatively large discount from the equipment suppliers (MCI Initial Brief at 20-21). Mr. Gansert testified that NYNEX used the discounts currently obtained from suppliers for purchases of incremental additions to its current electronic equipment. He further stated that it would be unreasonable to assume that a larger discount would be forthcoming if all the BOCs were assumed to be building new networks at once, because there could be a shortage of equipment that could result in no discounts or even premium prices (Tr. 8, at 354-356). MCI describes Mr. Gansert's answer as "cute, but disingenuous" and asserts that we should use the discount that NYNEX obtained several years ago when it replaced its old analog switches.

We find that it is speculative to assume what the manufacturers' discounts would be if a TELRIC network were being constructed today. Suppliers' discounts are a function of both supply and demand in the marketplace.

In conclusion, we find that the demand quantities, fill factors, and investment amounts presented by NYNEX, with the exceptions noted, are reasonable and appropriate for use in its TELRIC model.

B. The Cost of Capital

1. Positions of the Parties

NYNEX presents a 13.18 percent overall cost of capital for use in the TELRIC model, based on a cost of equity of 14.8 percent, a cost of debt of 7.9 percent, and a debt:equity ratio of 23.51:76.49. AT&T states that this is overstated and offers a cost of capital of 9.8 percent, based on a cost of equity of 11.5 percent, a cost of debt of 7.7 percent, and a debt:equity ratio of 45:55. We discuss in detail below the cases presented by the parties and our analysis and findings on these issues. Following a general overview of the issue, we turn to specific determinations of the cost of equity, the cost of debt, and the capital structure.

2. Analysis and Findings

a. Overview

The FCC provides us with guidance concerning the appropriate cost of capital to be used in the TELRIC cost studies. In one section of the Local Competition Order, we are directed to consider the monopoly, or bottleneck, aspects of the unbundled elements we seek to price:

> Based on the current record, we conclude that the currently authorized rate of return at the federal or state level is a reasonable starting point for TELRIC calculations, and incumbent LECs bear the burden of demonstrating with specificity that the business risks that they face in providing unbundled networks elements and interconnection services would justify a different risk-adjusted cost of capital or depreciation rate. These elements generally are bottleneck, monopoly services that do not now face significant competition. We recognize that incumbent LECs are likely to face increased risks given the overall increases in competition in this industry, which generally might warrant an increased cost of capital, but note that, earlier this year, we instituted a preliminary inquiry as to whether the currently authorized federal 11.25 percent rate of return is too high given the current marketplace cost of equity and debt. On the basis of the current record, we decline to engage in a time-consuming examination to determine a new rate of return, which may well require a detailed proceeding. States may adjust the cost of capital if a party demonstrates to a state commission

> that either a higher or lower level of cost of capital is warranted, without that commission conducting a "rate-of-return or other rate based proceeding." We note that the risk-adjusted cost of capital need not be uniform for all elements. We intend to re-examine the issue of the appropriate risk-adjusted cost of capital on an ongoing basis, particularly in light of the state commissions' experiences in addressing this issue in specific situations.

Local Competition Order at ¶ 702.

In other parts of the order, we are reminded to price these elements in the manner they would be priced by the ILEC and other entrants in a competitive market:

> In this proceeding, we are establishing pricing rules that should produce rates for monopoly elements and services that approximate what the incumbent LEC would be able to charge if there were a competitive market for such offerings. We believe that a forward-looking economic cost methodology enables incumbent LECs to recover a fair return on their investment, i.e., just and reasonable rates.

Id. at ¶ 738.

> Because a pricing methodology based on forward-looking costs stimulates the conditions in a competitive marketplace, it allows the requesting carrier to produce efficiently and to compete effectively, which should drive retail prices to their competitive levels.

Id. at ¶ 679.

And specifically, with regard to the cost of capital, we are directed as follows:

> [T]he forward-looking costs of capital (debt and equity) needed to support investments required to produce a given element shall be included in the forward-looking direct cost of that element.

Id. at ¶ 691.

In the sections below, we will employ these sections of the FCC order to determine the appropriate forward-looking cost of capital to use in the TELRIC studies for pricing unbundled

network elements.

No party to this proceeding disputes the general theory of finance that the cost of capital demanded by investors is related to the level of risk anticipated by those investors compared to other investments in the marketplace, and so we conclude that an appropriate response to the FCC directives is to assess the level of risk faced by NYNEX in its provision of unbundled network elements (see, e.g., Exh. AT&T-9, at 5-6). That assessment, in turn, will be used to determine the appropriate methodology for estimating the cost of capital to be used in the TELRIC studies.

In carrying out our assessment of the level of risk faced by NYNEX in its provision of unbundled network elements, we want to clearly distinguish our task from the task of determining an allowed rate of return in a rate case. In that instance, we review the return for an entire company, based on a number of factors, like its current customer base, its range of services, and the statutory framework governing provisions of all of those services. Here, we are constructing a stand-alone forward-looking cost estimate for each of a specific set of services. The relative risk of the rest of the company or the company as a whole is not at issue, unless there is not a significant difference in the risk of the particular assets in question and that of the entire company (Tr. 8, at 99).

AT&T cites paragraph 702 of the Local Competition Order as imposing on NYNEX the burden of demonstrating with specificity that the business risks associated with providing unbundled network elements would justify a different risk-adjusted cost of capital from the current authorized rate of return (AT&T Initial Brief at 44). As noted, the FCC, later in that

paragraph, permits states to adjust the costs of capital upon such demonstration by any party to this proceeding, "without the commission conducting a 'rate of return or other rate-base proceeding'". The inclusion of this latter statement raises the question of what evidentiary standard is required for us to adopt a different rate of return from that currently authorized for NYNEX as a whole, whether in the state or the federal jurisdiction. We explore this question in the context of the positions set forth by the parties.

As AT&T notes, Dr. Vander Weide argued in favor of assuming a competitive market as the context for this analysis, but it denigrates Dr. Vander Weide's assertion, stating that NYNEX offers no evidence proving a competitive market exists, "either today or at any time in the future" (AT&T Initial Brief at 46). AT&T further asserts that NYNEX is "uniquely situated to have available to it relevant data concerning competitive inroads into its existing monopoly business" (id. at 45).

We find that AT&T mischaracterizes NYNEX's obligation here and, indeed, mischaracterizes which parties have the information that would prove future levels of competition. NYNEX is under no obligation to prove that there are "competitive inroads to its existing monopoly business." We are conducting a forward-looking cost study and in so doing are attempting to estimate an appropriate cost of capital in the marketplace that will develop upon the signing of the interconnection agreements. Dr. Vander Weide expressed this point concisely and well:

> [I]t seems to me that the assumption that the FCC had in mind when valuing the investment in the network on a going-forward basis was that it was a competitive-market assumption. Indeed the entire Telecommunications Act and

> the FCC order is designed to bring about competition in telecommunications. . .Well, it would certainly be inappropriate to use a cost of capital that is based on no competition or very little competition or a regulatory model of some type when one is using a competitive assumption when valuing the investment.

Tr. 8, at 102.

The competition experienced by NYNEX to date is simply not a relevant indicator of the broadly expanded competitive marketplace envisioned by the Act. As noted by Dr. Hubbard:

> Q. Are there not carriers today who are competing on a facilities-based basis with NYNEX?
> A. But not on the scale that would provide the kind of meaningful competition that the Act is trying to get.

Tr. 7, at 108.

As to future levels of competition, NYNEX can scarcely be expected to offer estimates of the level of facilities-based competition that will be provided by AT&T, MCI, Sprint, TCG, and others in that environment.

Likewise, AT&T's argument that NYNEX's growth projections prove that NYNEX "will continue to enjoy its monopoly status for the foreseeable future" is specious (AT&T Initial Brief at 46). The NYNEX forecast (even if accurate) simply reflects a growth in demand. It does not offer an indication of market share, the prime determinant of monopoly status.[3]

Rather than adopting AT&T's misplaced view on this issue and its mistaken assertion

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[3] A similar argument could have been made upon the divestiture of AT&T in the early 1980s that if AT&T had projected growth in long-distance usage, it would maintain a monopoly in long-distance service but such an argument would also have been specious.

that NYNEX has the responsibility to prove the future existence of facilities-based competition in the Massachusetts telecommunications market, we turn to the record developed in this proceeding. Our aim is to produce a characterization of the relative risks faced by NYNEX in its provision of unbundled network elements. This, in turn, will inform our decision concerning the methodology to employ in estimating an appropriate cost of capital for the TELRIC studies.

Unbundled network elements are bottleneck facilities until competing carriers choose to bypass them by constructing their own facilities. It is clear that the Act and the Local Competition Order envision such bypass occurring. Indeed, the requirement to offer unbundled network elements, in addition to resold services, directly suggests that the Congress and the FCC understood that competing carriers will choose to construct facilities for portions of their networks. As noted by Mr. Montgomery, "That's the only way you can interpret what the FCC and in fact the Act require with respect to unbundling" (Tr. 6, at 29; see also Tr. 6, at 88; Tr. 7, at 108).

In this proceeding, the competing carriers have made it clear that they intend to use NYNEX's unbundled network elements to supplement the carriers' facilities where it is more economical to do so, but they have also stated a desire to move towards facilities-based competition. For example, Mr. Montgomery stated: "I know in the case of TCG that its philosophy and its business is oriented towards facilities-based competition" (Tr. 6, at 22). AT&T has a similar philosophy (Tr. 8, at 202-203). MCI has adopted a similar philosophy, as noted in its public statements:

> MCI is entering the local market and challenging the regional Bell companies with the same pioneering spirit it demonstrated when it took on AT&T for the right to offer long distance service over 25 years ago. … MCI plans to offer local service over its own network facilities in 25 major U.S. cities by early 1997. MCI now provides facilities-based switched local service to business customers in 13 cities. . . [list includes Boston].

RR-42.

As discussed in Phase 3 of this proceeding, Brooks and AT&T have both requested and received permission to install remote switching modules in collocated space to take advantages of the efficiencies of that equipment in the network. Those efficiencies include a reduction in leased transport capacity from NYNEX. Consolidated Arbitrations, D.P.U. 96-73/74, 96-75, 96-80/81, 96-83, 96-94 (Phase 3 Order), at 32-36 (1996). The degree to which carriers will rely on NYNEX's unbundled network elements versus NYNEX's resold services versus the carriers' own facilities is not established on this record. Certainly, the carriers face financial constraints that prohibit building a totally facilities-based network (Tr. 6, at 24-25, Tr. 8, at 202-203); and therefore they must direct capital to the most attractive business opportunities. It is difficult, at this time, to predict when and where those opportunities will arise. The experience of TCG and MCI in building facilities in the heavily travelled business market of downtown areas provides evidence of the desirability of carriers' owning facilities in such markets (see also, Tr. 6, at 88-89); but there are also reasons to believe that facilities-based competition could arrive in rural and suburban markets (Tr. 6, at 25-27).

Recognizing this uncertainty, we nonetheless conclude that the level of business risk faced by NYNEX with regard to the provision of unbundled network elements is higher than

that which would apply to a monopoly bottleneck facility, a facility that, by definition, is not subject to bypass. A utility providing monopoly services certainly faces business risks, for example, the risk of declining revenues during an economic recession. In contrast, here, there is a risk of bypass of the company's own facilities, a risk that is separate and distinct from the risks facing a monopolist. As Dr. Taylor explained:

> Q. If NYNEX were just in the business of providing competitive unbundled network elements, would investors view it any differently from any other company providing competitive unbundled network elements?
>
> A. The answer to that is probably no except for its historical reputation. But this is providing network services to large and sophisticated competitors, not to customers, so the fact that it's been here for 100 years and everyone knows the name doesn't count for anything.

Tr. 6, at 90.

An additional level of risk has been brought out in this proceeding. While NYNEX must provide other carriers with unbundled network elements -- either by using existing network capacity or by building new capacity -- those carriers are under no obligation to use those facilities for any specific contract term. The rates we set in this proceeding are posted rates for a circuit or a switching port per month. There is no contractual commitment by the competing carrier to use any given unbundled network element for more than a month. There is no termination liability proposed in this proceeding (Tr. 8, at 114-115, 204-206). In essence, NYNEX has an obligation to provide facilities, but the carriers have no obligation to take those facilities over all or even a significant portion of their useful economic lives (Tr. 6, at 85-86). This risk is aggravated further because the decreasing cost nature of the telecommunications

industry means that unbundled network customers could be encouraged to become facilities-based providers because they, with their newer equipment, would have a cost advantage over the incumbent (Tr. 8, at 107; Exh. NYNEX-15, at 18).

It might be suggested that this does not present a business risk for NYNEX, in that its own demand for network capacity will fill the capacity left behind by a carrier that built its own facilities. (Dr. Hubbard appears to make this claim (Exh. AT&T-9, at 20).) Such an assertion simply would not add up. If NYNEX installs and maintains sufficient network capacity to serve the projected needs of both it and its competitors, subtracting the latter after several months or years of usage does not cause the former to grow to fill the void. The problem is compounded because much of the network equipment is not fungible and therefore must remain in its installed location.

In a competitive market, investors viewing the provision of a speculative investment, like an office building or a "merchant" power plant, would demand a high return, certainly a return greater than that warranted for monopoly, bottleneck facilities (Tr. 8, at 114). We recognize that the provision of unbundled network elements differs from these examples which were posited by the arbitrator in this proceeding, in that, at least for some period of time, some carriers are certain to use some of the unbundled network elements. In the examples he mentioned, there is no assurance whatsoever that the given investment will ever be leased or sold. Thus, unbundled network elements might be viewed as a "hybrid" set of assets, having some of the characteristics of monopoly bottleneck facilities while also displaying some

characteristics of speculative, unsecured investments.[4]

We have reviewed the question of whether we might be assisted in determining the appropriate cost of capital for the TELRIC studies of unbundled network elements if we referred to the rate of return calculation last employed by the Department in reviewing NYNEX's retail rates, described by the FCC as a "starting point" for the instant proceeding. See NYNEX, D.P.U. 94-50, at 430-485 (1995). After all, our cost of capital decision there implicitly took into account our own intraLATA competition order, in which we determined that competition for telecommunications services would be permitted in Massachusetts. IntraLATA Competition, D.P.U. 1731 (1985). However, in that rate determination, we were establishing a rate of return for NYNEX as a whole, not for individual unbundled network elements. Further, while we had permitted competition, we had not established the pervasive requirements that have since been set forth in the Act. For example, we had not required NYNEX to provide resale of unbundled network elements on an unsecured month-to-month basis. Thus, the allowed cost of capital in that proceeding is not informative of the appropriate

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[4] The FCC has warned us to avoid the use of company-produced internal rates of return ("hurdle rates") on specific investments to estimate the appropriate cost of capital for unbundled network elements. Local Competition Order at ¶ 689. We want to make clear that we do not use such internal rates of return in this analysis. Instead, we present these examples to illustrate the features that would influence the way in which the capital markets might view the relative risks of providing unbundled network elements. We adopt, below, a market-based determination of the cost of capital for the TELRIC studies. In light of the FCC's advice, we find confusing AT&T's proposal that NYNEX's own internal cost of capital calculation should be regarded as establishing an absolute ceiling on any cost of capital estimate for NYNEX (AT&T Initial Brief at 47). If, as AT&T asserts, this internal cost of capital is not relevant, it is hard to see why it should represent a maximum.

cost of capital for use in the TELRIC studies.

Likewise, the FCC's allowed interstate rate of return offers little value in the instant proceeding. Local Competition Order at ¶ 702. It, too, was established before passage of the Act and could not have incorporated the elements of risk that derive from the pervasive requirements that have since been set forth in the Act.

b. Cost of Equity

In this proceeding, we are offered two approaches to estimating the cost of equity for the TELRIC studies. The first, presented by AT&T, uses the telecommunication providers in the United States as the comparison group and performs discounted cash flow ("DCF") and capital asset pricing model ("CAPM") analyses based on that group (Exhs. AT&T-9, 11). The second approach, presented by NYNEX, is a DCF model that draws upon a group of industrial companies ("the S&P 400"), stating that these companies are representative of the business risks facing NYNEX in the provision of unbundled network elements (Exh. NYNEX-15).

We cannot, for the reasons set forth above, rely on AT&T's analyses. The analyses rely on a set of companies that, while similar in whole to NYNEX, do not fully reflect the specific risk factors inherent in the provision of unbundled network elements. In particular, in light of our finding above concerning the relative risk of supplying unbundled network elements, we conclude that Dr. Hubbard's testimony is unsupported when he states that the leasing of network facilities is less risky than the other lines of business in which telephone holding companies participate (Exh. AT&T-9, at 20). As Dr. Hubbard notes, 91 percent of NYNEX's revenues were associated with providing regulated local and toll telephone services,

essentially on a monopoly basis. The remainder, 9 percent, are associated with other ventures (Exh. AT&T-9, at 19). We cannot conclude, based on this record, that this 91:9 split would also represent an appropriate characterization of the relative monopoly:competitive revenue-generating characteristics of the market for unbundled network services. As noted by Dr. Taylor, the large customers that AT&T and MCI and TCG will seek to serve upon the onset of competition (i.e., when the interconnection agreements are finalized), using the carriers' own facilities in downtown Boston, represent a substantially larger portion of the revenues collected by NYNEX today (Tr. 6, at 89-90). This point, which was not disputed by any of the competing carriers in this proceeding, was also made by Dr. Vander Weide (Exh. NYNEX-15, at 16).

In contrast, we find merit in NYNEX's approach. Dr. Vander Weide created a DCF model based on the S&P 400. These companies represent a range of business risks, from retail to medical service to manufacturing. AT&T correctly notes that we have never accepted an assertion that it is appropriate to take a group of 400 companies and deem them to be "on average" comparable to a subject company (AT&T Initial Brief at 49). Here, though, we are not establishing a rate of return for NYNEX as a whole. We are choosing a cost of equity that is meant to represent the workings of a competitive market, a market that is in some respects characterized by some suppliers' market power (ability to control a large portion of the market) and in other respects characterized by the buyers' market power (i.e., ability not to purchase or to influence the purchase price).

There is not yet a competitive market for unbundled network services, but there will be

one shortly. We need a surrogate to describe the risks of that to-be-developed market, and we choose to rely on one of the most liquid and well publicized markets, the stock market, whose performance is often measured by the S&P 400. It is a diverse market, representing a portfolio of companies and their incumbent risk. As such, we find that it presents a composite view of the risks of competitive organizations, against which it is reasonable to compare the likely risk of building and leasing unbundled network elements.

We recognize that our approach here is quite different from that employed by us in determining the rate of return for NYNEX and other companies in our jurisdiction, but, as we have stated, our task is different. We seek to estimate the cost of equity for a service offering that does not yet exist in a marketplace that is about to come into existence. We recognize that our finding must be inherently qualitative, and we are aware of the possibility that the S&P 400 might be less risky or more risky than a company selling unbundled network elements. We have already acknowledged that, based on this record, we cannot precisely determine the degree of risk associated with offering unbundled network elements. We know it is more risky than the provision of monopoly services. We know it is less risky than speculative real estate or power plant projects. It has some characteristics of the two, in that, for common carriers who lack the capital or the ability to build facilities, it does provide an essential service. For other carriers, however, it offers a no-obligation option to use and later abandon, perhaps to preserve capital in the short run and then to spend it on those facilities that have a high financial priority.

In total, we see no systemic reason that the level of risk represented by the S&P 400 as

a group should be biased either above or below that of an ILEC providing unbundled network elements.[5] Accordingly, we find that the comparison group employed by Dr. Vander Weide is of value in determining the appropriate cost of equity in the TELRIC studies.

We now turn to another criticism offered by AT&T of Dr. Vander Weide's model. A component of the DCF model is the growth assumption contained in that model. Dr. Vander Weide used a constant growth model, while Dr. Hubbard employed a three-stage growth model, in which the assumed growth rate declines over time. For the first five years Dr. Hubbard uses the same growth rate forecasts employed by Dr. Vander Weide; for the second stage, the next fifteen years, he assumes that the growth rate declines from the level of the first five years to the growth rate of the U.S. economy; and from the twentieth year forward, he assumes that the firm's growth rate equals the growth rate of the economy as a whole. Dr. Hubbard argues that Dr. Vander Weide's growth rate assumption, constant throughout the term of the study, results mathematically in any company with above-average growth ultimately consuming the entire U.S. economy (Exh. AT&T-10, at 7). Dr. Vander Weide agrees with the theory set forth by Dr. Hubbard, that in the long-term, the growth rate has to trend towards the growth rate in gross domestic product, but he further asserts that this has no impact on the

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[5] AT&T's assertions to the contrary are not on point (AT&T Initial Brief at 49-51). All of the points raised by AT&T refer to the overall risk of NYNEX as a corporation. We find no surprise, for example, in the fact that Bell Atlantic Corporation and NYNEX project that their merger will result in greater financial strength. (Indeed, we trust that their stockholders would expect such a result, one akin to that projected by MCI and British Telecommunications (RR-42)). That projection is not relevant to the question at hand.

DCF model, because dividends beyond 20 to 25 years have no impact on the price (Tr. 8, at 157). He further argues there is no support for the particular three stages used by Dr. Hubbard, and in particular, the idea that growth rates will reduce after five years. He cites Value Line, a financial publication, for the premise that growth rates for telecommunications firms would go up after five years (Tr. 8, at 158-159).

On this matter, we agree with Dr. Hubbard. The mathematical result of Dr. Vander Weide's analysis is uncontroverted and reasonable. Dr. Vander Weide's testimony concerning the Value Line forecast is not documented on the record, and, even if it were, does not address the underlying problem explained by Dr. Hubbard with regard to the model. Accordingly, NYNEX is directed to conduct its analysis in accordance with the three-stage growth methodology used by Dr. Hubbard.

c. Cost of Debt

The costs of debt assumed by NYNEX and AT&T are very close, 7.9 percent and 7.7 percent, respectively. NYNEX used the yield to maturity of Moody's AA-rated corporate bonds, while AT&T bases its cost of debt on the yield to maturity of NYNEX's outstanding debt. Given the narrow spread between these two estimates and the fact that even this small difference will be further reduced after it is weighted by the percentage of debt in the capital structure, we will not spend the time here to outline the methodological differences between the two approaches. Nor need we reach a policy determination as to which method is superior. We simply average the two and determine that 7.8 percent is an acceptable cost of debt for use in the TELRIC studies.

d. Capital Structure

The arguments of the parties concerning capital structure parallel those presented with regard to the cost of equity. Dr. Vander Weide used the average market-based percentages of debt and equity in the capital structures of the S&P 400 because he views this as consistent with the FCC mandate that network element pricing be based on a forward-looking competitive market model. He states that the average market-based capital structure of the S&P 400 is a good proxy for the capital structure of competitive firms. This produces a capital structure of 23.51 percent debt and 76.49 percent equity (Exh. NYNEX-15). Dr. Hubbard asserts that, to the extent the unbundled network element "firm" is less risky than the telephone holding company, it is likely to have a larger optimal use of debt financing in its long-term capital structure. He also says that telephone companies have less cyclical risk than industrial companies generally, and therefore they may optimally use more debt in their capital structure (Exh. AT&T-10, at 11). He presents market-based and book-based debt:equity ratios for NYNEX and for a sample of telephone holding companies, and then determines that a capital structure of 45 percent debt and 55 percent equity is reasonable (Exh. AT&T-9).

We have addressed this issue at length above, in our general discussion and in our determination of an appropriate cost of equity. We agree with Dr. Vander Weide that it would be inconsistent to use forward-looking competitive assumptions in the investment and expense components of a TELRIC study, but historical accounting-based capital structures in the cost of capital component (Exh. NYNEX-15, at 21). As in the case of the cost of equity determination, the S&P 400 offers a good proxy for the "firm" providing competitive

unbundled network elements under the conditions set forth in the Act and the Local Competition Order. Accordingly, we accept NYNEX's proposal with regard to the appropriate weighting of debt and equity in the TELRIC studies.

C. Depreciation Rates

The construction of a forward-looking cost study for unbundled network elements requires a determination of the appropriate depreciation rates to apply to the various categories of telecommunications plant. Local Competition Order at ¶ 702. The chart below summarizes, for the major plant accounts, the projection lives used by NYNEX in its TELRIC study, by MCI and AT&T in the Hatfield model, and the lives currently prescribed for NYNEX in Massachusetts by the FCC. The FCC prescription was most recently conducted in May, 1996 (AT&T Initial Brief at 55).

Projection Lives (Years)

Account	NYNEX	Hatfield	FCC
ESS Digital	10	14.3	15
Circuit Digital	8	10	11
Aerial Cable (metal)	17	20	22
Und. Cable (metal)	15	20	25
Buried Cable (metal)	17	20	23
Fiber Cable	20	20	25

Neither NYNEX nor AT&T presented witnesses who were involved in the determination of the depreciation lives used in their cost studies. Dr. Vanston, on behalf of NYNEX, and Mr. Lee, on behalf of AT&T, offered their opinions on the reasonableness of the economic lives that were presented to them (Exhs. NYNEX 13, 14 and unmarked AT&T Exhibit dated October 11, 1996). In summary, NYNEX contends that the current regulatorily-determined depreciation lives are too long in light of the pace of technological innovation that will occur in the telecommunications industry once full competition begins (NYNEX Initial Brief at 42-45). AT&T, on the other hand, argues that the FCC has been applying a forward-looking methodology in its determination of depreciation lives for regulated telephone companies for a number of years. This point is also made by the Attorney General. AT&T concludes by stating that the lives reflected in the Hatfield model, which are generally consistent with the current FCC-prescribed lives for NYNEX, are appropriate for TELRIC purposes. The Attorney General argues that the FCC lives, themselves, should be used (AT&T Initial Brief at 54-63; Attorney General Initial Brief at 8-12).

There is not sufficient time in an arbitration proceeding of this sort to conduct a full review of the appropriate depreciation rates for the TELRIC studies. Fortunately, that is not required here. As noted by Mr. Lee, the FCC's represcription process is based on a forward-looking orientation, including current technological developments and trends. He notes that this has been made evident in increasing depreciation reserve levels for NYNEX. He also states that the FCC projection lives result in a composite 7.4 percent depreciation rate, despite an average retirement rate of only 3.3 percent. This, he asserts, is a clear indication

that the FCC's projection lives are forward-looking, because, if it were using a historical approach, the composite rate would be in the 3 to 4 percent range (AT&T Unmarked Exh. at 6-4).

Under the terms of the Local Competition Order, it is NYNEX's burden to prove the reasonableness of its proposed depreciation rates. Dr. Vanston's testimony does not effectively rebut Mr. Lee's characterization of the FCC process, and, although he has offered general opinions about the degree of technological change that might occur in the industry, he has presented no NYNEX-specific analysis that might cause us to think that the FCC lives are not appropriate.[6]

We find, based on this record, that the projection lives prescribed by the FCC in its last represcription of NYNEX's depreciation rates are the kind of forward-looking projection lives required in a TELRIC study. Accordingly, as suggested by the Attorney General, we direct that these lives, rather than those used in either the NYNEX model or the Hatfield model, be incorporated into NYNEX's compliance filing when calculating the rates for unbundled network elements using the NYNEX TELRIC model.

D. The Calculation of Forward-Looking Joint and Common Costs

The FCC has directed that a reasonable allocation of forward-looking common costs shall be included in the TELRIC studies. Local Competition Order at ¶ 682. Some of these

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6 We will not present here a detailed review of Mr. Vanston's testimony and instead defer to AT&T's rather persuasive characterization of the points made by him (AT&T Initial Brief at 56-61.)

costs, "joint costs," are directly attributable to specific unbundled elements. Others are more general overhead expenses of the firm. Local Competition Order at ¶ 676. The FCC directed that "relevant common costs do not include billing, marketing, and other costs attributable to the provision of retail service." Local Competition Order at ¶ 694.

1. Retail-Related Costs

AT&T argues that NYNEX's calculation of joint and common costs is flawed. First, it states that NYNEX has improperly included retailing costs in the TELRIC study, restating a number of its arguments made in Phase 2 of this proceeding (the phase dealing with the avoided cost methodology used to determine the wholesale discount for resold services).

NYNEX says its approach with regard to retail-related costs is consistent with that used in Phase 2 and relies on its arguments set forth in that part of the proceeding. It states that it would make any appropriate adjustments to joint and common costs to reflect the Department's findings with respect to retail avoided costs.

We need not address this issue in detail here, as we have made findings with regard to retail-related costs in our Order on Phase 2. Consolidated Arbitrations, D.P.U. 96-73/74, 96-75, 96-80/81, 96-83, 96-94 (Phase 2) (1996). NYNEX is therefore directed to modify its TELRIC study to exclude those expenses found in Phase 2 to be related to the provision of retail service.

2. Calculation of the Cost Factors

a. Positions of the Parties

AT&T argues that NYNEX's calculation of the joint and common cost factors is not a

forward-looking methodology. It notes that the company simply used 1995 booked expenses, allocated those expenses to investment accounts, and created a ratio of those expenses to the investments in each account. AT&T disputes NYNEX's use of a fixed allocator to divide costs among the various investment accounts, stating that a more appropriate allocator would reduce the share of common costs allocated to the "critical bottleneck elements, such as the local loop" (AT&T Initial Brief at 37). AT&T also argues that there is no evidence that the historical relationships derived from the 1995 expense:investment ratios are the appropriate ratios to be applied to the forward-looking TELRIC network technologies and facilities. AT&T argues that this problem is aggravated because the TELRIC investment amounts far exceed NYNEX's embedded switching investment, resulting in expenses being twice as high in absolute dollars.

AT&T also says that NYNEX has failed to recognize future efficiency gains and cost savings. It cites Mr. Globerson's testimony in support of the proposition that NYNEX has the highest cost and is therefore the least efficient of the regional Bell operating companies. It argues that these figures indicate that NYNEX's historical performance is not reflective of what it should achieve in a least cost, forward-looking TELRIC world, when one considers technological improvements and competitive forces (id. at 39).

NYNEX defends it cost factors by stating that they reflect the actual costs incurred by NYNEX and that the allocation of these costs across the investment accounts is reasonable for a TELRIC study. It argues that the company has recently undergone a comprehensive investigation of its costs by the Department in D.P.U. 94-50.

b. Analysis and Findings

The parties agree that the joint and common expense factors should be presented as a ratio of expenses to investments, but they disagree as to how a forward-looking ratio should be calculated. NYNEX uses current expenses and allocates them equally across investment accounts. AT&T would allocate these costs differentially among the various TELRIC elements, and, it would also use a projection of expenses that reflected increasing efficiency in the company's operations.

On the first point, although the FCC has stated that a differential allocation among accounts could be appropriate, we have no record here to support anything other than an equal allocation. Accordingly, we find that NYNEX's equal allocation approach is acceptable. In so doing, we note in passing that AT&T's statement that the TELRIC model has doubled NYNEX embedded investment in switching is not supported on the record. In fact, the two numbers are remarkably close, separated by only $300 million out of over $6 billion (RR-44). The second point raises a more interesting question of analysis. We believe that AT&T is correct that it is reasonable to assume that NYNEX, upon the onset of competition, will take actions to reduce its joint and common costs. It has already begun this process (see, e.g., Exhs. AT&T-14; 27, at 17; 28, at 3). We enter here a realm of some speculation, but we find that it is inconceivable that NYNEX will maintain its current level of expenses, given its relative cost position in the country and the demands of a competitive marketplace. As Mr. Globerson notes, NYNEX currently has among the highest operating expenses per line of service in the country (Exh. AT&T-16, at 14). This is incompatible with a company that seeks to be a vigorous competitor.

This issue is not a question of the reasonableness of NYNEX's current expenses for retail ratemaking, as implied by NYNEX's argument that the company's rates were recently reviewed by the Department. It is a question of the appropriate level of expenses to assume for a forward-looking cost study.[7]

We find that it is appropriate and necessary, in constructing the kind of forward-looking cost study envisioned by the FCC, to scale down NYNEX's 1995 expenses to account for likely efficiency improvements in the face of improved technology utilization and competitive forces. In doing so, we will assume that NYNEX, to compete effectively, will have to incur a level of expenses at or near the average of its competitors. We do not have this information for the future for all of NYNEX's competitors, but we do have information about NYNEX's peers today, and we will use that as a surrogate. Mr. Globerson's exhibit presents the operating exenses per line in service for 1995 for ten of the Bell operating companies (Exh. AT&T-16 at Part LG-2, page 2). We have constructed a ratio of NYNEX's expense level to the average of the entire group, excluding NYNEX. That ratio is: 430/[(456 + 399 + 385 + 342 + 338 + 319 + 317 + 310 + 296)/9], or 1.22. We find that this ratio presents us with a useful surrogate of the extent to which NYNEX would have to reduce its expenses to be an effective competitor in a TELRIC network environment. (In fact, since all of the regional operating companies will be undergoing similar pressures to reduce costs, it is likely that the ratio is

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[7] Indeed, using the NYNEX argument on this issue, we would have been correct to use the company's currently approved retail rate of return instead of the cost of capital we have found appropriate in this Order. That, as we have discussed above, is also not appropriate for the TELRIC forward-looking study.

conservative.) We therefore direct NYNEX, in recalculating its TELRIC study, to scale down its joint and common expenses by dividing them by this factor before allocating those expenses to the various investment accounts used in unbundled element cost calculation.

VI. The Choice of Geographic Zones for Deaveraging of Costs

The FCC has provided clear guidance with respect to the issue of geographic deaveraging of rates. We repeat that here:

> The 1996 Act mandates that rates for interconnection and unbundled elements be "based on the cost . . . of providing the interconnection of network elements." We agree with most parties that deaveraged rates more closely reflect the actual costs of providing interconnection and unbundled elements. Thus, we conclude that rates for interconnection and unbundled elements must be geographically deaveraged.
>
> . . . We conclude that three zones are presumptively sufficient to reflect geographic cost differences in setting rates for interconnection and unbundled elements, and that states may, but need not, use these existing density-related rate zones. Where such systems are not in existence, states shall create a minimum of three cost-related rate zones to implement deaveraged rates for interconnection and unbundled elements. A state may establish more than three zones where cost differences in geographic regions are such that it finds that additional zones are needed to adequately reflect the costs of interconnection and access to unbundled elements.

Local Competition Order at ¶¶ 764-765, footnotes omitted.

A. Positions of the Parties

The parties to this case agree that the use of customer density, i.e., loops per square mile, is an appropriate indicator of the underlying costs of providing interconnection and unbundled network elements. They disagree, however, on the appropriate number of density zones for Massachusetts. NYNEX states that three zones -- urban, suburban, and rural -- are appropriate for geographical

deaveraging of costs. The urban zone is characterized by densities of over 1500 loops per square mile, the suburban zone contains areas with densities of 151 to 1500 loops per square mile, and the rural zone contains wire centers serving areas of under 151 loops per square mile.

AT&T and MCI state that four zones more accurately reflects the distribution of costs in the state, and they would separate the urban zone into a downtown Boston Central Exchange zone and a zone covering other urban areas. They note that the four most densely served central exchange wire centers -- Harrison, Back Bay, Franklin, and Bowdoin -- have densities that set them far apart from the next highest in the urban zone. They assert that the cost characteristics of this zone are sufficiently different that the TELRIC study should disaggregate this group from the rest of the urban zone.

NYNEX argues that, in light of the stay of the FCC's order, the Department should not deaverage the rates for unbundled network elements, regardless of the cost differences among the three or four density zones. It states that deaveraging the rates for unbundled network elements without a corresponding deaveraging of the company's retail rates for services that use the same elements will not promote efficient competition. Rather, argues NYNEX, the effect will be a "classic example of uneconomic bypass," as competitors gain a price advantage over NYNEX's retail rates in some areas solely because the company's retail services have been priced by the Department on a statewide average bases and have not been priced to reflect cost differences among exchanges (NYNEX Initial Brief at 4-6).

In response, MCI argues that this arbitration is being guided by the FCC pricing rules and that those rules specifically require geographic deaveraging into at least three density zones and that the evidence in this proceeding supports four zones. It further argues that the Act itself envisions

geographic deaveraging. It suggests that the appropriate remedy to the bypass issue raised by NYNEX is for NYNEX to petition the Department for changes in its retail rate structure (MCI Reply Brief at 7-12).

AT&T joins MCI in many of its arguments and further notes that the parties to this case agreed at the outset that the FCC pricing rules would be determinative of the rates set in this proceeding. It accuses NYNEX of wanting to "pick and choose" among the FCC requirements to support its commercial interests. AT&T strongly supports the use of four zones, in light of the evidence presented in the proceeding that the cost characteristics of the Boston Central Exchange are very different from the rest of the urban density zone (AT&T Reply Brief at 1-6).

B. Analysis and Findings

The following facts are in evidence and are agreed upon by the parties: The costs of unbundled network elements are properly characterized by reference to the density, in loops per square mile, of the NYNEX wire centers (see, e.g., Tr. 8, at 183). There is a substantial difference in loop density in the Boston Central Exchange wire centers (Harrison, Back Bay, Franklin, and Bowdoin) compared to the rest of the urban zone, or even compared to the next most densely configured wire centers, Cambridge, Somerville, and South Boston (Tr. 8, at 190-191; RR-15). When the NYNEX TELRIC study is run with the Boston Central Exchange wire centers separated from the rest of the urban zone, there is a significant difference in the cost produced by the NYNEX TELRIC model between that exchange and the rest of the urban zone and with the costs for the urban zone that are produced in the three-density-zone TELRIC study (RR-23; compare Exh. NYNEX-11, Part A, pages 1-2). A summary of some of those differences is presented here:

NYNEX TELRIC Cost Study Results (cost per month)

Loop Item	Combined Urban	Boston Exchange	Other Urban
Two-Wire Analog Voice Grade	$13.53	$9.22	$16.98
Four-Wire Analog Voice Grade	$46.87	$38.38	$53.01
Two-Wire Conditioned Digital	$29.60	$24.65	$33.39
Four-Wire Conditioned Digital	$111.26	$94.66	$121.60

We cannot ignore these differences. Indeed, the difference in loop costs between the Boston Exchange and the other urban zone is wider in all respects than the cost difference between NYNEX's original combined urban zone and the suburban zone in its TELRIC study (Exh. NYNEX-11, Part A, pages 1-2). We believe it would be contradictory to the language and the intent of the Act and Local Competition Order to ignore the cost differences between the Boston Exchange wire centers and the rest of the urban wire centers. Mr. Globerson presented persuasive reasons as to why a failure to deaverage rates into the four density zones would inhibit competition in the state, particularly in the highly attractive Boston market (Exh. AT&T-16, at 4-5; Tr. 8, at 181-182).

While we are sympathetic to the concerns raised by NYNEX with regard to the different rate design standard currently applied to retail rates, that is a matter for the company to pursue in another forum at the Department. AT&T and MCI are correct that, insofar as this proceeding is concerned, the parties agreed that the Act and the FCC regulations would be in force, and NYNEX may not now make policy arguments as to why the provisions of the federal rules should be held in abeyance. Accordingly, NYNEX is directed to create four density zones, as described above, when it recalculates the rates for

unbundled network elements using its TELRIC model.

VII. Service Order Pricing

NYNEX states that it will incur substantial development costs to introduce and maintain electronic interfaces through which the company and the resellers will exchange information concerning service order, trouble reporting and testing, and billing information. While NYNEX has provided an estimate of the cost onsets associated with resale, it has not yet quantified the costs associated with developing other systems and capabilities that will be required for unbundled elements and requests for branding. NYNEX states that the record in this proceeding concerning service order pricing and resale cost onsets is incomplete. Accordingly, it is not proposing a specific set of charges. It suggests that the Department review these issues, and the issues of whether NYNEX should be allowed to recover its associated costs and if so, from whom is NYNEX allowed to recover those costs when the NYNEX later comes forward with a specific proposal that contains full support for the proposed rates (NYNEX Initial Brief at 70-72).

AT&T agrees, but it elaborates further by stating that NYNEX should not be permitted, in any event, to impose charges on resellers to recover the costs associated with the development of the electronic interfaces that will allow NYNEX and resellers to exchange service orders, trouble reporting, testing information and billing information. These are costs, states AT&T, that implement a fundamental aspect of the network restructuring that NYNEX is obligated to accomplish under federal law and as a condition of entry in the interLATA market (AT&T Initial Brief at 73). MCI's comments parallel those of AT&T. It agrees that NYNEX has presented no cost justification for any service order prices. In their absence, says MCI, no substantial charges may be imposed (MCI Initial Brief at 29).

The parties have agreed that there is an insufficient record in this proceeding to determine this issue. Accordingly, no rates for service charges and cost onsets shall be included in the interconnection agreements until such time as the parties have agreed on such charges or the Department has arbitrated the applicability and design of such charges.

VIII. Prices for Collocation

The parties agree that the prices for collocation should be established on the basis of a TELRIC study. NYNEX states that it expects to prepare such a study by April 1, 1997. In the meantime, it suggests that its existing D.P.U. 15 tariff should apply, as the existing rates are cost based and appropriate for use on an interim basis. MCI suggests that the proposed continuation of the tariffed rates should be disallowed. AT&T suggests that the current rates be reduced by twenty percent.

As NYNEX says, there is no support for AT&T's proposal, and we agree that a reasonable course of action is to maintain the existing collocation rates, pending review of collocation costs and prices in a TELRIC study. Given our guidance concerning TELRIC studies in this order, however, we find that NYNEX's April 1, 1997 proposed filing date is unnecessarily delayed. The company is directed to file its collocation cost study within sixty days of the date of this Order.

IX. The Mutual Compensation Rate

A. Positions of the Parties

Mutual compensation refers to the means by which one exchange carrier compensates another exchange carrier for terminating traffic on that carrier's network. NYNEX believes that the rates set in this proceeding for unbundled elements, such as local and tandem switching, should be the basis upon which carriers compensate each other for terminating traffic.

In contrast, AT&T advocates a bill and keep arrangement subject to monitoring. It says that bill and keep will reduce the billing and collection costs of NYNEX and the other carriers and reduce a potential barrier to entry. In response to NYNEX's concerns about a lack of balance in providing interconnection to competitive carriers, AT&T states that this asymmetry is hypothetical and unlikely given its plans to be a full service provider of both business and residential services. Accordingly, AT&T supports adopting bill and keep and maintaining it as long as usage between it and NYNEX remain in reasonable balance. If, upon monitoring traffic flows for a year, it is apparent that there is a significant imbalance, an adjustment in the process can be made.

MCI says that the compensation rate should be based on the tandem, rather than end office rate, because all of the ILEC's traffic will terminate at a competitor's switch that is equivalent to a tandem switch.

TCG recommends that compensation be based on a long-run incremental costs ("LRIC") rather than on TELRIC costs, since the Department established these rates in the past as a floor for NYNEX's competitive offerings. It asserts that, if NYNEX prices services to TCG on a TELRIC basis, but sets rates for its own customers on a LRIC basis, TCG will be caught in a price squeeze. TCG also argues that each carrier should have the option of compensating the other on a flat rate basis, utilizing a flat monthly fee for a DS-1 level of capacity regardless of the actual number of minutes sent. The flat rate charges, it asserts, should be based upon an assumed use of 120,000 minutes per month multiplied by the applicable per minute rate for end offices or tandems. TCG, like MCI, asserts that it should be entitled to receive the tandem rate for calls terminating on its network. It describes its switch as the functional equivalent of a NYNEX tandem.

Sprint states that compensation should be based on the TELRIC methodology established in this proceeding.

B. Analysis and Findings

We discuss three issues: (1) whether the mutual compensation rate should be based on the TELRIC results from this proceeding or a bill and keep arrangement; (2) whether a flat rate option should be offered to carriers; and (3) whether the rate collected by a competing carrier should be based on a tandem or an end-office rate.

On the first issue, if we could be assured that calling was roughly symmetrical, we would adopt the bill and keep arrangement. However, we cannot be so assured, and so we will not require it. Parties are free, however, to agree between themselves on such an arrangement, if they deem it in their interest. Without such an agreement, the TELRIC rates developed in this proceeding shall apply.

On the second issue, we find merit in TCG's suggestion that carriers be offered the option of compensating each other on a flat rate basis. It is not at all inconsistent with the principles of the TELRIC methodology to buy and sell capacity, rather than usage. The basis for that capacity charge, however, is less clear on this record. TCG proposes a rate based on 120,000 minutes of use, the average number of peak minutes of traffic exchanged during a month. NYNEX, however, argues that TCG's assumption is wrong. It suggests instead that "any arrangement to utilize a flat-rate equivalent charge should be accompanied by a mechanism that regularly reviews the actual usage on the facilities and thus allows the parties either to select a per-minute rate if the usage is below the flat-rate equivalent or to adjust the rate upward if actual usage is found to exceed the standard" (NYNEX Initial Brief at 73).

NYNEX's recommendation misstates the purpose of a flat-rate charge. It is not intended, on a going forward basis, to be reconciled with actual usage. It is meant to reflect a different definition of cost incurrence, one based on capacity rather than usage. Such a charge is helpful in this situation in that it avoids the need to measure and bill for usage (Tr. 6, at 13). As noted by AT&T, that measurement and billing cost in itself can form a barrier to entry in the early days of competition (AT&T Initial Brief at 76).

As to the specific basis for the capacity charge, Mr. Montgomery pointed out that the FCC proxy rate of 9,000 minutes per DS-0, which NYNEX advocates, is applied to trunking between a local exchange carrier and a long distance carrier, and it is a surrogate for interoffice and local transport in the access arena. He asserts that it is not appropriate to use as a proxy for the TCG to NYNEX trunk because TCG would be spreading its traffic out over multiple NYNEX offices. Thus, the trunk loading will be different from that which would occur if NYNEX were connecting two of its own offices or if a long distance carrier were connecting directly to a NYNEX end office (Tr. 6, at 10-12).

We find Mr. Montgomery's analysis persuasive and accordingly permit the type of flat-rate pricing he advocates, as adjusted for the actual TELRIC results produced in this proceeding.

On the final issue, we find that the carriers' switch should be viewed as a tandem. As noted by MCI and TCG, it performs the functional equivalent of the NYNEX tandem. The FCC has reached the same conclusion, finding that "where the switch of a carrier other than an incumbent LEC serves a geographic area comparable to the area served by the incumbent LEC's tandem switch, the appropriate rate for the carrier other than an incumbent LEC is the incumbent LEC's tandem interconnection rate." Section 51.711(a)(3).

X. E911 Port Charges

TCG argues that because NYNEX already recovers it E911 costs through a separate statutory funding mechanism and has failed to provide any cost justification for its proposed charges, a per call rate should be established for terminating E911 calls that originate from TCG customers. NYNEX argues that this position is unreasonable. It states that, absent an appropriate charge to TCG for helping to support the overall E911 system, the costs of provisioning that system for all local exchange companies in Massachusetts would be borne only by the customers who elect to purchase their services from NYNEX.

We agree with NYNEX. Along with the benefit of access to Massachusetts customers, as provided in the Act, carriers also have a responsibility to help support the costs of the E911 system. Otherwise, as suggested by NYNEX, only its customers would bear those costs.

NYNEX suggests that, until it performs a cost and rate study for E911, there are two alternatives available. The first is to use the rates other carriers are paying under existing interconnection agreements. The second is for the company to develop a cost per line based on its cost of provisioning E911 service in the state, as reported to the Department.

We find that the second alternative is preferable. It allocates the E911 costs in proportion to the number of telephone numbers each carrier has in the E911 database. Since it can be assumed that the customer at the end of any line has an equal likelihood of needing access to this emergency service, this is a fair apportionment of these costs.[8]

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[8] However, Teleport will only be able to recover its portion of E911 costs in the same (continued…)

XI. ORDER

After notice, hearing and consideration, it is

ORDERED: That the issues under consideration in this Phase 4 be determined as set forth above; and it is

FURTHER ORDERED: That New England Telephone and Telegraph Company, d/b/a NYNEX shall determine the cost of unbundled network elements based on the findings in this Order and submit those calculations, along with supporting documentation, in a compliance filing, to be filed with the Department within fourteen days of the date of this Order; and it is

FURTHER ORDERED: That the parties incorporate these determinations into a final agreement, setting forth both negotiated and arbitrated terms and conditions, to be filed with the Department pursuant to the Section 252(e)(1) of the Act, by January 10, 1997; and it is

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[8](…continued)

manner as NYNEX when it provides local exchange service to over 1,000 subscribers. Therefore, Teleport is only required to contribute to E911 network costs when it reaches that penetration level. St. 1990, c. 291 sec. 7; G.L. c. 166 §15E; G.L. c. 159 §§ 19, 19A.

FURTHER ORDERED: That the parties comply with all other directives contained herein.

By Order of the Department,

John B. Howe, Chairman

Janet Gail Besser, Commissioner