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APPENDIX D

The Commonwealth of Massachusetts

DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

October 14, 1999

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

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

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I. INTRODUCTION

This arbitration proceeding is held pursuant to the Telecommunications Act of 1996, 47 U.S.C. § 252 ("Act"). The proceeding is a consolidated arbitration between New England Telephone and Telegraph Company d/b/a/ Bell Atlantic-Massachusetts ("Bell Atlantic," formerly "NYNEX"), the incumbent local exchange carrier ("ILEC"), and its competitors, AT&T Communications of New England ("AT&T"); Brooks WorldCom, Inc. ("Brooks"), formerly Brooks Fiber Communications of Massachusetts, Inc.; MCI WorldCom, Inc. ("MCI"), formerly MCI Telecommunications Corporation; Sprint Communications Company L.P. ("Sprint"); and Teleport Communications Group, Inc. ("TCG"). Consolidated Arbitrations, D.P.U./D.T.E. 96-73/74, 96-75, 96-80/81, 96-83, 96-94.[1]

On December 4, 1996, the Department issued an Order in this proceeding ("Phase 4 Order") which set forth our rulings with regard to the method to be used by Bell Atlantic in carrying out total element long-run incremental cost ("TELRIC") studies to determine the prices to be charged by Bell Atlantic to competing local exchange carriers ("CLECs") for the use of unbundled network elements ("UNEs").[2] The method employed by the Department was the one set forth by the Federal Communications Commission ("FCC") in its First Report and Order

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[1] Since the start of these arbitrations, AT&T acquired Teleport, and MCI WorldCom acquired Brooks. AT&T assumed representation for Teleport and MCI WorldCom assumed representation for Brooks. Thus, the remaining parties are Bell Atlantic, AT&T, MCI WorldCom, and Sprint.

[2] UNEs are parts of the telephone network that one carrier leases from another carrier to provide telecommunications services. See 47 U.S.C. §§ 153(29), 251(c)(3).

dated August 8, 1996 ("Local Competition Order").[3] On February 5, 1997, in response to motions for clarification, recalculation, and reconsideration, the Department issued a second Order ("Phase 4-A Order") with regard to the TELRIC studies and directed Bell Atlantic to submit cost studies in compliance with that Order. Most aspects of that compliance filing were approved by the Department on May 2, 1997 ("Phase 4-B Order").

This Order addresses three different cost studies filed pursuant to the Phase 4 Order: a non-recurring charge study, a house and riser study, and an OSS cost study.

Bell Atlantic's initial TELRIC studies and compliance filing did not include a TELRIC study to establish the non-recurring charges ("NRCs") that would apply to the ordering and provisioning of UNEs. On April 17, 1997, Bell Atlantic filed testimony setting forth its TELRIC study for NRCs. This was supplemented by additional testimony on August 25, 1997. Bell Atlantic presented Thomas M. Aulisio, managing director -- regulatory, as its witness in supported of its cost method at hearings on December 3, 4, and 5, 1997. Bell Atlantic filed a second revision to its NRC study on January 5, 1998.

Bell Atlantic's initial TELRIC studies and compliance filing also did not include a TELRIC study to establish the recurring and non-recurring charges that would apply to interconnection of another carrier's facilities to Bell Atlantic house and riser cable. In addition, Bell Atlantic's initial TELRIC studies and compliance filing did not include a TELRIC study to

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[3] Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98, First Report and Order, FCC 96-325, released August 8, 1996.

establish the recurring and non-recurring charges that would apply to Bell Atlantic's provision of operation support systems ("OSS"). OSS are the computer systems and service centers that are used by CLECs in carrying out transactions with Bell Atlantic for the purposes of ordering, provisioning, and maintaining resold services and UNEs. On July 3, 1997, Bell Atlantic filed testimony setting forth its TELRIC study for OSS. Bell Atlantic presented three witnesses in support of its filing: David J. Kelly, director in the operations and assurance group; Louis D. Minion, senior specialist in the financing controller's department; and William N. Orosz, director in the external affairs and regulatory department. Bell Atlantic's witnesses were examined at hearings on December 16, 17, 18, and 19, 1997.

On February 2, 1998, TCG filed the testimony of David M. Hirsch, director of regulatory and external affairs for the company. On February 3, 1998, AT&T and MCI jointly filed the testimony of a number of witnesses: Lee L. Selwyn, president of Economics and Technology, Inc., a research and consulting firm specializing in telecommunications economics, regulation, management and public policy; Susan M. Baldwin, senior vice president of the same firm; and Richard J. Walsh, a telecommunications consultant (whose testimony was revised on February 4, 1998.) In addition, AT&T sponsored the testimony of Janusz A. Ordover, Professor of Economics at New York University; Tina Gimas, the executive for AT&T's Northeast Local Services Organization in New England; and Lee J. Globerson, senior consultant for matters relating to telecommunications policy and analysis at Group G., Inc. MCI also filed the testimony of Annette Guariglia, senior analyst for MCI's Northern Region Local Competition Group.

Dr. Selwyn and Mr. Walsh were examined at hearings on April 8, 1998. Rebuttal testimony was filed by Bell Atlantic on April 29, 1998, and the rebuttal witnesses -- Dr. William E. Taylor, a consultant with National Economic Research Associates; Mr. Kelly; Mr. Minion, Paula S. Brown, vice president for regulatory matters for Bell Atlantic; Henry B. Gamsby, director of network facilities planning for Massachusetts and Rhode Island for Bell Atlantic; and Michael J. Anglin, a director in Bell Atlantic's service cost organization, who had adopted Mr. Aulisio's testimony, upon the latter's departure from Bell Atlantic -- were examined at hearings on June 9 and 10, 1998.

Surrebutal testimony was filed on August 12, 1998 by Ms. Guariglia on behalf of MCI, by Dr. Selwyn and Mr. Walsh on behalf of both MCI and AT&T, and by Mr. Ordover and Mr. Globerson on behalf of AT&T. These witness were examined at hearings on September 10 and 11, and October 30, 1998.

Briefs were filed by Bell Atlantic, AT&T and TCG jointly,[4] and MCI on December 4, 1998, and reply briefs were submitted on December 31, 1998. The issues in this case are summarized in the discussion below.

II. NON-RECURRING COSTS

A. Introduction

Non-recurring costs are those one-time costs associated with the process by which CLECs order particular UNEs from Bell Atlantic (the "service order" process) and by which Bell

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[4] In light of the merger of TCG into AT&T, we will henceforth refer to the briefs and arguments of both parties as originating from AT&T.

Atlantic actually installs and activates those UNEs (the "service provisioning" process). Bell Atlantic has offered an NRC cost model covering a multitude of service order and service provisioning items. AT&T and MCI, citing what they assert are flaws in the Bell Atlantic model, have offered an alternative NRC model. In this section of this Order, we shall describe the characteristics of the Bell Atlantic model and then present and analyze the AT&T/MCI critique of that model. Next, we will summarize the characteristics of the AT&T/MCI model and then present and analyze Bell Atlantic's critique of that model. Finally, we will set forth the characteristics of the model we intend to use in establishing NRCs for UNEs in Massachusetts.

In reviewing both models, we are guided by the standard for TELRIC studies employed by the Department in the Phase 4 series of Orders. This standard is set forth in the Act and is the one further elucidated by the FCC in its Local Competition Order. The cost study must be forward-looking, based on the least-cost, most efficient technology available to be deployed today. Local Competition Order at ¶¶ 690-693. The existing geographical placement of Bell Atlantic central offices is to be assumed, and the telecommunications network is assumed to serve the current and currently expected demand for telecommunications services. Id. at ¶ 685; Phase 4 Order at 7-8. Bell Atlantic has the burden to prove the nature and magnitude of any interconnection and UNE costs for which it seeks to charge. Local Competition Order at ¶ 680; Phase 4 Order at 8. The TELRIC study method is not a cost recovery model. Indeed, Bell Atlantic's current revenue requirement as may be established from time to time by the Department is not relevant to the estimation of forward-looking costs.

B. The Bell Atlantic NRC Model

1. Description of the Bell Atlantic NRC Model

Bell Atlantic has constructed an NRC model that relies on three general sets of inputs, as discussed in more detail below: (1) a description of the tasks and people that are involved in given ordering and provisioning functions; (2) the identification of labor rates of those members of the Bell Atlantic work force involved in these tasks; and (3) an assessment of the time required to carry out the various tasks. Bell Atlantic used a three-step process to develop the work times required for each function. First, it carried out a work-flow analysis to establish the functions necessary to complete each process. Next, the staff involved in designing the cost study conducted interviews and panel discussions with subject matter experts within Bell Atlantic to develop work time estimates by function within each work-flow analysis. Finally, the estimates were validated by conducting a review process performed by a panel of subject matter experts, and comparing the actual work times to estimated work times (Exh. BA-NRC-2, Attachment A).

The analysis considered two types of order processing paths, one in which orders would be processed electronically and one in which manual intervention would be required. Such manual intervention would be provided by Bell Atlantic's Coordination Bureau. Bell Atlantic constructed estimates of the relative proportions of these two types of paths. As noted above, the work-flow analysis relied on subject matter experts within Bell Atlantic who were familiar with the types of functions being analyzed. These people were asked to estimate a minimum, a maximum, and a most likely time to complete each task. The weighted means of these estimates

were then averaged to obtain a single mean for each work function. In those instances for which there was no actual operating experience, company personnel provided estimates of the work time required for each function based on their experience in completing similar work for Bell Atlantic's own retail customers. Bell Atlantic validated the work time estimates by engaging a panel of subject matter experts to review the process work times and by comparing the actual work times for given functions with the work times estimated by Bell Atlantic personnel. In general, the validation process had the effect of reducing the estimated work times used in the cost study (Exh. BA-NRC-1, at 5).

Bell Atlantic derived labor rates by taking from its books of accounts the basic wage expenses for each Job Function Code ("JFC") and dividing that figure by productive hours, i.e., the time spent working on customer services. These labor costs included loadings for clerical support, management supervisory personnel with direct reporting responsibilities, paid absence, premium time, and payroll taxes and benefits. The result is an estimate of the directly assigned labor rates in each JFC (Exh. BA-NRC-1, at 7).

2. Critique of the Bell Atlantic NRC Model

AT&T asserts that Bell Atlantic's NRC model suffers from the following flaws, which it describes as "fatal:"

(1) The model charges CLECs for NRCs that are completely unnecessary, in that they are caused solely by Bell Atlantic's refusal to provide combinations of UNEs, leading to numerous additional steps in the service order and service provisioning process.

(2) The model is not forward-looking, but instead derives from Bell Atlantic's existing

network and procedures. This means that costs are not based on the most efficient available technology, which would permit electronic provisioning and generate a high degree of "flow-through" (i.e., computer handled without human intervention) in the service order and service provisioning process. The model also is not forward-looking in that it is incompatible with Bell Atlantic's TELRIC model for the recurring costs associated with UNEs. In particular, it uses an assumption for loops based on a mixture of copper and fiber, whereas the Phase 4 Order on recurring costs used an assumed 100 percent fiber feeder in the loop plant. Finally, it is not forward-looking in that it uses technology assumptions that have the effect of driving up the cost of central office wiring.

(3) The model improperly charges CLECs up-front for disconnection costs which Bell Atlantic may not incur for many years, if ever.

(4) The model is based on unreliable work time estimates.

(5) The model fails to demonstrate how charges will actually be applied when a CLEC places an order for UNEs (AT&T Brief at 28).

MCI offers a similar set of critiques. MCI joins in suggesting that Bell Atlantic's use of copper in the fiber feeder plant is inconsistent with the TELRIC recurring studies and in arguing that Bell Atlantic's work time estimates are unreliable. MCI also offers the opinion that inclusion of Bell Atlantic's Coordination Bureau Charge is excessive and unnecessary in light of the automation that would result from properly functioning OSS (MCI Brief at 14-17).

Bell Atlantic has responded to each of these critiques and offers its opinion that its NRC model is basically sound. In the subsections below, we present the arguments and evidence

concerning each item and reach our findings on these items.

a. Unnecessary Charges

AT&T asserts that Bell Atlantic's unilateral refusal to provide combinations of UNEs and its insistence that CLECs wishing to lease combinations of UNEs must reconnect them through a collocation facility will result in avoidable and unnecessary NRCs. AT&T argues that the Department should not permit Bell Atlantic to impose charges for such work (AT&T Brief at 29-32). Bell Atlantic replies that these arguments are not germane to this proceeding and should be rejected by the Department (Bell Atlantic Reply Brief at 21).

The critique offered here by AT&T is a reargument of the many issues faced by the Department in the UNE Combinations portion of this arbitration. In our Phase 4-E and Phase 4-J and 4-K Orders, we addressed the issue of UNE combinations. To the extent that we have allowed Bell Atlantic to not combine separate UNEs, that policy does, as noted by AT&T, require more individual service orders and service provisioning events than a policy that would offer UNE combinations. Those individual steps are nonetheless real and must be completed by Bell Atlantic. Accordingly, they should be subject to charges based on properly determined NRCs. To the extent Bell Atlantic now must offer already-combined UNEs to CLECs, each such combination shall be considered one service order and should be subject to charges based on a properly determined NRC. We now address whether the NRCs are properly determined.

b. Forward-Looking

AT&T and MCI argue that Bell Atlantic has failed to model a forward-looking network properly, and as a result it both misspecifies the work functions that would have to be performed

under a forward-looking network and underestimates forward-looking efficiencies. One result, say the CLECs, is that the model assumes too high a level of manual intervention in the service ordering process. A second problem, they assert, is that the model uses an improper mix of copper and fiber in the loop feeder plant, resulting in too high a level of manual intervention to provision UNEs. A third point raised by AT&T is that the model ignores available technology that would eliminate expensive manual work functions in provisioning central office wiring (AT&T Brief at 32-37; MCI Brief at 15-16). We address these points below.

i. Flow-Through

AT&T and MCI argue that, because a TELRIC study of NRCs must reflect a wholesale environment in which Bell Atlantic's customers are the CLECs, as opposed to end-users, the study must recognize that the CLECs will interact with Bell Atlantic electronically when placing UNE orders. AT&T claims that Bell Atlantic's assumption that 15 percent of all UNE service orders will have to be handled manually is unreasonable. AT&T argues that this "fallout" rate is many times higher than one would expect to experience using efficient, well-functioning OSS. Fallout, notes AT&T, is generally caused by errors in data input or functioning of the electronic systems. If OSS and databases are properly operated and maintained, one would not expect the fallout rate to exceed two percent. The effect of this would be to reduce the assigned costs of Bell Atlantic's Recent Change Memory Access Center ("RCMAC") and Mechanized Loop Administration Center ("MLAC"), the two entities which handle fallout from the OSS, to near zero in the NRC study (AT&T Brief at 34-35).

Bell Atlantic asserts that its 85 percent flow-through level for particular types of service

is forward-looking and realistic. Bell Atlantic further asserts that AT&T's two percent figure is based on optical digital loop carrier technology which is not in use in Massachusetts and therefore its use in the NRC is inappropriate (Bell Atlantic Brief at 104). Bell Atlantic further replies that its NRC study reflects an aggressive assumption that most simple orders will be processed electronically, requiring only limited manual work. In reality, not all CLEC orders will be electronically received and forwarded to the provisioning OSS and work centers. Bell Atlantic notes that its 15 percent fallout rate reflects its overall experience with regard to its retail customers, a result it has not yet achieved with its CLEC customers. Bell Atlantic expects that OSS enhancements will eventually provide the flow-through that it has assumed in the NRC study, and it terms the fallout rates demanded by AT&T and MCI to be unsupported speculation (Bell Atlantic Reply Brief at 14-15).

The Department cannot conclude that Bell Atlantic's flow-through experience with retail customers, who contact Bell Atlantic on a individualized, oral, ad hoc basis, is likely to be illustrative of the experience it will encounter in processing order requests from the CLECs. The CLECs are sophisticated telecommunications carriers, who have every commercial interest in presenting service order information to Bell Atlantic electronically on a schedule, in a format, and with such accuracy designed to achieve the highest possible level of flow-through. As Dr. Selwyn testified, "it should, if anything, be easier for Bell Atlantic to reduce manual intervention and achieve highly efficient automated processing when the customer is another large and sophisticated provider" (Exh. AT&T OSS/NRC-11, at 51). In contrast, Bell Atlantic's witness testified: "We just assumed that we would be able to get to the same level at some point

in the future at the wholesale level that we are in the retail level" (Tr. 22, at 83-84). We find this unpersuasive: Bell Atlantic's NRCs are too high because they include a much higher level of labor costs than is appropriate.

In regard to this issue, too, we are unpersuaded of the utility of a fallout figure based on the Bell Atlantic legacy retail service order systems as representative of the state-of-the-art OSS installed to process CLEC orders. In support of the point (to be discussed later in this Order) that OSS investment costs are incremental to those costs required for Bell Atlantic's own operations, Mr. Kelly has provided an extensive description of the enhancements in OSS installed by Bell Atlantic on behalf of the CLECs (Exh. BA-OSS/NRC-7, at 1-10). Such systems are capable of a higher level of flow-through than the installed base of retail systems.

Thus, we agree with AT&T that, in this respect, the NRC model presented by Bell Atlantic is not a proper TELRIC model. It does not reflect the most efficient available technology, as it fails to take into account the efficiencies that will result from CLECs placing electronic orders for UNEs at wholesale.

We therefore turn to the evidence presented by the CLECs on this point. Mr. Walsh testified that some OSS currently in place have fallout rates of one percent and offered his opinion that this level of fallout should be achievable when OSS are operated and maintained efficiently. He cited in support of this figure the experience of Southwestern Bell Telephone Company ("SWBT") in operating and maintaining its Easy Access Sale Environment ("EASE") system for transfer of resale customers and that company's projections of achieving similar fallout rates for UNE provisioning. He offered his opinion that the Department should rely on

the fallout experience of OSS that currently are available to all ILECs, as opposed to focusing on Bell Atlantic's experience. That broader experience, he offered, would be more indicative of forward-looking fallout rates in the range of two percent (Exh. AT&T OSS/NRC-2, at 30-31, 41-42). Mr. Walsh also distinguished between the fallout that results in the day-to-day functioning of OSS – the figure in question here -- and the fallout that would result from improper maintenance of databases and other maintenance activities that should properly be carried out by the ILEC and whose cost is already captured in the recurring cost rates (Tr. 32, at 98-107).

Dr. Selwyn concurred with this analysis, noting that "it is reasonable to assume that, in general, if the various OSS components are functioning properly and have been appropriately integrated and synchronized, 'flow-through rates' are significantly improved, and 'fallout' rates should approach zero and in no event exceed the one percent to two percent level . . ." (Exh. AT&T OSS/NRC-11, at 51). Dr. Selwyn's testimony cited an earlier exhibit, in which he presented a comparative analysis of the telecommunications industry and other industries in which electronic operating systems are required to handle a large number of customer orders and accurately process them in real time. The fallout rates in that analysis were in the one to two percent range (Exh. AT&T OSS/NRC-1, Attachment at 28-34).

In response, Bell Atlantic has argued that inter-industry comparisons are not useful or relevant and has also offered evidence which it uses to contend that the SWBT experience is not relevant for the case at hand and that the OSS for processing UNE orders will be more complex and sophisticated both now and in the long term (Bell Atlantic Reply Brief at 24). An affidavit

submitted by SWBT employees is offered by Bell Atlantic to demonstrate that the flow-rate achieved by SWBT was for ordering only simple residential service and did not include business service. Neither did it include provisioning and billing systems, focusing instead on the mechanized transcription of service-order requests from an electronic interface into SWBT's internal service order format. The affiants also offer their opinion that it is improbable that a two percent fallout rate for wholesale services is likely to be achievable in the foreseeable future (Exh. BA-OSS/NRC-7, at 17-18; Attachment 1).

The Department has reviewed the affidavit submitted by SWBT employees in support of Bell Atlantic's argument that a dramatically lower fallout rate is unrealistic. The concluding paragraph of that affidavit is instructive in providing the context for the analysis presented. The affidavit, signed on December 15, 1997, concludes, "[I]t would be improbable that a one percent or two percent fallout rate is likely to be achievable for ordering Resold Services or UNEs in the foreseeable future, and certainly not by the end of 1998" (Exh. BA-OSS/NRC-7, Attachment 1, at 9-10). Because these individuals were not presented in person, it is difficult to know what to make of this statement. The issue before the Department is not whether a two percent fallout rate was achievable by the end of 1998. Our purpose is to establish a rate based on the application of forward-looking technologies. Perhaps the "foreseeable future" term used by the affiants is equivalent to the term that would be appropriate for a TELRIC analysis in Massachusetts, and perhaps it is not. We cannot be sure. In any event, we must look more deeply to determine if the affidavit is dispositive of the issue.

The affiants cite the experience of SWBT in processing orders from interexchange

carriers ("IXCs"), which have "been in existence since divestiture in 1984." They note that, "even with these mature systems, there is still a 30-50 percent fallout rate for access service requests . . . prepared by IXCs" (Exh. BA-OSS/NRC-7, Attachment 1, at 9). This experience is irrelevant to our determination in this case. The legacy OSS and procedures that have been in effect for IXCs for 15 years cannot be considered the kind of forward-looking systems appropriate for modeling in a TELRIC study in 1999. This is proven by the very next sentences in the affidavit, in which the affiants explain that access service orders are less complex than many of the orders for Resold Service or UNEs. By the logic of this affidavit, SWBT should never have been able to achieve a one percent fallout rate with EASE, and yet it has achieved just this result.

In contrast, Dr. Selwyn has made a persuasive case that many of the sources of fallout can be addressed and largely eliminated in integrated OSS. He explains that input errors are typically made by the service representative and can be checked for internal consistency at the time of entry and can be corrected on the spot. Facilities assignment errors, he notes, can result from a lack of accurate and synchronized databases, which can be corrected when the problem is detected. Dr. Selwyn states that physical connection and configuration errors will be reduced by the use of digital cross-connect and digital loop carrier systems, systems which we note are consistent with the technology we have assumed, above, is present in the TELRIC network (Exh. AT&T OSS/NRC-1, Attachment at 31-32).

We find that Dr. Selwyn's analogy to Electronic Data Interchange ("EDI") protocols is also quite relevant to the current question. EDI, he explains, "is a set of standard electronic

formatting protocols that allow data to be passed between different companies and computer systems electronically, without human intervention." He gives examples of firms that have used EDI to manage transactions with other firms, with a minimum of fallout. He asserts that ILEC operations are comparable in overall complexity to other large industrial processes characteristic of network-based industries, and he gives specific examples of such industries (Exh. AT&T OSS/NRC-1, Attachment at 33-34). This description is persuasive that the fallout projections proposed by the CLECs for the Bell Atlantic OSS have support in the experience of comparable industrial systems.

We conclude that Bell Atlantic has not met its burden of proof that the 15 percent fallout rate assumed in its NRC model is an appropriate reflection of forward-looking technology that will be in place to process service orders. We conclude that the CLECs have presented substantial evidence in support of a lower fallout rate in this industry, basing their analysis on a description of the appropriate use of forwarding-looking technologies. Their conclusions, too, are given credibility by their reference to comparable systems in other industries. We therefore conclude that the two percent fallout rate offered by the CLECs is indicative of likely experience with forward-looking technologies in this industry. (We discuss, below, a further required adjustment to the Bell Atlantic NRC model -- related to the Coordination Bureau -- that follows from this conclusion. See Section II.C.2.b.)

ii. Fiber Feeder

We agree with AT&T and MCI that the NRC model presented by Bell Atlantic is unacceptably inconsistent with the TELRIC model approved by the Department for the recurring

costs associated with UNEs. In earlier stages of this proceeding, Bell Atlantic forcefully argued that the appropriate forward-looking technology was a network with 100 percent fiber feeder in the loop portion of the network. We addressed this point in detail and overrode the CLECs' objections to this construct in the Phase 4 Order, noting "that the structure of the [Bell Atlantic] model provides a good representation of a reconstructed local network that will employ the most efficient technology for reasonably foreseeable capacity requirements." Phase 4 Order at 16-17.

Here, though, Bell Atlantic proposes to use a 90 percent copper feeder network, the result of which is to increase the NRCs associated with the loop UNE. Dr. Taylor argues that this inconsistency is warranted in the following summation.

> [N]on-recurring costs are largely driven by expenses (e.g., labor), while recurring UNE costs (e.g., loops) are largely investment-driven. Since technological change is generally embedded in new capital equipment, UNE costs can be more sensitive to technological assumptions than non-recurring costs. Second, recurring costs of UNEs are recovered over time as the UNE is used, so that if forecasts of future technology and investment prove to be wrong, adjustments to costs and prices can be made which will apply to the agent that caused the cost. In contrast, transactional and non-recurring costs, by definition, occur just once in a firm's relationship with its cost-causing customer. Once past, that opportunity does not come again, and errors in prediction cannot be corrected insofar as the individual customers are concerned. These relationships suggest that different, more conservative technological forecasts can be used to measure forward-looking . . . non-recurring costs compared with the recurring costs of UNEs.

(Exh. BA OSS/NRC-6, at 20-21).

We quote this interpretation of the case as a reference point to make clear that we do not agree with this conclusion. First, we differ from the witness on the factual contention that technology assumptions are somewhat removed from the NRC charges developed in the Bell Atlantic model. Those assumptions directly influence the level of labor costs incurred to carry

out loop-related provisioning functions. The time and labor inputs inherent in the Bell Atlantic NRC model are based precisely on the technology that the internal panels of estimators were told to assume (Exh. BA NRC-1, at 4-6; and Attachment A).

Mr. Globerson persuasively documents that the technology assumption is quite important to the level of NRCs derived. He provides a specific example, noting that the Bell Atlantic NRC study sets forth a cost of $21.12 to install and remove a piece of central office wiring when "Plain Old Telephone Service" ("POTS") service[5] is ordered. He asserts that there should be no need for central office wiring for POTS if there is 100 percent fiber in the feeder plant because such fiber would terminate in a central office into digital loop carrier ("DLC") technology that does not require central office wiring. He notes that it is the Bell Atlantic assumption of copper in the feeder plant that results directly in this extra labor expense (Exh. AT&T OSS/NRC-6, at 10). This example is representative of others interspersed throughout the NRC study, and it supports our conclusion that the technology assumption is important to the level of NRCs derived in the cost study.

Second, Dr. Taylor mixes the rate design function of the TELRIC method with the cost recovery function that might be found in other aspects of state regulation of the incumbent. The TELRIC method, as we have stated repeatedly, is based on a hypothetical, forward-looking telecommunications network. It is not meant to be related to the embedded or historic costs of the incumbent or the application of those costs to a particular customer. Thus, Dr. Taylor's

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[5] POTS is basic telephone service, without special features.

concern that the "agent that caused the cost" might have been charged a price that is "wrong" based on misplaced technological assumptions is not on point in this proceeding. The job of the Department is to use our best judgment in determining the full range of forward-looking costs at various points in time. If, at some time in the future, the Department's technology judgment is found to be in error, new forward-looking costs may be established at that time for application to subsequent transactions. As noted by Dr. Taylor, subsequent methodological changes that might occur in UNE recurring costs would not apply retroactively to those customers who might have benefitted from a previously determined lower UNE charge (Tr. 35, at 29-32). Thus, there is a parallel treatment of customers who face the "wrong" NRC and to those who face the "wrong" recurring charge. Finally, as noted by Dr. Selwyn, the distinction between recurring and nonrecurring functions is somewhat arbitrary, and it "makes no sense to suggest that different network assumptions should be applied for each 'type' of cost" (Exh. AT&T OSS/NRC-11, at 48). In light of these facts, there is no reason to apply a different set of technology assumptions to the development of NRCs from recurring charges.

In fact, we agree with AT&T that this assumption invites undue selectivity or "cherry-picking," i.e., producing the higher recurring costs associated with all fiber feeder and the higher NRCs associated with a network composed primarily of copper feeder (AT&T Brief at 36). Our goal, as noted above, is to model a forward-looking telecommunications network. Bell Atlantic's arguments in support of a 100 percent fiber network were persuasive to us many months ago, and they remain so today. The NRC study must therefore incorporate this assumption.

iii. Central Office Wiring

AT&T argues that Bell Atlantic, by basing its NRC study on the current network, rejects the use of forward-looking integrated digital loop carrier ("IDLC") technology because that technology is not currently deployed by Bell Atlantic. AT&T states that this has the result of reflecting a substantial increase in central office wiring. IDLC technology is a currently available technology which the Litespan DLC units already deployed in the Bell Atlantic network can support, asserts AT&T, and the fact that Bell Atlantic has not chosen to deploy it should not preclude its use in the TELRIC cost study network (AT&T Brief at 37-38).

Bell Atlantic responds that it based its central office wiring activity on universal digital loop carrier ("UDLC") loop technology because this technology reflects the vast majority of Bell Atlantic's loop network architecture that will be in place for the foreseeable future. The technology assumed by AT&T, says Bell Atlantic, is not technology that it is currently deploying in Massachusetts (Bell Atlantic Brief at 69-70). Bell Atlantic explains that the difference between IDLC and UDLC is that the former provides a direct interface between the loop and the central office digital switch. The latter, in contrast, requires a step to wire and terminate a loop on the Main Distribution Frame. However, says Bell Atlantic, IDLC's use would require additional upgrades to the Bell Atlantic network that would add additional recurring costs, costs which have not been considered by AT&T (id. at 71-73). Further, Bell Atlantic notes that the recurring cost study approved by the Department in the Phase 4 Order employed the UDLC technology (Bell Atlantic Reply Brief at 16). Finally, Bell Atlantic notes that even the IDLC technology proposed by AT&T and MCI will not prevent the need for manual cross connections

in the central office in an environment of multiple carriers rather than a single carrier (Bell Atlantic Reply Brief at 18-19).

Our goal here, as above, is to maintain a consistency between the recurring cost TELRIC study and the NRC TELRIC study. There is no disagreement that Bell Atlantic's assumption regarding the digital loop carrier technology in the NRC study is the same as that used in the Department-approved TELRIC recurring cost method; yet, the CLECs urge that different technology assumptions be used. In the section above, we declined to permit Bell Atlantic to include such adjustments, and here we decline to adopt the CLECs' proposals.

c. Disconnection Costs

The issue surrounding disconnection costs is not whether such costs should be estimated and charged to CLECs. The issue is whether the CLEC which has ordered a service should be charged for disconnection of that service at the time service is ordered or upon disconnection. Bell Atlantic, in parallel with its policies and Department-approved NRCs for retail customers, has proposed to include these charges in the wholesale service ordering rate element. AT&T argues that this policy is inappropriate when it comes to the CLECs. AT&T draws a number of distinctions between the CLECs' and the retail arenas.

First, notes AT&T, disconnection costs are not incurred merely because a CLEC's end-user customer may terminate service. So long as the CLEC continues to lease UNEs from Bell Atlantic, they will not be disconnected no matter how many end-user customers may succeed one another at the service location. Thus, says AT&T, the actual likelihood of a disconnection is less than in Bell Atlantic's retail service offerings. Second, AT&T argues, unlike the retail customer,

from whom a disconnect fee may be difficult to collect, CLECs will not disappear and can be charged for any reasonable and appropriate fee at the time it is incurred. Third, permitting the collection of an up-front disconnection charge would provide Bell Atlantic a source of cost-free capital from its competitors. The effect of all of these points, argues AT&T, is an artificial barrier to competitive entry (AT&T Brief at 39-40). MCI joins in these arguments (MCI Brief at 11-12).

Bell Atlantic expresses concern that separating disconnection costs from up-front NRCs for provisioning UNEs would offer no assurance that Bell Atlantic would recover disconnection costs that will inevitably be incurred in the future. Bell Atlantic argues that neither AT&T nor MCI offer any evidence that CLECs will behave differently in their remittance practices from Bell Atlantic's retail customers. Finally, in response to AT&T's argument that the up-front disconnection fee would provide a source of cost-free capital, Bell Atlantic says that this ignores the long-term effect of inflation on the actual disconnection costs that it will incur in the future (Bell Atlantic Reply Brief at 27-28).

The inclusion of disconnection costs has long been a standard practice for the Department in the calculation of retail installation NRCs. This has been the case because the ultimate collection of disconnection costs from retail customers is more difficult than the collection of installation costs, and Bell Atlantic is entitled to a reasonable assurance that such costs will be recovered from customers. Their inclusion at the time of service ordering has provided an appropriate allowance for Bell Atlantic, in anticipation of whenever the ultimate disconnections might take place.

While the CLECs have argued that they represent a different class of customers from retail customers, the parties did not persuade us that a CLEC would be more available and willing to pay disconnection costs than retail customers. Thus, an allowance for these costs in the TELRIC-based NRCs is appropriate. We recognize that the inclusion of these costs does, as noted by the CLECs, provide Bell Atlantic with a source of funds that is available for other purposes between the time of installation and the time of disconnection, but, as noted by Bell Atlantic, there is no assurance that the funds so collected will ultimately be sufficient to cover the actual costs of disconnection.

We have considered other mechanisms to assure collection of these costs at the actual time of disconnection. For example, we could order that the interconnection agreements contain a provision that would give Bell Atlantic a claim on a CLEC's assets to satisfy this obligation; but any such mechanism would be complicated and could ultimately interfere with other commercial and legal obligations of the two companies (for example, the obligations of a CLEC to other creditors in the event of a bankruptcy.) Therefore, we maintain our longstanding policy of including disconnection costs in the calculation of installation NRCs.

d. Work Time Estimates

AT&T argues that Bell Atlantic has not met its burden of proving that its work time estimates are credible. First, says AT&T, Bell Atlantic did not estimate the time to perform individual functions but instead made an aggregate estimate of the entire involvement of whole work groups. This concern is amplified because Bell Atlantic time estimators were biased because they were told that the estimates were going to be used to establish charges that would

be assessed against CLECs. Second, the time estimates solicited by Bell Atlantic came from such small samples of respondents, and were so wide ranging, that there is no basis for finding them to be reliable. In any event, Bell Atlantic did not perform a statistical analysis or make any attempt to eliminate obvious outliers. Third, there is no basis for the arbitrary weights assigned by Bell Atlantic to the individual time estimates in order to derive weighted averages for the purpose of calculating NRCs. The decision to weight the estimates by assigning a weight of one-sixth to the "minimum" time, one-sixth to the "maximum," and four-sixths to the "most likely" was, in AT&T's opinion, unsupported. Finally, argues AT&T, Bell Atlantic failed to verify its time estimates by any reliable means, even where the work it expects to perform for CLECs is identical to the work it performs for retail customers today. AT&T notes that Bell Atlantic refused to reveal the professional qualifications or even the names of its subject matter experts, those who were involved in validating the results. These experts, in any event, were not instructed to take into account the effect of projected developments in Bell Atlantic's operating systems in the near future, and so their opinions are not based on forward-looking technologies (AT&T Brief at 41-45).

Bell Atlantic argues that its work time estimates were based on reasonable and well-documented methods (Bell Atlantic Brief at 75-91; Bell Atlantic Reply Brief at 19). It argues, in contrast, that the work estimates supplied by the CLECs' witnesses are totally unsupported and biased (Bell Atlantic Reply Brief at 20).

The Department agrees with AT&T that there are serious flaws in the Bell Atlantic method. These flaws include the smallness of the sample sizes, the wide ranges of estimates

produced by the Bell Atlantic employees, and the fact that employees were not always informed of and instructed to assume forward-looking technologies in making their assessments. These flaws introduce an element of bias into the estimation process and impair its reliability. We have not been presented with a coherent explanation of why the weighting system used by Bell Atlantic is appropriate. There is also a strong likelihood of bias when employees are instructed to provide estimates that they are told will be used to derive charges for their employer's competitors. Bell Atlantic has failed to demonstrate that it acted to reduce the probability of such bias. Finally, we note the anonymity and lack of qualifications presented for the subject matter experts used by Bell Atlantic to validate these estimates.

Nonetheless, as we discuss below, (see Section II.C.), the NRC model offered by the CLECs also contains many flaws in the development of work time estimates, and we are also reluctant to use those results. We could choose to send Bell Atlantic back to the drawing board to conduct new studies, but we are reluctant to do so because we are not convinced that such studies would be a productive use of company time or the regulatory process or that they could be completed in a period frame appropriate for these proceedings. Accordingly, we are left with no choice but to modify the numbers presented by Bell Atlantic to offset, to the extent possible, the biases in its approach. We choose to do so by adopting a set of numbers produced by Bell Atlantic that is least likely to be biased, the "minimum" figures produced by its employees. We therefore direct Bell Atlantic to resubmit its cost study using the "minimum" work time estimates in deriving the NRCs.

e. Applicability of Charges

AT&T argues that the Bell Atlantic NRC model fails to demonstrate how CLECs will actually be charged when ordering UNEs and thus cannot form the basis for reasonable and appropriate non-recurring charges. AT&T cites Bell Atlantic witnesses as being contradictory, stating on the one hand that Bell Atlantic would seek to recover each and every cost identified in the study in its UNE charges, and then retracting that statement and acknowledging that certain costs set forth in the study will not be charged to CLECs. Likewise, AT&T cites a Bell Atlantic witness as stating that the NRC cost study did not identify all of the charges Bell Atlantic might impose on CLECs for provisioning UNEs, while not indicating when such charges will be identified. AT&T also notes that the Bell Atlantic witness was unable to explain how the costs of provisioning an order for two or more links would be charged where not all the links were to be provisioned at a single cross-box. These and other examples, say AT&T, render the NRC study useless in determining the reasonable and appropriate rates to be charged to CLECs (AT&T Brief at 47).

Bell Atlantic responds that it submitted on June 19, 1998, a detailed description of how the non-recurring charges for UNEs would be applied. Bell Atlantic asserts that the fact that the filing has yet to be examined by the Department provides no basis for rejecting its NRC study (Bell Atlantic Reply Brief at 21-22). This portion of the proceeding has focused almost exclusively on the method of the NRC study. The specific application of the study results, as noted by Bell Atlantic, has received little attention in the Department's hearings. The Department will address the questions and concerns raised by AT&T in the next phase of this

proceeding, when Bell Atlantic submits its NRC study compliance filing.

C. The AT&T/MCI Non-Recurring Cost Model

1. Description of the Model

AT&T and MCI have offered a competing NRC model ("NRCM") for consideration by the Department (Exh. AT&T OSS/NRC-2). They characterize that model as using forward-looking costs and being based on "bottoms up" estimates of NRCs, using the following major assumptions: (1) a TELRIC engineered network using forward-looking technologies and efficient processes; (2) an electronic ordering interface between the CLEC and Bell Atlantic that incorporates front-end edits to minimize service order errors and the ability of those errors to be returned electronically; (3) an efficient OSS environment with unpolluted databases to minimize fallout; (4) electronic provisioning where possible; (5) POTS services that are treated as non-designed services; (6) connect and disconnect charges that are calculated separately; and (7) OSS investment costs that are recovered in recurring rates (MCI Brief at 4-14; AT&T Brief at 49-52).

2. Critique of the NRCM

Bell Atlantic has offered a critique of the NRCM, stating that it is neither reasonable nor appropriate for setting UNE rates (Bell Atlantic Brief at 100). In our discussion above, the Department has already addressed some of the areas of disagreement between the parties: the use of next generation integrated loop carrier; the use of 100 percent fiber in the feeder network; and the two percent fallout rate. In addition, Bell Atlantic cites additional flaws.

a. Cross-Connection Costs

The first criticism is that the NRCM assumes that there are no incremental NRCs

associated with cross-connections at the feeder distribution interface. According to Bell Atlantic, the NRCM assumes 100 percent Dedicated Outside Plant ("DOP"), thus causing no incremental cost to be incurred to perform cross-connections at the Feeder Distribution Interface ("FDI") for the unbundled loop. The costs of these cross-connects are assumed in the NRCM to be included in the recurring rates for unbundled loops.

Bell Atlantic points out that these assumptions are unwarranted because, by design, the number of distribution pairs exceeds the number of feeder pairs at each cross-connect point. Also, Bell Atlantic does not wire all customers through the FDI with initial construction because loop facilities are constructed prior to customer demand. The result is that cross-connection costs are incurred on an "as needed" basis. Bell Atlantic states that, if no cross wiring is necessary at the serving area interface, the charge for this activity will not apply (Bell Atlantic Brief at 105-106).

The CLECs do not respond to this specific criticism. We find merit in Bell Atlantic's presentation, and agree that the NRCM's assumptions are flawed in this area.

b. Coordination Bureau

The second criticism leveled by Bell Atlantic is that the NRCM improperly eliminates all costs associated with the Coordination Bureau. The work performed by the Coordination Bureau, says Bell Atlantic, is critical to the efficient installation of new links, the transfer of working links (hot cuts), and CLEC-to-CLEC link transfers[6] (Bell Atlantic Brief at 106-107).

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[6] Bell Atlantic states that the Coordination Bureau oversees departments that must do work (continued...)

MCI responds that none of the activities of the Coordination Bureau are necessary if Bell Atlantic had a properly functioning OSS which would automatically notify the CLEC that installation had been completed. MCI also argues that, in fact, the Coordination Bureau has played no noticeable role in resolving any of the problems that MCI has encountered when purchasing loops from Bell Atlantic (MCI Reply Brief at 12-14).

Bell Atlantic responds that the activities of the Coordination Bureau are critical to meeting service commitments to the CLECs. Bell Atlantic argues that the non-recurring Coordination Bureau costs associated with provisioning UNEs are based on physical work activities that will continue to be required even with technologically advanced architecture (Bell Atlantic Reply Brief at 22-23).

For purposes of the Department's analysis, we put aside MCI's current complaints about the efficacy of the Coordination Bureau in handling recent orders. We assume that these are start-up problems that will be resolved over time. We accept Bell Atlantic's argument that the Coordination Bureau provides an important function in those cases requiring manual intervention. Indeed, we imagine that the absence of such a bureau would be quickly lamented by the CLECs if it did not exist to help with certain problems. Accordingly, the exclusion of all such costs in the NRCM is not warranted.

Nonetheless, we must recognize that the costs included in the Bell Atlantic NRC model

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[5](...continued)
to provision links, including accepting changes and directions from the CLECs (Bell Atlantic Brief at 107-108).

for the Coordination Bureau are based on the amount of manual intervention associated with a fallout rate of 15 percent, rather than the two percent rate we have adopted. Thus, the ongoing costs of that Bureau must be related in some way to the likely level of activity it will carry out. Because we have assumed that a forward-looking network will require less manual intervention, some adjustment must be made to the costs assumed for the Coordination Bureau included in the Bell Atlantic study. Bell Atlantic is therefore instructed to modify the Coordination Bureau costs included in its NRC study to reflect a lower level of activity, consistent with the two percent fallout rate we have adopted. In the absence of a persuasive presentation on this issue in its compliance filing, we will exclude all such costs from the NRC study.

c. Work Time Estimates

Bell Atlantic's third area of criticism is that the NRCM adopts unreasonable work times. Bell Atlantic states that the work times used by the CLECs are provided without supporting rationale or documentation (Bell Atlantic Brief at 108-109).

AT&T responds by noting that each of 200 individual work functions are evaluated to develop its NRC estimates, and the specific steps involved to perform each of these separate functions have been spelled out, allowing for an independent evaluation of the time estimates used in the NRCM (AT&T Brief at 51-52).

Bell Atlantic offers such an evaluation on a number of work time estimates. For example, it notes that the NRCM allows only one minute for installation of a 2-wire cross-connect on a main distribution frame. In contrast, its studies, provided by people involved in this activity, show that a cross-connect for a new loop takes 14 minutes, and 21 minutes for a hot cut

(Bell Atlantic Reply Brief at 26-27).

The Department has reviewed the NRCM work time estimates. We appreciate the fact that the CLECs have clearly set forth the functions they have employed in the model, but they have offered little in the way of documentation or validation of these estimates. We cannot accept these estimates in the absence of adequate support for the inputs. As noted above, we have recognized the flaws in the Bell Atlantic approach, but we can not be agnostic with respect to the flaws pointed out by Bell Atlantic with regard to the NRCM estimates, flaws which essentially go unanswered by the CLECs. Accordingly, we do not accept the work time estimates employed in the NRCM.

D. Conclusion

The CLECs have provided a useful service to the Department in presenting a competing NRC model. In particular, we appreciate the transparency of the model, i.e., its clear presentation of structure, assumptions and variables. We have noted above our resolution of criticisms of that model by Bell Atlantic. Because we cannot adopt the work time estimates used in the NRCM and because we have no alternative set of numbers to insert into the model for these items, we must rely on the Bell Atlantic model -- with the adjustments we have ordered -- for purposes of establishing NRCs. Accordingly, Bell Atlantic is directed to make the adjustments we have ordered to its model and to submit those revisions in its compliance filing. The Department directs Bell Atlantic to submit its NRC compliance filing within 28 days of the date of this Order.